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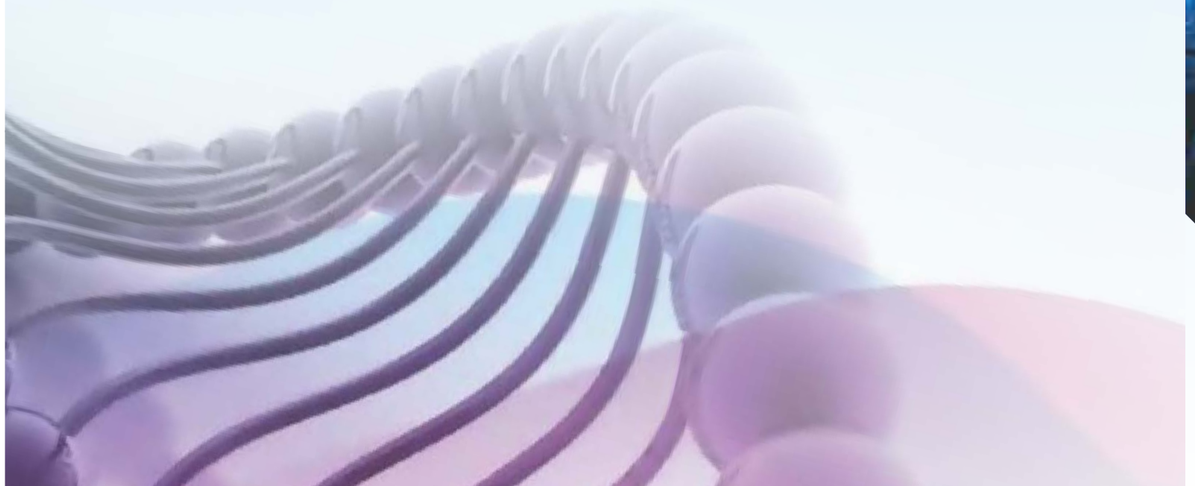


birac

INNOVATION PROFILES 2019

INNOVATE FOR EXCELLENCE

birac

Ignite Innovate Incubate

INNOVATE FOR EXCELLENCE

CONTENTS

FOREWORD

PREFACE

ABOUT BIRAC

INNOVATE FOR EXCELLENCE

THEME WISE ASSESSMENT

INNOVATION PROFILES

Healthcare-Therapeuties

Acubiosys Pvt. Ltd.	SBIRI	32
Affigenix Biosolutions Pvt. Ltd.	SBIRI	33
Ahammune Biosciences Pvt. Ltd.	BIPP	34
Bharat Immunologicals and Biologicals Corporation Ltd.	NBM	35
Bharat Immunologicals and Biologicals Corporation Ltd.	NBM	36
Biomac Life Scienecs Pvt. Ltd.	BIG	37
Cellugen Biotech Pvt. Ltd.	SBIRI	38
CSIR-National Institute of Oceanography	PACE-AIR	39
Cuor Stem Cellutions Pvt. Ltd.	SPARSH	40
Exocan Healthcare Technologies Pvt. Ltd.	SBIRI	41
Eyestem	BIG	42
Genzir Technologies Pvt. Ltd.	BIG	43
Hanugen Therapeutics Pvt. Ltd.	BIG	44
Himedia Laboratories Pvt. Ltd.	BIPP	45
International Center of Genetic Engineering and Biotechnology	PACE-CRS	46
IGY Immunologix Pvt. Ltd.	SBIRI	47
Indian Immunologicals Ltd.	NBM	48
Integral Biosciences Pvt. Ltd.	SBIRI	49
Jamia Hamdard, New Delhi	PACE-CRS	50
Jamia Hamdard, New Delhi	PACE-AIR	51
Jubeln lifesciences	BIG	52
KAS Institute of Research Pvt. Ltd.	BIG	53
Luxmatrainnovations Pvt. Ltd.	BIG	54
Mynvax Private Ltd.	NBM	55
National Centre for Antarctic and Ocean Research	PACE-CRS	56
Nitin Yadav	BIG	57
NMAM Institute of Technology	PACE-AIR	58
Oncosimis Biotech Pvt. Ltd.	BIG	59
Oniosome healthcare Pvt. Ltd.	SBIRI	60
Oniosome healthcare Pvt. Ltd.	SBIRI	61
Plabeltech Pvt. Ltd.	BIG	62
PNB Vesper Life Science Pvt. Ltd.	BIPP	63
Raman Parkesh	BIG	64
Rasayani Biologics Pvt. Ltd.	BIPP	65
Regrow Biosciences Pvt. Ltd.	BIPP	66
Rethi Madathil	BIG	67
SASTRA University, Thanjavur	PACE-AIR	68
Samarthakrupa Lifesciences Pvt. Ltd.	BIG	69
Serum Institute of India Pvt. Ltd.	NBM	70
Sun Pharmaceutical Industries Ltd.	NBM	71
Tergene Biotech Pvt. Ltd.	NBM	72
Tranalab Pvt. Ltd.	BIG	73
Translational Health Science and Technology Institute (THSTI)	PACE-CRS	74
University of Mysore	PACE-AIR	75
Vandita Kakkar	BIG	76
Vidya K.C.	BIG	77
Vitane Biologics Pvt. Ltd.	NBM	78
Weinnovate Bio solutions Pvt. Ltd.	SBIRI	79

Healthcare-Devices and Diagnostics

4S Medical Research Pvt. Ltd.	IIPME	82
4S Medical Research Pvt. Ltd.	SBIRI	83
Abikshyeet Panda	BIG	84
Adiuvo Diagnostics Pvt. Ltd.	SBIRI	85
Aindra System Pvt. Ltd.	IIPME	86
Althion Tech Innovations Pvt. Ltd.	BIG	87
Atmen Technovention Pvt. Ltd.	BIG	88
Avinash Dental Laboratories & Research Institute Pvt. Ltd.	BIPP	89
Bagmo Pvt. Ltd.	SBIRI	90
BeAbleHealth Pvt. Ltd.	BIG	91
Biodesign Innovation Labs	BIG	92
BiolMed Innovations Pvt. Ltd.	BIPP	93
BiolMed Innovations Pvt. Ltd.	SBIRI	94
Biomoneta Research Pvt. Ltd.	SBIRI	95
Bionic Hope Pvt. Ltd.	IIPME	96
Biopraxis Pvt. Ltd.	BIG	97
Cartosense Pvt. Ltd.	BIG	98
Chimera Translational Research Fraternity Pvt. Ltd.	BIG	99
Chrogene Aarogyam Biotech Pvt. Ltd.	BIG	100
Comofi Medtech Pvt. Ltd.	BIG	101
Cyonics Cyto Solutions Pvt. Ltd.	BIG	102
Df3d creations Pvt. Ltd.	SPARSH	103
Diagnorite Innovative Healthcare Pvt. Ltd.	SBIRI	104
Dipti Gupta	IIPME	105
Dzeal Pvt. Ltd.	BIG	106
Dzeal Pvt. Ltd.	SBIRI	107
Ekistics Solutions Pvt. Ltd.	BIG	108
Fast Sense Diagnostics Pvt. Ltd.	BIG	109
Flexmotiv Technologies Pvt. Ltd.	BIG	110
Genomix Molecular Diagnostics Pvt. Ltd.	SBIRI	111
Genrich Membranes Pvt. Ltd.	SPARSH	112
Happy Reliable Surgeries Pvt. Ltd.	IIPME	113
HTIC, IIT-Madras	NBM	114
Huwel Lifesciences Pvt. Ltd.	NBM	115
Iatome Electric India Pvt. Ltd.	IIPME	116
IIT Bombay	PACE-AIR	117
IIT Delhi	PACE-AIR	118
IIT Madras	PACE-AIR	119
Indius Medical Technologies Pvt. Ltd.	BIPP	120
Indian Institute of Toxicology Research	PACE-AIR	121
Innaumation Medical Devices	BIG	122
Inochi Care Pvt. Ltd.	IIPME	123
Institute Of Chemical Technology, Mumbai	PACE-AIR	124
Janitri Innovations Pvt. Ltd.	IIPME	125
JC OrthoHeal Pvt. Ltd.	BIPP	126
Jeevtronics Pvt. Ltd.	IIPME	127
Kornerstone Devices Pvt. Ltd.	IIPME	128
Kriyaneuro Technologies Pvt. Ltd.	IIPME	129
Kumudha Health Tech Pvt. Ltd.	BIG	130
Lattice Innovations Pvt. Ltd.	SPARSH	131
Lora Mishra	BIG	132
Lumisoft Technologies Pvt. Ltd.	SPARSH	133
Machphy Solutions Pvt. Ltd.	BIG	134
Manipal Academy of Higher Education, Manipal University-	PACE-AIR	135
MediAsha Technologies Pvt. Ltd.	BIG	136
MicroGO LLP	BIG	137
Mimyk Medical Simulations Pvt. Ltd.	SBIRI	138
Miraqules MedSolutions Pvt. Ltd.	BIG	139
Module Innovations Pvt. Ltd.	SBIRI	140
Monitra Healthcare Pvt. Ltd.	SPARSH	141
Munna Lal Yadav	BIG	142
Morphle Technologies Pvt. Ltd.	BIG	143
Mocxa Health Pvt. Ltd.	BIG	144
National Institute of Animal Biotechnology	PACE-AIR	145
National Institute of Animal Biotechnology	PACE-AIR	146
Nemocare Wellness Pvt. Ltd.	BIG	147
Nesa Medtech Pvt. Ltd.	SBIRI	148
Newndra Innovations Pvt. Ltd.	SPARSH	149
NextGen In-Vitro Diagnostics Pvt. Ltd.	BIPP	150
Nishant Kathpal	BIG	151
Neukelp Innovation Technology Pvt. Ltd.	BIG	152
On My Own Technology Pvt. Ltd.	BIG	153
Orthocrafts Innovations Pvt. Ltd.	SBIRI	154
Orthocrafts Innovations Pvt. Ltd.	NBM	155
Osind Medi Tech Pvt. Ltd.	IIPME	156
Osind Medi Tech Pvt. Ltd.	SBIRI	157
Panacea Medical Technologies Pvt. Ltd.	NBM	158
Persistent Systems Ltd.	BIPP	159
Piscium Health Sciences Pvt. Ltd.	BIG	160
Prantae Solutions Pvt. Ltd.	BIG	161
Purplas It Services Pvt. Ltd.	BIG	162
Rcupe Lifesciences Pvt. Ltd.	SBIRI	163
Renalyx Healthsystems	NBM	164
Salcit Technologies Pvt. Ltd.	BIG	165
Sensivision Health Technologies Pvt. Ltd.	IIPME	166
Solbots	BIG	167
Svasthyaadhar Pvt. Ltd.	BIG	168
Swagatika Panda	BIG	169
Swapnil Sinha	BIG	170
SynThera Biomedical Pvt. Ltd.	SBIRI	171
Synersense Pvt. Ltd.	BIG	172
Tejomir Diagnostics LLP	BIG	173
The University Of Burdwan	PACE-AIR	174
Turiya Innovations Pvt. Ltd.	BIG	175
Tvasta Bio-Science Pvt. Ltd.	BIG	176
UnivLabs	IIPME	177
Urvogelbio Pvt. Ltd.	BIG	178
Valetude Primus Healthcare Pvt. Ltd.	BIG	179
Vikas Sahu	BIG	180
Vineesh V S	IIPME	181
VMP Ortho Innovations LPP	SBIRI	182
Voxelgrids Innovations Pvt. Ltd.	NBM	183
Yostra Labs Pvt. Ltd.	SBIRI	184
Yostra Labs Pvt. Ltd.	SPARSH	185

Agriculture

ADNAN NAIM	BIG	188
A. G. Bio Systems Pvt. Ltd.	BIPP	189
Andhra Pradesh State Sericulture R and D Institute	PACE-AIR	190
Anitha Peter	SPARSH	191
BAIF Development Research Foundation	PACE-AIR	192
Dtronics Technology Pvt. Ltd.	SPARSH	193
Indo American Hybrid Seeds	SBIRI	194
JIVA Sciences Pvt. Ltd.	BIPP	195
Krimmi Biotech LLP	SBIRI	196
Kwaklei and Khonggunmelei Orchids Pvt. Ltd.	SBIRI	197
Madhusudhana Murthy J	BIG	198
Maharashtra Animal and Fishery Sciences University	PACE-AIR	199
ONE Acre venture Pvt. Ltd.	SPARSH	200
Pious Thomas	BIG	201
Proximal Soilsens Technologies Pvt. Ltd.	SPARSH	202
Saveer Biotech	BIPP	203

CONTENTS

Srikara Biologicals Pvt. Ltd.	BIG	204
T.Stanes & Company Ltd.	SBIRI	205
Utilis Biosciences Pvt. Ltd.	BIG	206
Utpal Tatu	BIG	207
Vaseeharan	BIG	208
Visargha Agri Sciences Pvt. Ltd.	SBIRI	209

Industrial Biotechnology

AlgalR NutraPharms Private Limited	BIPP	212
Anasuya Roy	BIG	213
Anna University	PACE-AIR	214
Arjuna Natural Limited	SBIRI	215
Baijnath Pharmaceuticals Pvt. Ltd.	BIPP	216
Bhapra Biosolutions Pvt. Ltd.	BIG	217
Carot Labs Private Limited	SBIRI	218
CSIR-National Institute for interdisciplinary Science & Technology	PACE-CRS	219
Fermentech GSV Pvt. Ltd.	Synthetic biology	220
Himedia Laboratories Pvt. Ltd.	BIPP	221
Innotech Intervention Pvt. Ltd.	BIG	222
Innovation Biologicals Pvt. Ltd.	SBIRI	223
Kalpana Joshi	BIG	224
Krimmi Biotech LLP	BIG	225
Kuantum Papers Ltd.	BIPP	226
Mallipathra Nutraceutical Pvt. Ltd.	BIPP	227
National Chemical Laboratory, Pune	PACE-AIR	228
R. Aswati Nair	BIG	229
Rajkumar Halder	BIG	230
Ram Rajasekharan	BIG	231
REVY Environmental Solutions Pvt. Ltd	SPARSH	232
Sabran Bioentri Pvt. Ltd.	BIG	233
Sengathali biofiber Pvt. Ltd.	SPARSH	234
Shaon ray Choudhari	BIG	235
Sir MVIT (Sir M. Vishveshwarayya Institute of Technology)	PACE-AIR	236
Sowbhagya Biotech Pvt. Ltd.	SBIRI	237
The Oxford College of Engineering	PACE-AIR	238
Vivekanand Arts, Sardar Dalip Singh Commerce & Science College	PACE-AIR	239

Grand Challenges India

Grand Challenges India	GCI	242
Grand Challenges Exploration-India	GCE-INDIA	243
All Children Thriving	ACT	244
IMPRINT (Nutritional Interventions to improve Linear Growth during Infancy in India)	IMPRINT	245
Improving Immunization Data Systems – Innovating for Action	IDIA	246
Antimicrobial Resistance (AMR)	AMR	247
Ki Data Challenge For Maternal and Child Health In India	KI	249
Healthy Birth, Growth and Development Knowledge Integration (HBGDKi) India	HBGDKI	250
Knowledge Integration and Translational Platform (KnIT)	KNIT	251
The Nutrition Domain Center	GCI	252
The Maternal And Child Health Domain Center	MCH	253
Sentinels Initiative	SENTINELS	254
Reinvent The Toilet Challenge	RTTC	255
The Med-Tech Challenge	GCI	256
Achieving Healthy Growth through Agriculture and Nutrition (AGN)	AGN	257
National Biopharma Mission	NBM	258
Way Forward		

FOREWORD

According to the Global Innovation Index (GII), India ranks #1 in Central and Southern Asia for last 8 years. India's science and technology clusters in Bengaluru, Mumbai and New Delhi are among the global top 100 clusters. Biotech sector is a significant contributor to the innovative products and technologies coming out from the country and we expect this contribution to increase further exponentially. The theme for this year's compendium is very aptly chosen as "Innovate for Excellence", since innovation is the key to growth of any sector.

BIRAC supported innovations are a clear testimony of a secure and bright future of Indian biotech sector. A range of BIRAC's initiatives & integration with government policies and mission programmes, including Make in India, Start-up India, Ayushman Bharat, Swachh Bharat etc. have fuelled this innovation drive.

Biotech sector has specific challenges, unlike IT, Fintech & services sectors. Recognizing the special needs of this sector, Government of India, through the Department of Biotechnology & its Public Sector Unit BIRAC has made distinct efforts to identify gaps, find & implement solutions to create a tangible impact on the ecosystem.

This compendium, which is an excellent compilation of the innovative products/technologies supported by BIRAC is a clear reflection of the growing & expanding biotech innovation ecosystem in the country. Compared to the earlier editions, current compendium demonstrates significantly higher proportion of startups which have crossed ideation to PoC stage and progressed to validation & commercialization. More than 130 products/technologies supported by BIRAC are available in the market. Global footprint of BIRAC grantees is increasing with our awardees being recognized at prestigious national & international platforms. Enhanced investments by angel investors/venture capitalists indicate high value market ready innovations.

The time has come when the world is looking at us for affordable innovative solutions addressing global problems. I congratulate everyone who contributed to the growth and expansion of biotech ecosystem of the country. This available Biotech innovation ecosystem is poised to grow exponentially with the unconditional and enabling support from the Government.

Dr. Renu Swarup
Secretary, DBT & Chairperson, BIRAC

PREFACE

Global Bio India 2019 is being organized this year to showcase the strengths of Indian Biotech sector to the International Community. It is certainly a matter of pride that our Biotech Industry is now ready for a global showcase. The phenomenal role played by the Department of Biotechnology and BIRAC in nurturing the innovation ecosystem has visibly transformed the sector and provided wings to the innovators. BIRAC through its several unique, customized and responsive initiatives for large scale evangelization, incubation, pre-incubation efforts has brought recognition for Biotech Entrepreneurship as a career option. Factors including constantly growing numbers of applications for funding support, expanding bioincubation facilties, increased patent filing trend, national and international awards and recognitions, availability of biotech products and technologies in the market reflect tangible growth of the Biotech Startup Ecosystem in the country.

The compendium 2019 brings to you a snapshot of innovative projects supported by BIRAC. It is motivating to note that the projects are now moving towards higher TRLs, i.e. towards validation and commercialization. I am sure that moving forward with the present level of commitment and energies, the biotech innovations have the power to transform billions of life. This justifies the title of present edition of compendium: "Innovate for Excellence".

I appreciate and complement all the stakeholders for their active engagement and efforts, which have helped in the exponential growth of biotech ecosystem and ensure relentless support for further growth and expansion of the same.

Dr. Mohd. Aslam
Advisor (Scienist 'G'), DBT & MD, BIRAC

About BIRAC

Vision

"Stimulate foster and enhance the strategic research and innovation capabilities of the Indian biotech industry, particularly startups and SMEs, for creation of affordable products addressing the needs to the largest section of society."

Mission

Facilitate and mentor the generation and translation of innovative ideas into biotech products and services by the industry, promote academic-industry collaboration, forge international linkages, encourage techno entrepreneurship and enable creation and sustainability of viable bio enterprises.

Focus

Empowering and Enabling the Biotech Innovation Ecosystem for affordable product development

Core Values

• Integrity • Transparency • Team work • Excellence • Commitment

Set-up in 2012 by Department of Biotechnology, Ministry of Science & Technology, Government of India, to serve as its interface agency to promote industry-academic interface, BIRAC is a Section 8 " Not-for-profit Company" under the Companies Act, 2013. The mandate of BIRAC is to nurture and empower the biotech innovation ecosystem and transform all elements of the nascent biotechnology industry systems. A schedule 'B' Public Sector Undertaking, BIRAC is guided by an independent Board of Directors comprising of senior scientists, academicians and policy makers and industrialists.

To serve various dimensions of its mandate, BIRAC operates mainly in 3 verticals. Investment schemes provide funding support to academia, entrepreneurs, start-ups , SMEs and Biotech Companies for all stages of the product development value chain from discovery to proof of concept to early and late stage development to validation and scale up, right upto commercialization. There are also few special development missions. The second vertical is Entrepreneurship, Development which focuses not only on the funding support, but also on making available the right infrastructure, mentoring and other networks for technology transfer and licensing, IP and business mentoring including regulatory guidance. Lastly BIRAC's Strategic Partnership group works closely with all partners- national and international which includes Government departments and Ministries both Central and State, industry organisations, international bilateral agencies, philanthropic organisations and corporate sector, to leverage the strength and expertise and mobilize resources and extend the outreach of its activities.

Innovate for Excellence

Biotechnology sector is recognized as a sunrise sector whose growth is expected to have multiplier effect and contribute to India's economy target of USD 5 Trillion by 2024. Policy initiatives of Government of India (GoI) such as Make in India program are aimed to develop India as a world-class Biotechnology innovation and Bio-manufacturing hub. India is among the top-12 destinations for biotechnology in the world with approximately 3% share in the global Biotechnology industry. Indian biotech industry's economy is valued at $51 billion during 2018-19 and is expected to grow to $ 100 billion by 2024.

Recent estimates suggest that currently India have 600+core biotech companies, nearly 2,700 biotech startups, 100+ biotech incubators and 200+ biotech teaching & research institutions.

As per the Global Innovation Index (GII), India is the most innovative country in Central and Southern Asia since 2011 and has consistently outperformed on innovation relative to its GDP per capita for nine years in a row. India ranks 2nd amongst the middle-income economies world-wide with regard to the quality of scientific publications, universities and patent-related filings. Overall, India's innovation rank has seen a major improvement from 81st in 2015 to 52nd in 2019.

Innovation is an integral component to the exponential growth and development of biotech sector, and so is reflected by the theme of this year's compendium, “Innovate for Excellence”. BIRAC is committed to support and nurture innovations leading to a better tomorrow.

INNOVATE FOR EXCELLENCE

The digital revolution and innovative technologies in Biotech Sector is transforming the world, stimulating huge social and economic advances. Individuals and communities have now started to use technology to bring about positive transformations in their lives as technology has brought lots of convenience and great user experience to people. Indian biotechnology sector is one of the fastest developing knowledge-based sectors, considered as the sunrise sector and is expected to play a pivotal role in shaping India's rapidly developing economy. The Government aims to scale up the number of start-ups in biotechnology sector to more than 2,000 in coming years. 4 regional and entrepreneurship development centres and 41 bio-incubators have also been set up across India enabling the development of innovation landscape in the country. India is on operation mode to achieve $100 billion Bioeconomy target by 2025. India's bio-economy is concentrated on the following sectors, Bio-pharma and healthcare, Bio-services, Bio-Agri, Bio-Industrial and Bioinformatics and System Biology. BIRAC is constantly putting efforts to improve this Bio-innovation ecosystem.

India is full of talented innovative minds, manpower and resources which can soup up the Bioeconomy with cutting-edge research for developing new technologies and exploring start-up ecosystem. Academia–Industry collaborations are likely to play a key role in this Strategic partnerships to ensure the growth of Indian economy. BIRAC with its vision to stimulate, foster and enhance the strategic research and innovation capabilities of the Indian biotech industry, particularly start-ups and SME's, has been playing an enabling role in this mission.

BIRAC's core mission is to work as a development agency in the field of biotechnology to address the national needs of health and food security problems through bottom up competitive grant approach or through top down product development programmes. The core function is to provide support for discovery technologies, product development/ translational stages and for technology diffusion across different sectors like Public Health, Agriculture and Green technology and Industrial process. To achieve this, BIRAC is working in partnership with private, public and international groups. The organization has diverse teams which still affirm operational reciprocity.

BIRAC operates under three verticals:

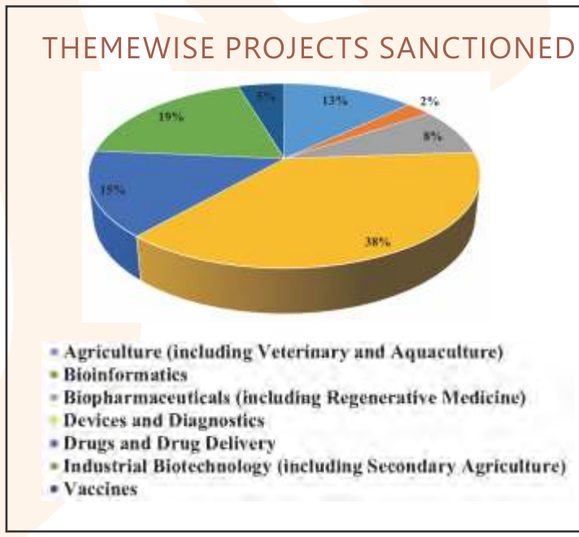
Investment schemes which provide funding support to entrepreneurs, start-ups, SMEs and Biotech Companies for all stages of the product development value chain from discovery to proof of concept to early and late stage development to validation and scale up, right upto pre-commercialization. There are also special product development missions.

Entrepreneurship Development which focuses not only on the funding support, but also on making available the right infrastructure, mentoring and other networks for technology transfer and licensing, IP and business mentoring including regulatory guidance.

Strategic Partnership group works closely with all partners –national and international which includes Government departments and Ministries, both Central and State, industry organizations, international bilateral agencies, philanthropic organizations and corporate sector, to leverage the strength and expertise and mobilize resources and extend the outreach of its activities.

These verticals address the different stages of biotechnology product development, the lateral teams are cross cutting inter disciplinary groups (like healthcare, agriculture, green technology) which focus on a particular product and see it through from discovery to diffusion stage. BIRAC provides support at all levels of the product development chain through its various funding schemes.

THEMEWISE PROJECTS SANCTIONED



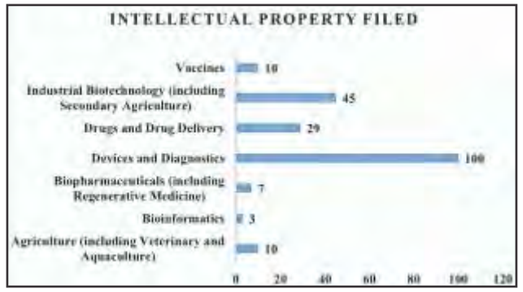
Innovate for Excellence

- Proof-of-concept studies are supported under Biotechnology Ignition Grant (BIG), Industry Innovation Programme on Medical Electronics (IIPME) and Academic Innovation Research (PACE-AIR),
- Validation studies are supported under Small Business Innovation Research Initiative (SBIRI), Biotechnology Industry Partnership Programme (BIPP) and Contract Research Scheme (PACE-CRS)
- Scale-up of the technology is supported under BIPP and PACE-CRS
- NBM (National Biopharma Mission)- To enable and nurture an ecosystem for preparing India's technological and product development capabilities in biopharmaceuticals to a level that will be globally competitive over the next decade, and transform the health standards of India's population through affordable product development.
- Synthetic Biology call for Proof of Concept and Early/Late stage validation

In order to empower and support entrepreneurs and start-ups, BIRAC has supported 41 Bio-incubators under which 4,41,863 sq. ft. incubation space has been created. In addition to this, 4 Regional and Entrepreneurship Development Centres at Venture Centre (Pune), C-CAMP (Bangalore), KIIT (Bhubaneswar) and IKP (Hyderabad) have been set up. BIRAC has facilitated access to research resources by establishing protein characterization and cGMP compliant bioprocessing facilities and provides services for IP and Technology Management and provides mentoring support through its panel of subject matter experts and workshops. Recently, Regulatory facilitation cell (FIRST HUB) has also been set up at BIRAC whose mandate is to provide guidance to innovators in regulatory aspects.

The impact that BIRAC has created in the past 7 years has been remarkable. A total of 656 start-ups and Entrepreneurs have been supported by BIRAC through Rs. 1162 crores worth of funding. This has resulted in the development of 133 products and technologies and 204 new IPs. BIRAC funded projects have generated employment for approximately 3300 people and 190 Women entrepreneurs have been supported. The list of ongoing projects is available at **http://birac.nic.in/projects.php.**

Proposals funded by BIRAC are categorized under 7 broad thematic areas which include Agriculture (including Aquaculture & Veterinary Sciences), Bioinformatics, Biopharmaceuticals (including Regenerative Medicine), Devices and Diagnostics, Drugs (including Drug Delivery), Industrial Biotechnology (including secondary agriculture) and Vaccines. Considering the theme wise distribution of the sanctioned projects, it is observed that the majority of the projects (38%) falls under the theme Devices and Diagnostics followed by Industrial Biotechnology (19%), Drugs (15%) and Agriculture (13%). Other thematic areas like Biopharmaceuticals (including Regenerative Medicine), Vaccines and Bioinformatics account for 15% of the total sanctioned projects.

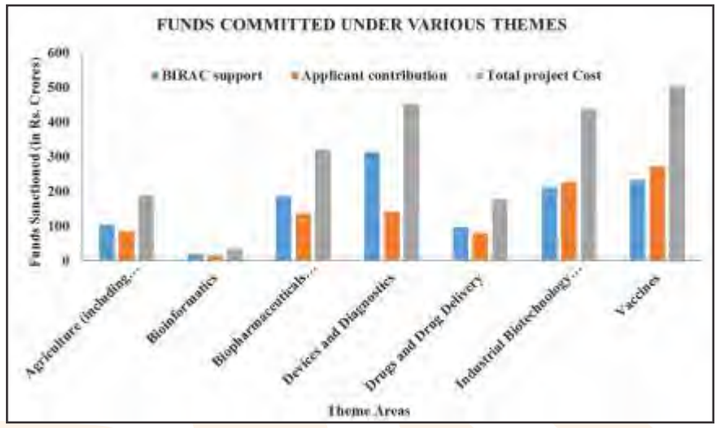


However, a different trend is observed while comparing the funds sanctioned to different thematic areas by BIRAC till date. The projects under "Vaccines" correspond to the maximum total cost of the projects followed by "Devices and Diagnostics", "Industrial Biotechnology", and Biopharmaceuticals (including Regenerative Medicine).

Looking at the trend in intellectual property (filed/generated) on comparing with the different thematic areas significant observations were made. The trend conforms to the number of projects sanctioned under the theme area. The highest number of IP has been filed under Devices and Diagnostics (100) followed by Industrial Biotechnology (45) followed by Drugs (29). The IP filed/ generated is a good measure of the success of the project for assessing the market potential of the product/ technology that have been developed. BIRAC in-house IP Cell conducts IP due diligence for all the eligible proposals received under various public-private partnership funding schemes. To promote and foster the innovation ecosystem in India and also to enable the commercialization of technologies, BIRAC offers a wide range of IP and Technology Management services to SME's, Startups, Academia and also to Indian Biotech Industry.

BIRAC has been supporting the entire life cycle of the product/technology development right from the ideation stage till pre-commercialization and has played an instrumental role in shaping the biotechnology ecosystem. This has been achieved through various investment schemes which are designed to specifically fit the biotechnology product/technology life cycle.

Various schemes like BIG (ideation stage), SBIRI (early-stage validation), BIPP (late stage validation), PACE (translational research), SPARSH (social innovation) and IIPME (in collaboration with MIETY specifically for medical electronics) have been introduced to cater the dynamics of biotechnology sector. Comparing the distribution of various themes under each scheme, it is observed that BIG scheme, supports the ideation stage and is open for individuals and start-ups, have large number of projects from Devices and Diagnostics. Similarly, SPARSH scheme also has high representation of this theme.



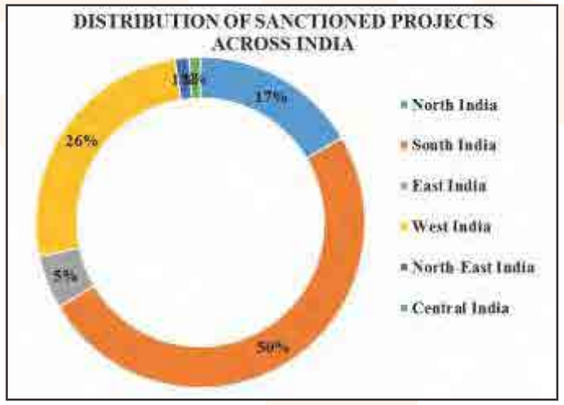
PPP investment schemes SBIRI, BIPP and NBM attracts small and medium enterprises and industries and have uniform distribution of these thematic areas. For instance "Agriculture" based projects are best represented by SBIRI and BIPP schemes. BIPP caters to the high risk projects and thus have good number of projects from "Biopharmaceuticals (including Regenerative Medicine)" and "Vaccines".

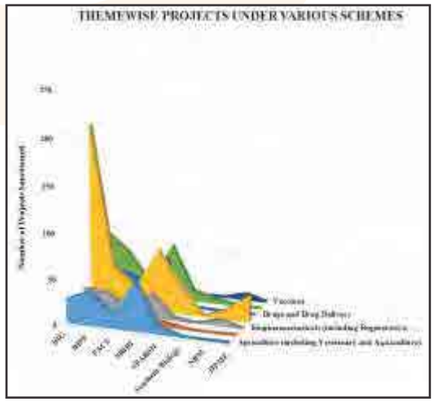
Lower capital cost, defined regulatory requirements and short gestation period can be the reasons attributed for larger preference of young entrepreneurs for "Devices and Diagnostics" thematic area.

BIRAC through its large array of schemes have encouraged a lot of industries to get actively involved in biotechnological research that can be observed while studying the composition of different BIRAC beneficiaries. Academic Institutes have gained momentum in showing an increasing trend of involvement towards translational research by forming collaborations with industries.

Region wise distribution of sanctioned projects under various schemes shows that the majority of the companies/entrepreneurs (50%) are from South Indian states namely Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana and the union territory of Puducherry with Karnataka and Andhra Pradesh being the major hubs. West Indian states (Goa, Maharashtra, and Rajasthan) have 26% of the total projects sanctioned by BIRAC which is same as that of last year. However, compared to the last year's figures, projects sanctioned to North Indian states namely Delhi, Haryana, Punjab, Himachal Pradesh, Uttar Pradesh have shown an increasing trend representing about 16% of the total projects sanctioned. East and North-Eastern states represents 6% of the share of total projects sanctioned by BIRAC and is expected to increase further owing to increased outreach activities being conducted by BIRAC.

Innovate for Excellence





Recognition for BIRAC Startups & SMEs

Several BIRAC supported startups and SMEs have received recognition from other national and international agencies for their products and technologies.

1. **YOSTRA Labs:** SPARSH grantee received NASSCOM Desing4India Award (2018)
2. **Janitri Innovations Pvt. Ltd.** was Silver Winner at Medicall in July 2019
3. **KBCols Sciences** won the green chemistry innovation award (startup category) at SERB-IGCW awards 2019.
4. **Arjuna Natural Extracts Pvt. Ltd.** awarded with Gold Grade for Outstanding performance in Industrial Safety & Health 2018. Dr. Benny Antony Joint MD has been conferred with the National Intellectual Property Award for the year 2019 in the category of Top Individual for Patents and Commercialization
5. **Rope Production Centre** was conferred with Cavinkare Innovation Award for introducing break through changes by innovating Rope Production machines such as Banana pseudostem rope cutting machine, automatic rope making machine, power rope machine and power rope winding machine
6. **Forus Health Pvt. Ltd.:** Marico Innovation Foundation Awards 2018- Breakthrough Innovation in Healthcare.
7. **String Bio** nabbed itself a US$100,000 grant at the inaugural Future Food Asia Award (FFAA). Dr. Ezhil Subbaine received Women Transforming India award by Niti Aayog
8. **Dozee Health** has been recognized as Tech Startup of 2019 at ASSOCHAM's Emerging Digital Technology Summit & Awards 2019
9. **Aspartika Biotech Pvt. Ltd.** conferred with National Entrepreneurship Award 2019 (Ministry of Skill Development and Entrepreneurship) in the Renewable Energy and Waste Management under A1 category of the Enterprise Award Track
10. **Bionic Hope** Awarded 1st Place at Startup Masterclass Select IIT Patna in Dec 2018.
11. **Sensivision** got selected for Karnataka Govt Startup Elevate100 in 2019 also selected to be mentored by PATH - Tata Trust "Quest" program specifically focused on Clinical Trial/Validation.
12. **Cutting Edge Medical devices** INVENT MP - an investment of Rs. 35,00,000/- on convertible notes a program by CIIE - IIMA, Tata Trust, Rajasthan Industries Corporation - RICO and Start-up Oasis.
13. **Cutting Edge Medical devices** 3rd Prize: Pitch Day - Leaders in Innovation Fellowship Program by Royal Academy of Engineering, London, UK among more than 60 participants across 5 countries. details of the program attached herewith
14. **Osind Medtech** Second Prize: Best Innovation Award - Velammal Healthcare Innovation Awards 2018.
15. **Skin Curate Research Pvt. Ltd.** was 1st runner-up in CII Healthcare Innovation Summit, 2018 and was within top 10 (7th position) in Data Innovation Bazar, 2018.

16. **Dr. Shaon Ray Chaudhury:** The technology won the Visitor's award in Technology Category in 2019 (Waste to weather Innovative technologies)
17. **Miraqules med solutions Pvt. Ltd.:** Won the Mass Challenge Platinum Winner Title (2019) Won the Dare to Dream contest organized by DRDO
18. **Vidcare Solutions:** Winner of the prestigious India Innovation Growth Program 2.0 (2019), by Lockhead Martin, DST, Tata Trusts, FICCI, etc.
19. **Cyca Oncosolutions:** She loves tech India 2019, Winner of the prestigious India Innovation Growth Program 2.0 (2019), by Lockhead Martin, DST, Tata Trusts, FICCI, etc.
20. **AlgoSurg:** received Qiantang innovation star awards 2018 held at Hangzhou China
21. **Testright Nanosystems:** First position in IKMC 2018 in category Agri, food and nutrition
22. **Affigenix Biosolutions** received Bio Excellence award at Bangalore Tech Summit 2018
23. **Coeo Labs Pvt. Ltd.** won following awards:
    - Won the Commonwealth Secretary-General's Innovation for Sustainable Development Award, 2019
    - Won Asia Social Innovation Award at Hong Kong in the Health & Wellness Category, 2018

24. **Pandorum Technologies Pvt. Ltd.** Won 1st place at the 2019 Entrepreneurship World Cup (India) ,
25. Kavitha from **Zumutor Biologics** received Women Transforming India award to by Niti Aayog,2018
26. **Sea6 Energy Pvt. Ltd.** received following recognitions:
    - Among five startups recognised by NABARD for their innovative agri-focused ventures (July 2019)
    - Emerging company of the year" in Bio-Agri category in Bangalore Tech Summit, 2018
27. **Module Innovations Pvt. Ltd.** Ranked among top 10 winning innovations at 'Social Alpha Quest for Healthcare Innovations 2018 and was Winner of the Design: Impact Awards 2018 by Titan and Tata trusts.
28. **Spotsense Pvt. Ltd.** was chosen as one of world's top 10 startups in World Health Summit 2018

Innovate for Excellence

29. **Prantae Solutions Pvt. Ltd.** Was among Top 10 startup of Odisha by Silicon India, 2019 and was recognized as Pride of Odisha in Make in Odisha Conclave 2018, by Govt of Odisha
30. **Innaccel Technologies Pvt. Ltd.** was rated as ASSOCHAM startup of the year award 2018
31. **Eyestem Pvt. Ltd.** Was Selected by Niti Aayog to represent India's startup ecosystem at the India Singapore summit
32. **Empathy Design Labs** won following awards and recognitions:
    - IOT NEXT Award Top 2 Country finalist, 2019,
    - WINNER DELEGATE- CANADA INDIA ACCELERATOR,2018
    - WINNER – NASSCOM SOCIAL INNOVATION FORUM – HELTHCARE 2018
33. **Nesa Medtech Pvt. Ltd.** Winner at Medtech Innovator Singapore Pitch Event (2019)
34. **Scidogma Research Pvt. Ltd.** Was conferred with Smart Fifty Award - Fifty Solutions to Transform India (2018) and People's choice award (Global Diabetes Innovation challenge) 2018
35. **Mocxa Pvt. Ltd.** Winner Tata Social Enterprise Competition (2018)
36. **TerraBlue XT** was Among 50 Hot Startups in 2018, by ET
37. **Muse Diagnostics Pvt. Ltd.** Winner of 2019 ASME Innovation Showcase (ISHOW)
38. **Aumeesh Tech Pvt. Ltd.** Won following awards:
    - Winner of event "Upstart pioneer" Organized in IIT-Kanpur at Techkriti.
    - Winner of 10th NCPEDP-MPHASIS Universal Design Award in 2019
39. **Aodh Lifesciences Pvt. Ltd.**won Best Innovation Award from All India Achiever's Foundation and Best Innovation Award in Micro Industry Category From Telangana
40. **Evelabs Technologies Pvt. Ltd.** was the first Indian startup to get selected to IMEC.iSTART program conducted by imec in Belgium and best Innovation in CAHO tech 2019 BRINC Indian program
41. **Mr. Rupa Manoj:** Global Forum for Innovations in Agriculture (Sustainable farming) – 2019 winner - Best Innovation Crop protection Crop Protection
42. **Biodesign Innovation Labs:** received XPOMET Medicinale Startup Sponsored Germany visit for startup segement and Qualcomm design india challenge 10 top startups award
43. **Startoon Labs Pvt. Ltd.** won following awards:
    - Won Gold Award in Medicall Made in India Innovaton Award 2019
    - Won "Most Innovatve Idea – P&S Track" award at BMC Competton 2019 organized by IIT Kharagpur
    - Won "Best Potental Award" at GSAP2018 organized by Samsung, Korea and IIIT Bangalore
    - Won CAHOTECH 2019 startup award
    - Won First prize in healthcare and healthtech Category at IKMC 2018
44. **Turtle Shell Technologies Pvt. Ltd.:** Top 5 Innovations in Medicall Made in India 2019
45. **Nemocare Wellness Pvt. Ltd.** won following awards:
    - Winner of Asia Hardware Battle 2019 ,China hosted by Technode China
    - Part of GSBI inresidence social accelerator program at Miller Center for Social Entrepreneurship, Santa Clara University ,USA
    - Global Finalist at MASS Challenge Texas cohort 2018
    - India winner Smart cities 4.0 hosted by 1m1b and global finalist of Global social venture challenge 2018 by UC Berkley-April 2018 (oldest social entrepreneurship contest)
    - Winner: Action for India Silicon Valley Challenge 2018
    - Winner- CII Healthcare innovation Summit 2018
    - Winner Aditya Jha Entrepreneur India Award 2018-5 lacs cash award

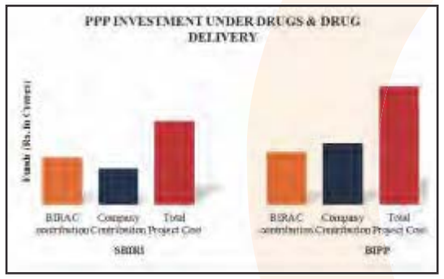
THEME WISE ASSESSMENT

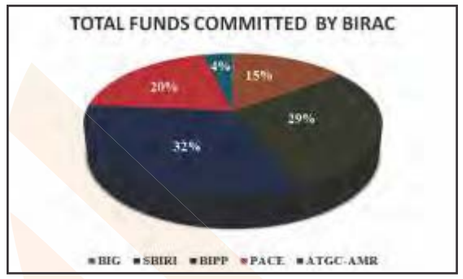
Drugs and Drug Delivery

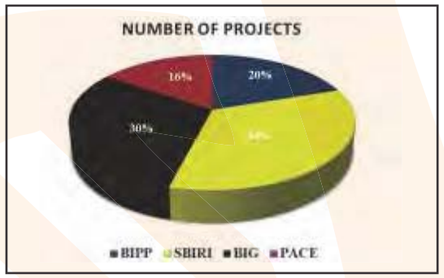
To excel and acquire leadership position in Drug development/ Drug delivery area, initiatives are immensely needed in order to develop New Chemical entities NCEs, novel drug delivery systems/ technologies. By helping to spark research, BIRAC is focused and intended to substantially contribute & support product development in this area to meet the needs of population impacted by a variety of diseases that have little, or no treatment options for patients.

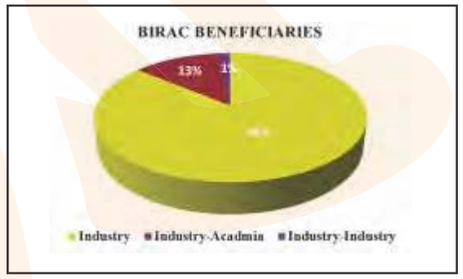
This thematic area broadly covers, primarily, development of novel drug molecules starting from insilico designing of novel molecules as well as their analogous, validating their activities through various In-vitro and In-vivo models and validating through human clinical trials and secondly, using novel drug delivery models for better efficacy, specificity and bioavailability of various available drugs in market.

A report from Visiongain estimates that the global discovery outsourcing market reached $22,69bn in 2018 and forcasts a compound annual growth rate (CAGR) of 11.7% through 2028 with the market reaching an estimated value of $68.61bn. The global drug delivery systems market is expected to register a CAGR of 5% during the forecast period, 2019 to 2024.

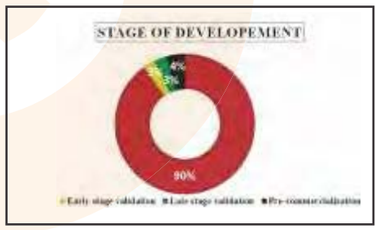




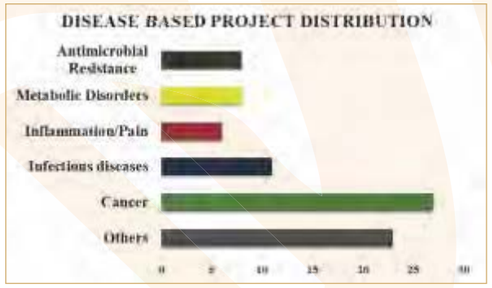


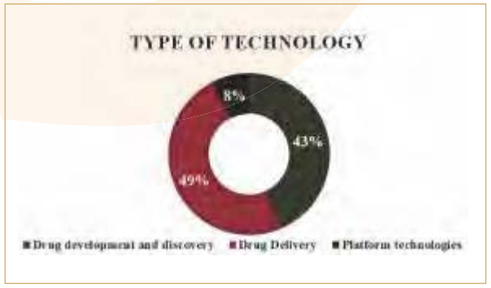


BIRAC has supported a total of 140 projects in the area of Drug and Drug delivery. The analysis shows that total PPP investment under this area amounts to Rs. 166.14 Crores wherein BIRAC has invested Rs. 82.43 Crores and Industry invested Rs. 80.78 Crores by supporting 87 projects under BIPP and SBIRI. Collectively, the projects involved >90% Industry followed by few collaborative projects with Industry–Industry and Industry academia projects. BIRAC has invested nearly 51.91 Crores by supporting 76 projects under Grant programs i.e. PACE, BIG and DBT-BIRAC joint calls (ATGC, AMR Mission).



Theme Wise Assessment





Achievements

- Few successful outcomes during last few years are clinical investigation of Galnobax, for the treatment of diabetic foot ulcer is in Phase III clinical trials, Diiodothyronine analog for treatment of cardio metabolic risk was supported by BIRAC for Phase II trials.
- Many proposals have been supported for preclinical studies such as to evaluate efficacy and toxicity for a Non peptide CCK receptor antagonist for inflammatory pain and currently being supported for follow up funding for Phase I clinical trials.
- BIRAC has supported preclinical studies for the lead compound, ORX-301 for treatment of Niemann-Pick Type C disorder. The drug molecule has been licenced outside India.
- Validation studies have been assessed and performance found to be on par with competitors' products for Insulin receptor auto phosphorylation bioassay using in-house developed engineered cell lines expressing Insulin receptor A and B in CHO cell lines. The funding are intended to substantially contribute to marketing approval of assay and usage for potently for insulin protein.
- Few platform technologies has been developed last year, associated with an alternate/better delivery to tablets and capsules for low dose API -nutraceuticals/pharmaceuticals with POC of Vitamin D (commercialized), Nano crystalline solid dispersion particle technology for better bioavailability of less soluble drugs such as celecoxib and curcumin.
- Pipeline products to be ready as single innovator product includes generation of clinical grade exosomes which will have commercialization potential in R&D laboratory/clinical areas.

Analysis

- Maximum projects funded under this area are for developing proof of concept followed by preclinical and early stage validation.
- The disease wise projection under this theme shows that disease wise distribution maximum number of projects supported for Cancer, infectious diseases, metabolic diseases and other disease areas such as skin & ear disease/ Tissue engineering/ arthritis. This analysis shows that project related to drug delivery were relatively higher than drug development and platform technologies.
- Within last few years BIRAC has been providing much-needed financial support for clinical trials of potentially life-changing treatments for patients with life threatening diseases. To date, the drug products undergoing Clinical trial projects have supported research for diseases such as Breast Cancer, Solid tumours, Diabetic foot ulcer and inflammatory pain.

  Initiatives and Future pathway: DBT-BIRAC joint program has announced special calls in 2019-2020 to tackle antimicrobial resistance and accelerate translational research leads beyond early stage validation and encourage academia to develop technology/product & processes. Two proposals have been selected under the call.

  This is a journey which is well begun and given the pace & the overall role played as a key enabler, BIRAC is on track to be a significant contributor to the overall ecosystem in the years to come.

Biopharmaceuticals (including Regenerative Medicines)

Biologics are protein-based drug derived from living cells and are manufactured by various biotechnology methods such as recombinant deoxyribonucleic acid technology, controlled gene expression, and antibody technology. Being one of the fastest growing classes of therapeutic compounds as compared to the small-molecule drugs, biologics are expected to make up over a quarter of the entire pharmaceutical market by 2020.

A biologics commercial success in the biopharmaceutical industry, depends not only on the cost economics of the discovery along with the research and development, but also on its efficient manufacturing solution. Owing to its large and complex structure, biologics requires an extensive analytical data. To meet the increasingly strict demands of regulators across the world, State-of-the-art techniques as well as facilities for evaluation of activity, stability and reproducibility of biologics are essential.

Biosimilars are the biological products that comes into the picture, once the patent for an existing biological originator product has expired. Under the area of regenerative medicine, several national and transnational linkages have emerged to develop innovative capacity, most prominently in stem cells and cord blood banking, as well as in gene therapy, tissue engineering, biomaterials and 3D printing. More thoughtfulness is seeked towards governance of private cord blood banking, nanomaterials and 3D bio-printing for which regulatory bodies are taking initiatives.

Since the launch of first biosimilars, several products have been approved and have been launched in the marketplace and global market is ready to welcome many new biosimilars in 2019 and 2020, urging competition among the pharma industries and will potentially lead to significant reduction of cost per patient. The global market for pharmaceuticals reached $1.2 trillion in 2018, up $100 billion from 2017 and is expected to reach $20.8 billion by 2022, with a compound annual growth rate (CAGR) of 30.5% from 2017 through 2022. Despite ongoing reputational challenges, India's biologics market is set for robust growth in 2019 driven by biosimilars production. India's growing biosimilars industry is the primary driver of growth, as an outcome of increased domestic demand, bio investments and the potential for exports to advanced markets and is also augmented by government subsidies, expiration of existing biologics patents and India's Central Drugs Standard Control Organisation (CDSCO) aligning guidelines closely with other regulators. The global regenerative medicine market was worth $28 billion in 2018 and will grow to over $81 billion by 2023, with a CAGR of 23.3% during this period as indicated by reports. Along with other countries, India is also endorsing research and development of regenerative medicines and has invested in advancing the research and commercialisation through several initiatives which led to an exponential growth in this specific area.

Keeping in view, the importance of the area of Biopharmaceuticals (including Regenerative Medicine) and Regenerative Medicines, BIRAC have supported a total of 99 projects till date. The supported projects along with the development of biosimilars including process optimization till manufacturing of the clinical grade biosimilar formulation and conduct of pre-clinical and clinical studies to establish the biosimilarity. Proposed interventions address different diseases like Cancer, Diabetes, Inflammatory diseases, Alzheimer's etc. The supported projects under this area also include development of platform technologies for producing monoclonal antibodies. In the field of regenerative therapy, the projects being funded includes the process development for isolation and expansion of different types of stem cells and establishing their efficacy in different disease conditions like osteoarthritis, diabetic foot ulcer and urethral stricture. Further different scaffolds development for supporting these cell culture have also been considered apart from media development.

A total investment under this area, amounts to Rs. 418.17 crores wherein BIRAC alone has committed an investment of Rs. 181.21 crores for supporting 99 projects. These supported projects engaged 78 industries (alone including Start-ups), industries in collaboration with other industries/academia numbers to a total of 9 whereas 4 different individuals and 6 academic institutions were also supported.

Achievements

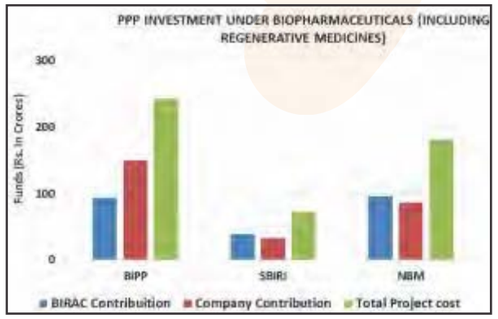
Different products/technologies/PoC developed under this specific area include:

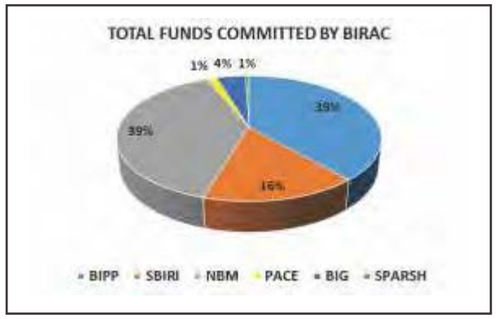
Foligraf for reproductive technology is the first recombinant FSH product developed, manufactured and sold by an Indian Company (BHART SERUM & VACCINES). Rasburicase to control Hyperuricemia under trade name TULY is a recombinant Uricase to control hyperuricemia in cancer patients undergoing chemotherapy developed by VIRCHOW BIOTECH and with number of units sold 27,570. The company is also being funded for clinical grade plasma purified Alpha-1 Antitrypsin and C1- esterase Inhibitor. Affigenix Biosolutions Pvt. Ltd. has developed an immunoassay which enabled drug companies to monitor the clearance of trypsin used in the downstream processing of Biologics and Biosimilars. The kit has been commercially launched as “Trypsin clearance assay kit” and more than 200 kits already sold. In the field of regenerative medicine, a multi-centric clinical trial for evaluation of safety and efficacy of

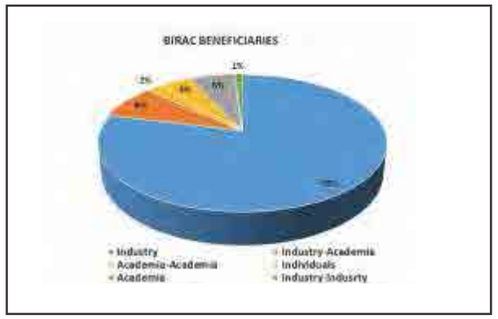
Theme Wise Assessment

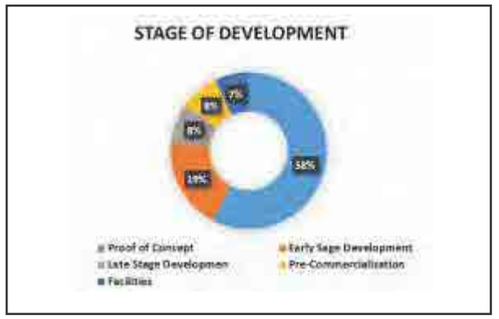
UregrowTM (Autologous Adult Live Cultured Buccal Epithelial Cells) implantation for the treatment of urethral strictures has been successfully conducted. Navya (Shilpa Medicare Limited) has developed biosimilar-Aflibercept using in-house high density fermentation process for further RCGM permission towards conduct of preclinical toxicity studies.

Further to develop biosimilar related research, different proposals have been considered specifically for biosimilars development, novel cell line development as well as shared facilities have been promoted for development of biotherapeutics by National BioPharma Mission (NBM) -Innovate in India (i3) programme to empower biotech entrepreneurs & accelerate inclusive innovation jointly funded by DBT and World Bank Loan Assistance. National Biopharma Mission is funding products of huge public health demand for cancer, inflammatory diseases, wet AMD and diabetes among others. The products supported for accelerated development include Trastuzumab, Ustekinumab, Palivizumab, Aflibercept, Ranibizumab, Insulin Glargine, Insulin Lispro, Liraglutide, rHSA and plasma HSA. Developed by small, medium and large enterprises, industry-academia and academia collaborations, most of these biosimilars are expected to reach the market within the next five years. The Mission is also supporting to create Biosimilar Clones for Ramicirumab and Golimumab for cancer and recombinant Factor VIII, for developing biosimilars with innovator patent expiry after 2020 and products not launched yet in India.









BIRAC has supported different industries to set up facilities for addressing the needs of bio therapeutic development and to fast-forward development of biosimilars from bench to pilot scale which can be used by different start-ups, companies and institutions. Facility support specifically intends to enhance the institutional and organizational capacity needed to successfully translate the early phase development to commercial product and to offer a full range of GMP and bioanalytical labs. It will also help the manufacturers to test their products at affordable cost and get data for regulatory dossier submissions. The supported facilities include: 1) Cell Line repository for certified cell lines, cell bank characterization and safe storage, 2) Analytical characterization facility for drug substance and drug product characterization, 3) Process Development Lab and GMP manufacturing facility for process development, scale-up and clinical lot manufacturing, 4) Bioprocess facility for large-scale production of microbial antigens and monoclonal antibodies, 5) Scale-up facility for plasma fractionation of clinical grade.

A total budget of Rs 192.95 Crores has been committed for Facility development, wherein BIRAC's investment is Rs. 84.83 Crores.

Analysis

- Industries including Start-ups alone are pursuing maximum number of projects in this area without any collaborations with Academia or other Firms. Collaborations (either Industry-Industry or Industry -academia) may be encouraged for successful and timely outputs and to involve more technical expertise in the respective projects.
- Maximum number of projects funded are at Proof of Concept stage followed by early stage validation, late stage validation and Pre-commercialization.
- BIPP scheme followed by NBM continues to capture maximum share of funds committed due to large scale production units being developed.
- A lot of Industries has initiated their research towards development of Biosimilar Clones for biosimilars that are expected to reach the market within the next five years and further process optimization followed by Clinical Trials
- Several facilities have been funded for strengthening and accelerating the biotherapeutics development as well as development of novel cell lines for the same.

Vaccines

Investing in disease prevention today reaps health, economic, and societal benefits in the future. As a nation, it is critical that we continue to invest in programs that support our children's wellbeing, like nutrition, handwashing, sanitation, and immunization. Vaccines are a smart investment, as vaccine-preventable diseases impact so many parts of our lives. Not only does immunization save lives, but it also prevents the devastating costs of hospitalization that may throw families into poverty or exacerbate inequalities.

Ideal vaccine is the one that has high protective efficiency with no or less side effects and can be affordable. BIRAC has made concerted efforts in strengthening vaccine research and development since its inception in 2012 through various endeavours.

Vaccine development programmes at BIRAC encourages novel and innovative vaccine related discoveries, accelerated development of candidate vaccines for which earlier leads are available, research of basic & applied nature to improvise our current understanding of vaccine science and strengthens the scientific basis for future vaccine design.

BIRAC has supported a total of 30 projects in the area of Vaccine development. Total PPP investment under this area amounts to Rs. total 316.23 Crores wherein BIRAC has invested Rs. 138.12 Crores and Company invested Rs. 178.11 crores by supporting 30 innovative projects. These 30 projects engaged all type of grantees like companies, start-up, academic institutes, Industry academia collaborative projects and Industry –Industry collaborative projects.

Achievements

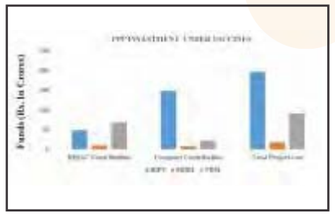
Support for vaccine development through different schemes of BIRAC have demonstrated major achievements like i) development of low cost Rotavirus vaccine which became part of the universal immunization programme, ii) market license has been obtained for JEEV (Japanese encephalitis vaccine) in India for the age group of >1 year to < 3years and iii) more than a lakh of doses of Pandyflu vaccine (Influenza vaccine) have been supplied to Government of India.

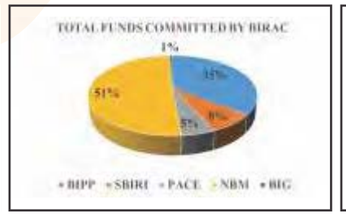
The first indigenous low cost Rotavirus Vaccine from an Indian strain 116E efficacious in preventing severe rotavirus

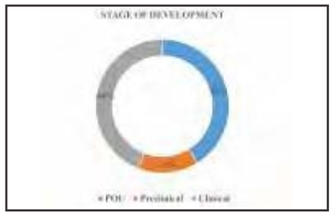
diarrhoea in low-resource settings in India has been introduced in 9 states namely Odisha, Andhra Pradesh, Haryana, Himachal Pradesh, Assam, Tripura, Tamil Nadu, Madhya Pradesh and Rajasthan as a part of India's Universal immunization Programme. The ROTAVAC® was granted WHO prequalification in 2018.

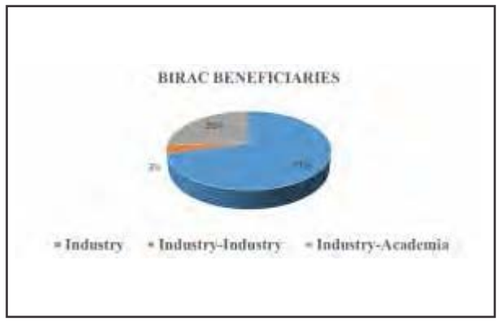
Several other leads in Vaccine Development :

- Malaria Vaccine: Vaccine for Falciparum Malaria is undergoing phase I clinical trial and vaccine for Vivax Malaria has already completed phase I trial.
- Vaccine for Kala-Azar: A live attenuated Centrin gene knock out Leishmania vaccine candidate that protects from all forms of Leishmaniasis in India has been supported. At present the vaccine is undergoing preclinical toxicity analysis. A Multivalenet Leishmania Vaccine candidate has also been supported.
- Pneumococcal vaccine: An affordable, Asia specific 15 valent Pneumococcal Polysaccharide – CRM 197 Protein Conjugate Vaccine has completed Phase II clinical trial and is ready for Phase III clinical trial.
- Dengue Vaccine: The recombinant EDIII- based sub-unit dengue vaccine candidate that protects against all four dengue strains endemic to India has been supported. The team is presently optimizing the production process and are expected to initiate clinical trial in the near future. Also a Live attenuated Dengue Vaccine candidate licensed from NIH is being supported by BIRAC.
- HPV Vaccine: A VLP based HPV vaccine has been developed and is currently undergoing Phase II clinical trials.
- Development of Chikungunya, Influenza, Typhoid, Paratyphoid, and Cholera vaccine candidates is also being supported.









Analysis

- Industry Contribution is more than BIRAC contribution under BIPP scheme. However, BIRAC has contributed a significantly higher amount as compared to Industry for clinical development of vaccines through National Biopharma Mission (NBM) Program.
- Industry prefers to develop vaccines solely without collaborating with any academic institute or other industry. However, collaborations may be encouraged.
- Some projects which have been funded by BIRAC are at developing proof of concept and preclinical stage. However certain projects directed towards the development of vaccines for important diseases in India such as Pneumonia, cervical cancer, malaria etc. are undergoing clinical trials.
- A large array of diseases have been covered by industries for the development of vaccines through BIRAC support.
- BIRAC has initiated a Mission Program, National Biopharma Mission for accelerating vaccine innovation in India.

Devices and Diagnostics

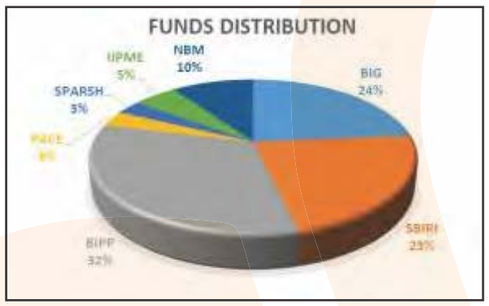
The medical devices industry in India consists of large multinationals, with extensive service networks, as well as small and medium enterprises (SMEs). The current market size of the medical devices industry in India is estimated to be $ 5.2 bn. As per the Department of Pharmaceuticals, the estimated retail market for medical devices is between $ 9.3 bn – $ 10.8 bn.

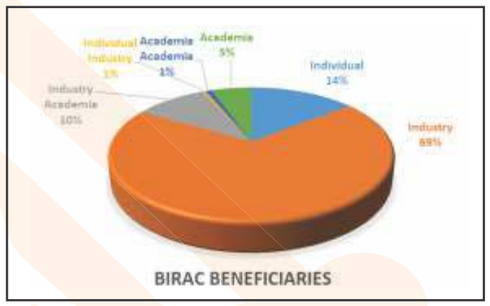
Diagnostic imaging, consumables, and other medical devices form 86% of total export trade for Indian medical devices industry in FY 2016-17.

India's medical devices industry is poised for significant growth in the next five years:

- The market size is expected to reach $ 50 bn by 2025
- Orthopaedic prosthetics and patient aids segments to be the two fastest-growing verticals by 2020 and are projected to grow at a CAGR of 9.6% and 8.8%, respectively
- Diagnostic imaging, dental products, and consumables are expected to grow at a CAGR of 7.1%, 7.4% & 7.1%, respectively during 2015-20 (Source: Invest India)

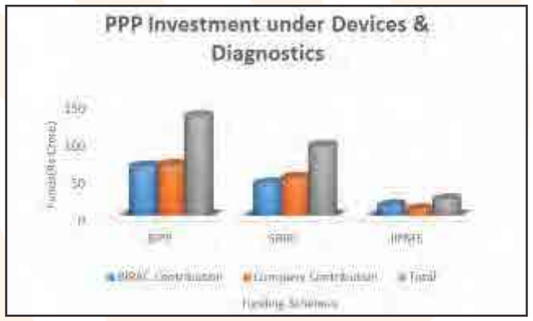
BIRAC to promote Make in India initiative of Government of India has invested around INR 400 Crores in Medical Devices and Diagnostic sector. BIRAC has many programs at various stages of product development cycle to promote the sector and reduce the import dependency. BIG, BIPP, SBIRI, PACE, IIPME, SPARSH and NBM are few examples.

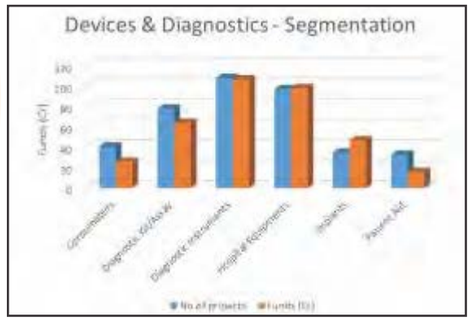




Under the Public Private Partnership Investments, it is witnessed that Company contribution is slightly higher than BIRAC contribution.

The sectors fetching maximum amount of funds at BIRAC under devices and Diagnostics are Oncology, Cardiology and Orthopedic. Many projects are supported for development of platform technologies for diagnosis of many diseases through a single assay. MCH sector includes projects related to maternal and child health including neonatal health.



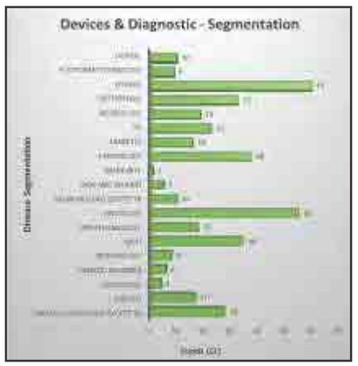


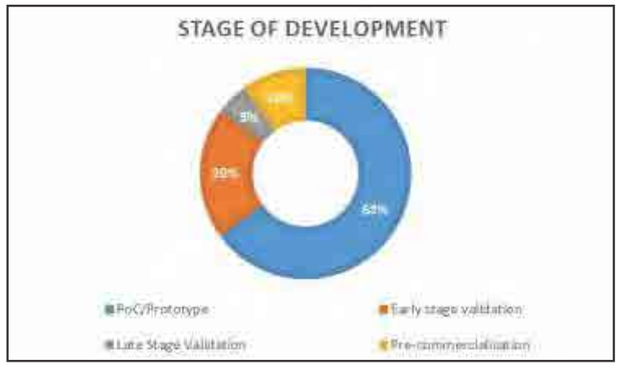
Others category includes general projects like hygiene monitoring in public settings, Safety Syringe, easy-to-use stretcher, digital stethoscope, blood bag monitoring solution, Sensors for Connected Health, automated cell counter, Medical Kit for Road Traffic Emergencies, Opto fluidic Microscope and Portable Slide Profiler, Automatic Biochemistry and Urine strip Analysers, fluorescence correlation spectrometer etc.

As per the analysis of BIRAC funded projects, maximum interest is observed in the Diagnostic instrument sector. Within diagnostic instruments, connected medical devices which use Telemedicine, IoT or Digital health as major component is the trend among the young innovators. The future of devices sector is moving towards the Artificial Intelligence based diagnostic, Screening or predictive devices.

Achievements

BIRAC is increasing its pipeline of projects through various programs like Social innovation Immersion fellowship, UIC and BIG. Maximum number of projects are at prototyping stage and as they move towards Pre-commercialisation the number decreases. It is observed that many companies die out during the product development cycle. The number of technologies reaching pre-commercialisation is around 59 i.e successfully achieved TRL 7. BIRAC is taking efforts to increase the number of projects reaching market through various collaborations like KIHT for testing and standardisation and Gem Facilitation, WISH Foundation for last mile connectivity and Product Commercialisation Unit for funding support. Through these efforts BIRAC is successful in facilitating commercialization of 51 products and technologies and generating 96 Intellectual properties in the Medical devices and diagnostics domain. To facilitate the ecosystem, BIRAC has organised various regulatory workshops across India and also initiated the FIRST HUB unit to address the queries of Innovators.





Analysis

1. The Indian Medical devices Industry is going through the period of uncertainty in the regulatory ecosystem. The New Medical Devices Rules 2017 has brought much awaited clarity in the regulations but it is applicable for only notified devices. As per the current situation, the devices are considered as drugs hence the sector is demanding a separate law for Medical devices.
2. Some of the challenges associated with this sector include need of testing and calibration facilities, Institutionalised mechanism for clinical trials, Access to Government e-procurement system and connections with mentors.
3. BIRAC is successful in facilitating commercialization of 51 products and technologies in the Medical devices and diagnostics domain.
4. The sectors fetching maximum amount of funds at BIRAC under devices and Diagnostics are Oncology, Cardiology and Orthopedic.
5. The latest trend this year is for connected Medical devices with Artificial Intelligence, IoT or telemedicine as an integral component.

Agriculture (including Veterinary Sciences and Aquaculture)

Agriculture has remained as a centerpiece of Indian economy. This is not only because it is the main source of livelihood for a majority of Indian population but also for being responsible to feed the billion plus population. Therefore, the sector requires serious technological interventions at every link in the food chain right from seed to fork. Similar to the transformations in other sectors, technology is undergoing revolution and shaping farming practices. Some of the major technology trends that are currently shaping the agricultural revolution globally include farm robotics, remote sensing, machine learning and analytics and block chain. While globally these technologies are making farm operations more insight-driven and efficient, in Indian context they need to address challenges related to quality, quantity, distribution and storage.

In spite of several technological interventions, agriculture production in India is still largely dependent on natural factors resulting in inconsistent and unpredictable yields. In the last few years, concentrated technological efforts coupled with major policy initiatives have contributed significantly towards sustainable agriculture ensuring both food security and generating rural employment. Some of the key policies initiatives taken by Govt. of India include: Soil Health Card Scheme, National Mission for Sustainable Agriculture (NMSA), Pradhan Mantri Krishi Sinchai Yojana (PMKSY), National Agriculture Market (e-NAM), Pradhan Mantri Fasal Bima Yojana (PMFBY), etc.

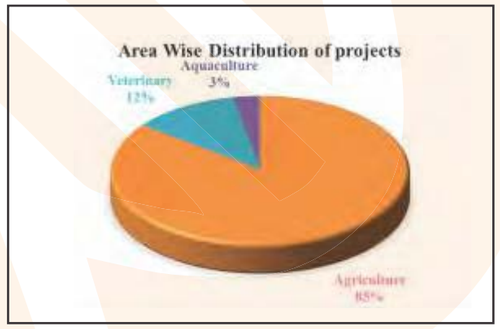
Over the years, BIRAC has supported close to 135 projects in the field of agriculture and allied areas like veterinary and Aquaculture (Fig. 1A). Under Agriculture, the pipeline of projects supported up till now covers research areas such as Marker Assisted Selection (MAS), transgenics, tissue culture, biocontrol and plant health (Fig. 1B). Under aquaculture, the supported projects mainly deal with control of diseases during shrimp farming. Some notable technologies funded in the area of veterinary sciences include: improved semen technology, vaccine development, improved germlines cells for poultry development, bovine sperm sorting, low-cost milk fat analyzer, etc. Lately, in the area of agriculture, wide support has been extended to various disruptive technologies which have the ability to transform every link in the food chain. Technologies such as AI, nanopesticides, CRISPR, pheromones, remote sensing, sensors, residue testing by Matrix-assisted laser desorption/ionization (MALDI), seed invigoration by magnetopriming, digital technologies, etc. are being encouraged under entrepreneurial ventures to put Indian stakeholders at par with the global players (Fig 1C).

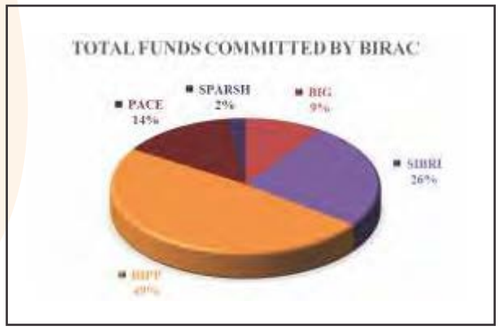
Achievements

Some of the technologies/interventions which have reached late stage validation and shown potential for commercialization are:

Agriculture :

High gingerol containing lines generated through exploiting soma clonal variations elite hybrids of orchids, increasing mustard productivity through hybrid vigour, pheromones for Integrated Pest Management, stress (salt) tolerant rice and rice hybrids resistant to blast and bacterial leaf Blight, development of local fungal strains of tea ecosystem as biocontrol agents for management of tea insects and pests, promoting plant growth using formulations of seaweed extract and seaweed associated microbes, technology to grow EPN (Entomopathogenic Nematode) as biocontrol agent on silk worm pupae and development of Biopesticide using a seed extract of Hydnocarpus pentandra.





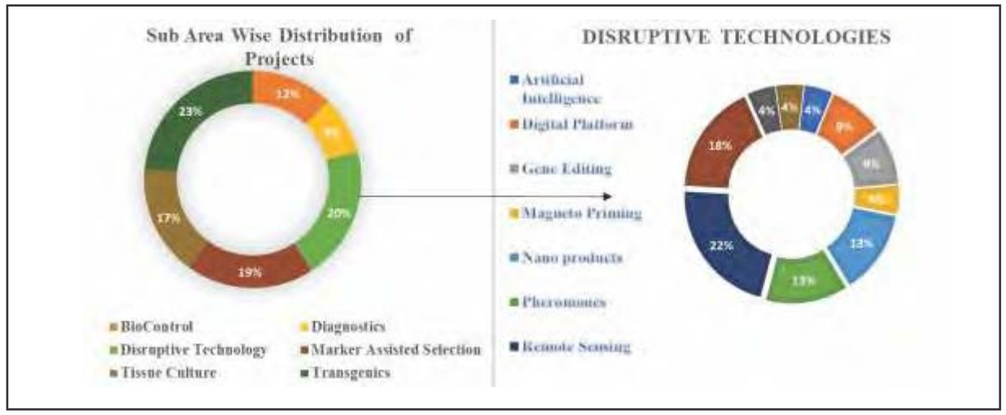
Aquaculture

Technologies/interventions which have shown promising results include: Nano- formulation mixed with dsRNA-VP28 for controlling a WSSV infection of shrimp, development of stable nano-sized formulation of β-glucan particles as potent immunity booster for shrimp, PCR detection kits for shrimp infection and bacteriophage-based Vibrio control in Shrimp (vibrosheild)

Veterinary Science

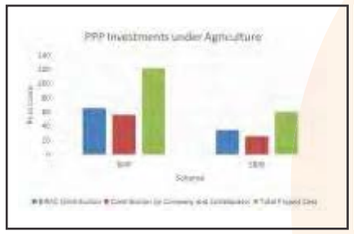
Some of the promising veterinary research projects include: thermo stable vaccine development using freeze dried Brucella abortus, peste des petits ruminants (PPR) vaccine, VLP vaccine against Parvovirus infection, and enteric coated oral IgY formulation against canine parvoviral enteritis, vaccine for Marek's disease in poultry pocket spectrophotometer, Prizm+ as a quality measurement for testing of biological liquid material and fat in the milk.

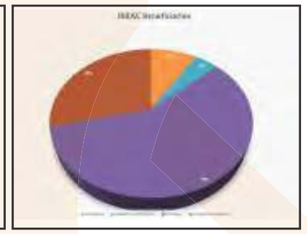
- Besides supporting development of products & technologies, BIRAC has also supported/facilitated transfer of technologies through multi-partnered projects:
- One such technology transfer program relates to development of biofortified and disease resistance banana from Queensland University of Technology (QUT), Australia to India. Under this program, technology transfer has been carried out for developing transgenic varieties of Indian banana (Grand Naine and Rasthali) with enhanced micronutrients (iron and pro vitamin A) and disease resistance (Fusarium and BBTV).The program's objectives are being jointly translated by 5 Indian research organizations namely, National Agri-Food Biotechnology Institute (NABI), National Research Centre for Banana (NRCB), Bhabha Atomic Research Centre (BARC), Indian Institute of Horticulture Research (IIHR) and Tamil Nadu Agricultural University (TNAU). Significant progress has been made to develop transgenic plants with enhanced level of Pro Vitamin A (PVA) and the analysis in fruit-pulp of the main crop plants. Initial results of agronomic & yield performance of main crop plants and distinctness, uniformity and stability (DUS) testing for PVA are have shown promising results. The ongoing work on FOC and BBTV too is quite encouraging
- BIRAC has also pursued technology transfer initiatives where the translatable leads from the Academic institutions were assigned to the relevant Industries for translation. In this regard three White Rust resistant lines of Oilseed Mustard (Brassica juncea) were developed by the Centre for Genetic Manipulation of Crop Plants (CGMCP) Delhi University, South Campus (DUSC) developed with the financial support of Department of Biotechnology (DBT), Government of India through mapping and marker assisted backcross have been transferred to 6 Indian companies for further translation and eventual commercialization.
- BIRAC in partnership with USAID and Indian Council for Agriculture Research (ICAR) is supporting development of high yielding, heat tolerant wheat cultivars suitable for Indo- Gangetic Plains. These new varieties shall be developed by building upon the available resources and breeding materials by utilizing information from model

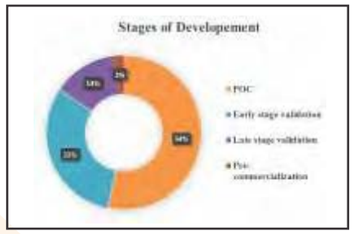


systems and currently available modern breeding, genetic, genomic, physiological, and biochemical tools. During the course of the study genes/ QTLs controlling heat tolerance will be identified, mapped and tagged; improved insight into physiological, genetic, biochemical, and molecular bases of the trait obtained, and a system will be put in place to utilize the new information in cultivar development.

- For supporting 135 projects in agriculture and allied areas, a total investment of Rs. 216.76 crores has been made under various schemes. This includes BIRAC contribution of Rs.134.73 crores. The distribution pattern of funding support under BIPP, SBIRI, PACE, SPARSH and BIG has been provided in figure Fig. 2. The total BIRAC contribution in agriculture under public- private partnership (BIPP & SBIRI) is close to 100 crores (Fig 3). In agriculture, 78 projects involved only companies, 12 involved individuals, 6 had only academic institutions/organizations, and 39 involved both company/ies and academia (Fig 4).
- So far as the stage of technology development is concerned, maximum projects have been supported for development of Proof of concept, followed by early stage validation. Considering the fact that agricultural projects involve long gestation period relatively fewer projects were funded for late stage validation, pre-commercialization and commercialization (Fig 5).







Analysis

- In spite of the good progress, policy and technology boost certain pain points exist in the Indian agriculture like small and fragmented land-holding, availability of quality/certified seeds, lack of use of eco-friendly manures, fertilizers and biocides, lack of proper irrigation and mechanization, long gestation period of crops, season variations to name a few.
- In the recent past, several schemes have been launched by the government of India to circumference these, and to promote sustainable agriculture through the application of emerging technologies
- Syncing with the latest government initiatives, BIRAC has also supported projects in the area of soil and plant health, digital agriculture, precision farming, genome editing, drones, IOT, remote sensing and artificial intelligence
- Some other entrepreneurial ventures which BIRAC has supported under agriculture and allied area are: residue testing plant health (grapes), arsenic testing kit for soil health, platform development for precision farming and soil health prediction and monitoring through precision irrigation and remote sensing, etc. Additionally, support has been extended to develop UAV/Drone-based Hyperspectral Remote Sensing & AI for estimation of crop yield, pest infestation, etc.
- Some of the technologies that have progressed well and reached late stage validation/ pre-commercialization stage last year include development of integrated products with plant growth and defence potential, multiplication of beneficial nematodes on waste silkworm pupae against agriculture pests and diseases, clinical evaluation and scale up of novel formulations for treating fatal viral diseases in dogs, etc.
- Overall analysis of funding pattern in agriculture and allied areas under various BIRAC schemes suggest that so far, projects related to recombinant DNA technology and Marker Assisted Breeding received maximum funding. However, going by the present trend, in future, projects related to emerging technologies (as described above) are likely to dominate.

Industrial Biotechnology (including secondary Agriculture)

Industrial biotechnology includes development of processes for sustainable production of chemicals, materials and fuels. These processing methods makes use of enzymes and microorganisms to produce products that are can be used in varied industrial sectors, such as pharmaceutical, nutrition, paper, textiles, chemicals and polymers.

Industrial sustainability is drastically enhanced as substitution of these green processes makes many of these industries more efficient and environmentally friendly.

As per a recent report by Reports and Data, the Industrial biotechnology Market is expected to reach USD 576.89 Billion by 2026. Increasing use of technology across several industries on account of its multiple advantages such as environmental friendliness, efficient production methods, new raw material chains, low waste generation, reduced manufacturing costs, and raw material consumption is anticipated to have a positive impact on the market over the next few years.

As per another report, the industrial enzyme sector is growing at a rate of 7% and has touched Rs. 2360 crore for the year 2018-19 (Biospectrum, Volume 17, Issue 9). The surge is due to the rapid development in food and beverage, pharmaceuticals and chemicals industry.

The secondary agriculture provides value addition to agricultural products, creating facilities for primary processing and stress management in agriculture and adds value to the basic agro commodities to allow farmers to get better returns from their harvest. It also creates new jobs in the rural sector to grow rural economy which is entirely based on agriculture. Several potentially high impact technologies, in terms of value added products from agriculture produce, are presently at different stages of development and could benefit of a coordinated effort to scale up their production and dissemination.

BIRAC has facilitated and accelerated the development of newer technologies for innovative processed and value added products from agro-produces, byproducts and enhance professional expertise of Indian scientists and knowledge base in food processing, byproducts utilization and biofuels.

BIRAC, since its inception has been trying to bridge the above challenges by providing funding, mentoring and training in this area. Total investment under this area amounts to ₹ 439 crores wherein BIRAC has contributed ₹ 210 crores for supporting 209 innovative projects. These projects engaged 103 companies, 54 start-ups, 31 entrepreneurs and 44 academic institutes.

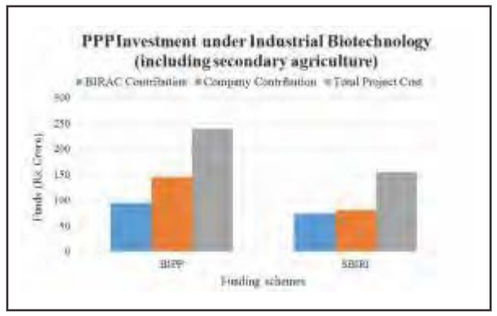
Achievements

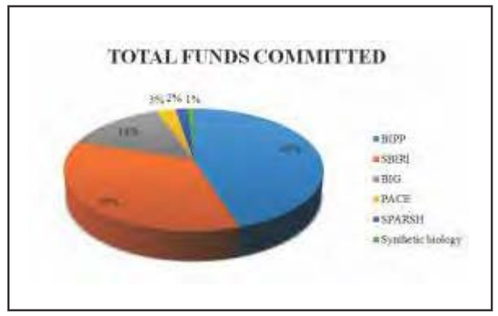
The major achievements of BIRAC in this area are 51 technologies/product/PoC and 45 intellectual properties.

The projects that have been supported involves the use of biotechnological platforms and can be categorized in several sub-areas such as bioenergy, speciality chemicals, industrial enzymes, industrial processes, bioremediation, secondary agriculture, infrastructure support and many other fine chemicals as shown below.

Various research models like collaborative research, PPP programs and Industry sponsored programs has given this sector a successful impetus. BIRAC in the last one year has had some remarkable achievements in the area of Industrial biotechnology and Secondary agriculture:

- A stand-alone compact digester for decentralized waste processing





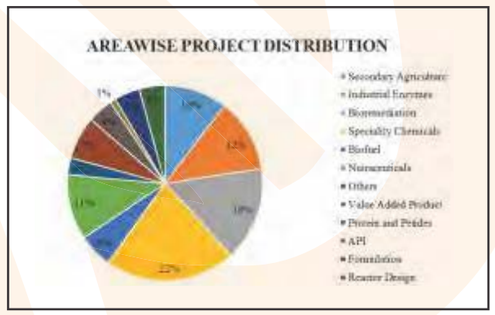
- An innovative device for enhancing biogas yield of distillery spent wash or reducing COD in effluents
- A technology for pilot scale production of docosahexaenoic acid from microalgae
- A pilot-scale supercritical fluid extraction unit for nutraceutical and cosmeceutical products development
- A green technology of solvent free extraction for purification of catechin from tea leaves
- Pilot demo plant based on conversion of faecel waste to fertilizer
- Facilities have been established for promoting production of chemicals and therapeutics
  - Facility for development of technologies culminating into commercial manufacturing of therapeutics made by fermentation processes
  - Pilot scale translational facility for value added chemicals from biomass

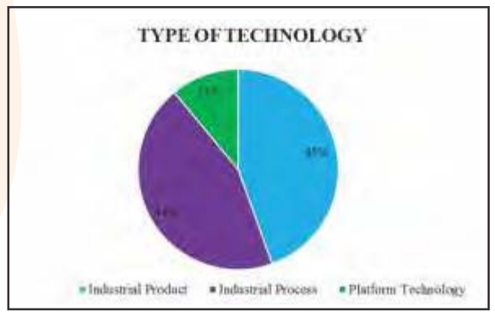
Keeping up with these initiatives, BIRAC grantees under this area have received recognition at various platforms at national as well as international level:

1. Kbcols: KBCols sciences won the green chemistry innovation award (startup category) at SERB-IGCW awards 2019. Industrial green chemistry world (IGCW) awards are considered as an industrial benchmark for outstanding research & industrialization stories incorporating green chemistry principles.
2. Arjuna Natural Extracts Pvt Ltd. awarded with Gold Grade for Outstanding performance in Industrial Safety & Health 2018. Dr. Benny Antony Joint MD has been conferred with the National Intellectual Property Award for the year 2019 in the category of Top Individual for Patents and Commercialization
3. Rope Production Centre was conferred with Cavinkare Innovation Award for introducing break through changes by innovating Rope Production machines such as Banana pseudostem rope cutting machine, automatic rope making machine, power rope machine and power rope winding machine.
4. String Bio nabbed itself a US$100,000 grant at the inaugural Future Food Asia Award (FFAA). The FFAA is an Asia-Pacific-wide competition organised by investment firm ID Capital and supported by the Economic Development Board of Singapore and global food processing company Archer Daniels Midland Co. String Bio converts methane gas into proteins, which are then used to make animal feed.
5. Aspartika Biotech Pvt Ltd was adjudged as one of the Top Ten Scale up Companies in the LevelNXT Program conducted by FICCI, PWC and CNBC among all the sectors. Award was given on 5th Mar 2019.
6. Aspartika Biotech Pvt Ltd conferred with National Entrepreneurship Award 2019 (Ministry of Skill Development and Entrepreneurship) in the Renewable Energy and Waste Management under A1 category of the Enterprise Award Track

In order to promote the sector further, BIRAC has been taking specific initiatives:

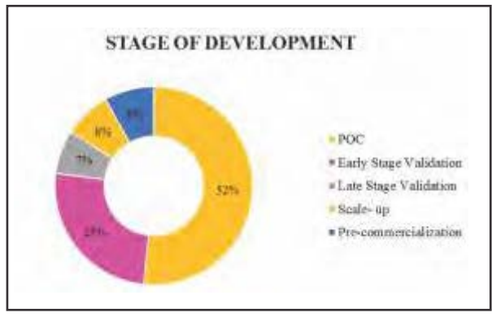
- Call for proposals in Synthetic biology for development of a bio-based economy
- BIRAC supported secondary agriculture entrepreneurial network to address the unmet technological needs of two industrial sectors — 'Fruit & vegetable processing industry' and 'Cereal & grain processing industry' of Punjab by using technical infrastructure and expertise of NABI, CIAB and other relevant institutions. The initiative will develop technologies such as value-added products from tomatoes and anthocyanin-rich wheat (anti-oxidants). It will also develop technology for enhancing shelf life of fruits and curbing stubble burning. After laboratory success and validation, the technology will be transferred to the industry for commercial exploitation. The strategic initiative is to support the food processing industry and promote start-ups in the agri food sector. A state-specific call for proposal to support start-ups in Punjab, particularly in the secondary agriculture domain was done by BioNest- Punjab University. These would be supported financially as well as technically by providing mentorship, incubation space and instrumentation support. To provide conducive environment needed for the technology commercialization is the aim of this network.
- BIRAC has announced a call for proposals in the area of 'Guar-Gum' with an aim to support overall development of guar industry in India
- Scale up of technologies in the waste to energy area under the 100 days agenda of the Department of Biotechnology
- A Wetlab student challenge with a focus on establishing Water Innovation in the City, aligned to a water experience lab at the Barapullah Drain in Delhi.

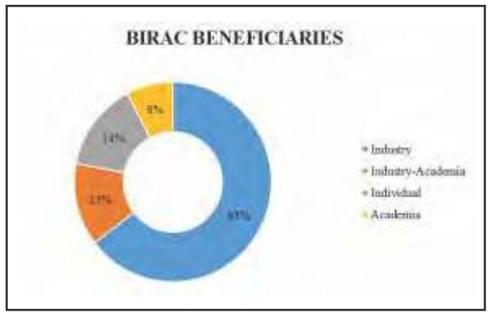




Analysis

- BIPP scheme still continues to capture maximum share of funds committed due to large scale production units being developed.
- Majority of the projects have been funded to industry alone. However, there is a, increased interest of young entrepreneurs for development indigenous process and product development.
- Major projects have been supported for proof of concept under BIG and SBIRI scheme.
- A large number of projects are considered for Follow on funding wherein proof of concept has been supported by BIRAC only.
- Technologies for the production of specialty chemicals still continues to capture the major share of BIRAC funding. However, technology development in environmental remediation is an area which is also picking up.
- High investment for large scale production is the major limiting factor for scale up of technologies in this area. There is a need to de-risk this limitation to promote indigenous product development and import substitution.





Artificial intelligence, Big Data Analysis, IoT's, software development & Bioinformatics

The Indian bio-IT sector is expected to remain on an uptrend and reach USD10.2 billion by 2025; of this, the bioinformatics sector is expected to contribute USD 2.7 billion.The spectacular rise of the commercial Indian genomics industry and the broadening application of genomic techniques in biology and medicine has created a commercial market for Translational bioinformatics. In current era, bioinformatics has become an important part of many areas of biology. Bioinformatics is growing as an independent discipline and is fundamental to the growth of biotechnology. India has achieved remarkable success particularly in the software industry.

Over the past decade, the bioinformatics market has significantly evolved across the globe owing to increasing application of genomics in biotech and pharmaceutical research & development. This growth in the global bioinformatics market has positive implications for the Bio-IT industry. Bioinformatics is one of the fastest-expanding

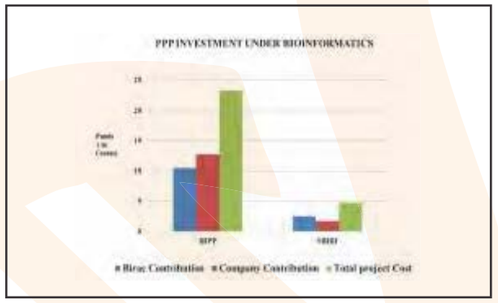
fields in India's biotechnology sector today and BIRAC is encouraging and focussing on the translational bioinformatics driven projects.

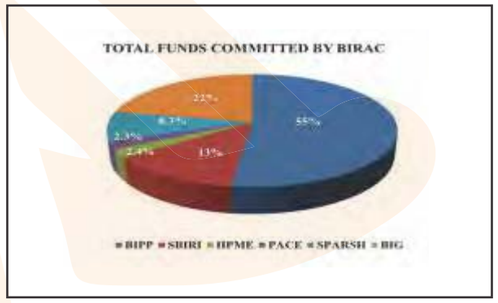
Achievements

Bioinformatics technologies developed by through BIRAC support:

Developed platform, tools

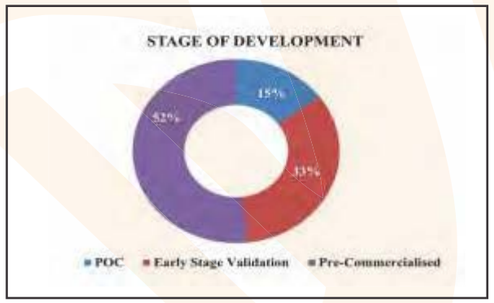
- Nemocare Raksha: An IoT enabled smart Wearable along with an intelligent decision support system to augment non-invasive clinical hemodynamic monitoring to predict and identify early markers for late onset of sepsis and periodic shock in neonates
- Behavioural Evaluation & Standardized Treatment for Mental Disorders BEST-MD - Machine learning driven assistive technology to assess and treat children diagnosed with mental disorders such as Autism, dyslexia and ADHD.
- A kit for the detection of onco mutation for more than 10 type of cancers & computational pipelines for the analysis of NGS data. A NGS based gene panel for the diagnosis of cancer has been developed.
- A machine learning based software for the detection of diabetes retinopathy is developed and validated. Software (icheck) has been launched. Currently software has been launched with new Name- ChironEye
- In-Silico hepatotoxicity prediction platform to conduct toxicity studies of any lead compounds.
- SanGenix named comprehensive NGS data analysis suite that offers a scalable and user friendly solution with predefined or custom workflows for seamless analysis of NGS data. Product is available on (http://www.sangenix.com/Products.html)
- High computing infrastructure set up for NGS data Analysis with more than 16 NGS pipelines & providing 25% discount price to the Indian academics and institutions. Services are available on (http://www.scigenom.com/bipp)

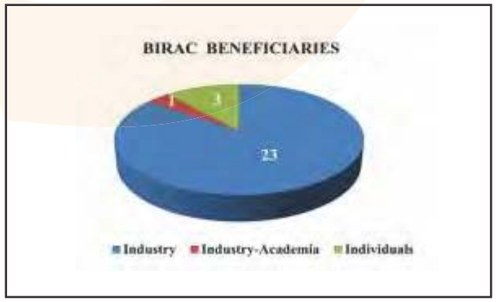




Products in Pipeline

- Developing affordable Intelligent Self Care product for multi-morbid patients providing personalized preventive care using predictive analytics from historical/real-time using IOT/ Mobile based app
- MinDevice - A standalone wearable high performance consumer device & developer platform for acquiring EEG with self adjusting frame & electrodes, to analyse & learn brain data along with a user interface to communicate between brain & computer
- Intelligent health care kiosk for immediate simple healthcare for simple common symptoms is under pipeline. An artificial intelligence based software for the health care kiosk. This medical kiosk will diagnose the vital symptoms and will provide e-prescription and also dispense the drugs.
- A software for improving auditory perception and speech performance of hearing impaired children and adults using their visual cortex.





Analysis

- 3 IP's have been generated so far
- 55% funds are disbursed through the BIPP for bioinformatics sector.
- Few of the projects from Bioinformatics area involved Industry-academia collaborations though many are pursued by industry alone.
- 52% projects have been successfully reached to pre-commercialized stage. Rest of them are at early stage validation.

INNOVATION PROFILES

HEALTHCARE

THERAPEUTICS

ACUBIOSYS PVT. LTD.

Title of the Proposal

Preclinical pharmacokinetics and efficacy optimization of selective, potent Indoleamine 2,3 dioxygenase inhibitors for the treatment of colorectal breast and lung cancer

Brief description:

The aim of the project isLead optimization of a small molecule IDO inhibitor that displays good potency, drug metabolism, pharmacokinetic and efficacy profile

Current stage of development:

Proof-of-Concept

Innovative Element(s)

The novelty lies indiscovering the role for the ubiquitous heme cofactor in immune regulation. Indoleamine 2,3-dioxygenase IDO1 is a heme protein that catalyzes the dioxygenation of tryptophan. Cells expressing this activity are able to profoundly alter their surrounding environment to suppress the immune response. Cancer cells exploit this pathway to avoid immune-mediated destruction.

Market Potential :

The cost of drugs to treat cancer is USD 100 billion.

National/Societal Relevance

New cancer cases growing at around three times the expected rate of population growth over the same period.

Project achievements

a. **Progress vis-a vis objectives-** Two chemotypes for IDO inhibitors have been developed. Both showed nM potency against IDO enzyme and ELISA based assay. Compounds from these chemotypeshave shown good ADME profile.

b. **Technology/Product (to be) developed –** Lead optimization of a small molecule IDO inhibitor that displays good potency and drug metabolism, pharmacokinetic and efficacy profile.

c. **IP generated/ Potential for IP generation -** Compounds are currently being protected as a trade secret until candidate selection

d. **Resources Generated -** Man power has been employed and Facility has been created

Plans to take innovation further

Looking for partnership for further development

Risks envisaged

Toxicity of the compounds could be a setback.

Project coordinator:
Srinivas Maddi

Team Members:
Subhabrata Sen
Radha Krishna

Contact :
Technology business incubator,
BITS Pilani Hyderabad,
Jawaharnagar, Hyderabad,
TELANGANA, India-500078

AFFIGENIX BIOSOLUTIONS PVT. LTD.

Title of the Proposal:

Development of ready to use engineered cell lines for in vitro Insulin receptor phosphorylation bioassay to monitor Insulin drug potency.

Brief description:

The applicant has developed ready-to-use cell-based assay with two engineered cell line expressing Insulin receptor INR-A &. INR-B and also anti-insulin receptor antibodies and phospho specific antibodies.

Current stage of development:

Validation

Innovative Element(s)

Ready to use Insulin Receptor Expressing Cell lines that can be used for potency assay. Replaces animal testing for Insulin potency. Indigenous Insulin receptor phosphorylation ELISA kit.

Market Potential

Limited to Insulin manufacturing companies as of now, as it is mandated to be used by regulatory agencies.

National/Societal Relevance

Developed cell based bioassay will effectively serve the manufacturing companies all over the worldto develop safe, effective, high-quality novel as well as biosimilar Insulin for diabetes management.

Project achievements

a. **Progress vis-a vis objectives -** Two functional cell lines and commercializable ELISA kits are ready for commercial launch.

b. **Technology/Product (to be) developed -** The applicant has developed ready to use Insulin receptor A and B expressing cell lines and also developed a ELISA kit.

c. **IP generated/ Potential for IP generation -** Looking for the patentable IP.

d. **Resources Generated -** 3 Man power and Managed to get a NABL accreditation to the laboratory.

Plans to take innovation further

Using the Cell line developed for screening, further planning to develop anti-Insulin receptor antibodies that can cross the blood brain barrier and also Insulin with long half-life that can reduce the frequency of dosing.

Risks envisaged

Low commercialization potential.

Project coordinator:
Arumugam Muruganandam

Team Members:
Bindu Mahesh, T. R. Krithika,
M. Karunakara, J. Arulchelvan,
S. Ajithkumar, G. Kalaiselvi
and V.G. Vishnu Priya.

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India – 560074.

AHAMMUNE BIOSCIENCES PVT. LTD.

Title of the Proposal

Pre-clinical studies of AB1001, a novel drug candidate for debilitating skin disorder, Vitiligo

Brief description

Ahammune has developed a new drug candidate AB1001, which stops vitiligo progression. IND-enabling studies are currently being undertaken with AB1001 for performing first-in human trials in 2020.

Current stage of development

Proof-of-Concept

Innovative Element(s)

The new drug candidate specifically targets relevant mechanisms underlying vitiligo pathophysiology in contrast to Primary treatment strategy for vitiligo which involves long-term use of steroids &immunosuppressantswhich merely manage the disease

Market Potential

Global prevalence of Vitiligo is 1-2%. Vitiligo is currently an unattended market and there is tremendous need for a new drug and a huge market potential of over $2.4 billion by 2024.

National/Societal Relevance

The burden of Vitiligo is huge in India, with certain regions like Gujarat having an estimated 8% of population being affected. The disease affects both personal and professional lives of patients globally as they have to live with the trauma throughout their lives.

Project achievements

a. **Progress vis-a vis objectives-** Optimization of formulation and pre-clinical toxicity studies has been completed.

b. **Technology/Product (to be) developed –** IND-enabling studies with new drug candidate for performing first-in human trials in 2020.

c. **IP generated/ Potential for IP generation -** Ahammune has filed a patent application for its innovative solution for vitiligo treatment.

d. **Resources Generated -** The Company has recruited research scientist.

Plans to take innovation further

Ahammune will be seeking monetization strategies post Phase II clinical trials with AB1001, including global licensing, regional licensing and/or doing Phase III followed by manufacturing and marketing.

Risks envisaged

Direct translation of pre-clinical data to humans is a challenging task as it is difficult to predict how a drug will interact with human body.

Project coordinator:
Parul Ganju

Team Members:
Sudhanand Prasad,
Mahesh Kumar Verma,
Annie Richharia,
Sanket Shete,
Vinodita Phatak

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Pashan, Pune, MAHARASHTRA,
India-411008

BHARAT IMMUNOLOGICALS AND BIOLOGICALS CORPORATION LTD.

Title of the Proposal

Production of safe and effective oral cholera vaccine of global GMP standards in India through Industry Academia partnership to meet India's supply needs.

Brief description:

The recent global disease burden study estimated more than 400 million high-risk populations in India who may warrant oral cholera vaccine (OCV) use. The number of doses required to cover such large population is enormous. A collaboration between THSTI-IVI-BIBCOL could facilitate the scale-up OCV production in India. The overall goal is to make India capable of producing Oral Cholera Vaccine to global GMP standards to meet its own supply needs in support of its National Cholera Control and Elimination Plan.

Current stage of development

Pre-commercialization

Innovative Element(s)

Safety and immunogenicity of the same IVI vaccine have already available. Validated endpoint assay availability makes the product, more convenient for a clinical trial, help to clear regulatory, and licensing procedure comparatively easy.

Market Potential

The World Health Organization estimates that globally there are 1.3 to 4.0 million cholera cases annually and that 21 000 to 143 000 of them result in death.

National/Societal Relevance

India is considered endemic cholera country and estimated to have 675,000 cholera cases and 20,000 deaths in 2015 which is constitutes 24% and 21% of predicted global cholera cases and deaths respectively. When looked at the national level, economic burden due to cholera treatment, loss of income due to inability to work and death is estimated to be more than $830 million in US$2015.

Project achievements

a. **Progress vis-a vis objectives-** R&D lab and the bulk production facilities main building structure is ready. Lab for vibriocidal assay at THSTI is ready.

b. **Technology/Product (to be) developed –** OCV will be developed through technology obtained from IVI, Korea .

c. **IP generated/ Potential for IP generation –**International Vaccine Institute will transfer the technology for low cost production of the oral cholera vaccine.

d. **Resources Generated –**Two officers have been trained for upstream and downstream processes in India and further training shall be given at IVI, Korea with other members, the facility for pilot scale at 100 liter fermentation shall be created to produce 2 million doses of vaccine initially which can later be scaled up to 500 liter fermentation facility.

Plans to take innovation further

The plan is to scale up the production of the OCV to a 500 liter scale to meet the requirement of India. The fund shall be raised from the business of OCV, Govt grant/loan.

Risks envisaged

It is the fourth tech transfer for IVI thus very low risk is expected.

Project coordinator:
Arup Banerjee

Team Members:
C.B. Benjwal, R.K. Shukla,
S.K. Singh, S.A. Ansari ,
Amit Kumar, Ankit Gupta

Contact :
OPV Plant, Village - Chola,
Bulandshahr,
Uttar Pradesh - 203 203

BHARAT IMMUNOLOGICALS AND BIOLOGICALS CORPORATION LTD.

Title of the Proposal

Plasma fractionation process for production of albumin, immunoglobulin and other products for therapeutic uses.

Brief description

The project is aimed to develop and optimize novel process for production of biologicals from plasma. The project will utilize a hybrid process using precipitation, chromatography and membrane based purification system for the recovery of albumin, immunoglobulin, factor VIII and other high value products.

Current stage of development

Proof-of-concept

Innovative Element(s)

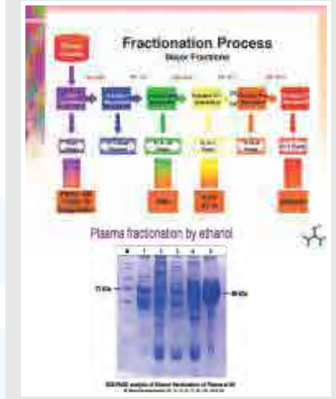
The proposed method will be combination of ethanol precipitation and modern downstream operation such as membrane separation, two phase extraction and solvent extraction to purify Albumin and IgG.

Market Potential

The total market for plasma protein is around $26 billion.

National/Societal Relevance

The current IgG requirement for India is around 15,000 Kg whereas that of albumin is around 60,000 Kg. The Current manufacturing only meets 25% domestic requirement. Hence, there is a high gap between demand and supply of these plasma components.



Project achievements

a. **Progress vis-a vis objectives-** Production and characterization of Albumin at 1L scale. To achieve this objective most of the necessary equipments has been purchased and experimental work have been started to optimize the Albumin production from plasma at 1 L in the newly developed laboratory. The results of the experiments are successful so far.

b. **Technology/Product (to be) developed –** The applicant will set up 50 L pilot scale GMP facility for plasma fractionation, once the Albumin production from plasma at 20L will be successful.

c. **IP generated/ Potential for IP generation -** Possible IP generation for novel process steps leading to better yield and recovery.

d. **Resources Generated –** Manpower recruited -5

Plans to take innovation further

The data generated from 50L GMP plant will be used to design the 2000L/batch plasma processing plant to produce albumin, IgG, factor VIII and IX. The 50L GMP pilot plant will be used to produce high value, small volume products such as Fibrinogen, Fibronectin, Hepatoglobin, clotting factor, sealant etc.

Risks envisaged

The supply of plasma is a critical factor for the success of this technology.

Project coordinator:
A.K. Panda

Team Members:
C.B. Benjwal,
Vinay Kumar Sharma,
Amit Kumar, Utkarsh Pandey,
Gopalan Sampath kumar,
Ayub Qadri and Anil Kumar

Contact :
OPV Plant, Village - Chola,
Bulandshahr,
Uttar Pradesh - 203 203

BIOMAC LIFE SCIENECS PVT. LTD.

Title of the Proposal

Development and validation of Chimeric Antigen Receptor T cells for the treatment of patients with recurrent or relapsed B-cell Acute Lymphoblastic Leukemia.

Brief description

The project aims to develop Chimeric antigen receptor [CAR] T cell therapy for the treatment of cancer.

Current stage of development

Validation

Innovative Element(s)

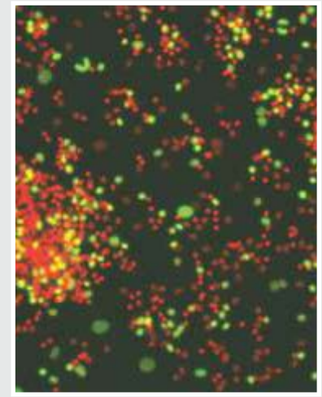
Indigenous CAR-T therapy will be developed using novel method at affordable cost.

Market Potential

Almost $4 billion by 2027

National/Societal Relevance

There is an unmet need for developing novel therapeutics for treating cancers in India. The five-year survival rate for most cancers in India is one of the lowest in the world. The CAR T cell therapy will bring cure for patients with certain type of cancers.



Project achievements

a. **Progress vis-a vis objectives-** CD19 specific CAR T cells are developed by designing the CD19 specific CAR, generating the viral particles, and introducing CAR into the T cells using the viral particles. Preclinical validation of CD19 specific CAR T cells for its specific and efficient killing of CD19+ cancer cells.

b. **Technology/Product (to be) developed –** BioCAR-19, which is a autologous genetically engineered T cell immunotherapy for treating B-cell type leukemia and lymphoma.

c. **IP generated/ Potential for IP generation -** Patent filed on "A novel lymphocyte harboring macrophage lhm and method of its generation", Application No.201921004254 A.

d. **Resources Generated -** A dedicated facility for handing cells and cell lines has been established and two employees have been effectively trained.

Plans to take innovation further

The company is looking for partnership with Hospitals and investors to validate and to successfully develop this therapy.

Risks envisaged

Regulatory approvals; Timely completion of clinical trials.

Project coordinator:
Senthilkumar Natesan

Team Members:
Ashok Chauhan,
Chirag Desai, Kranti Vora,
Madhuparna Mitra and
Sneha Acharya.

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A-304 Swagat Blossom-3,
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- 382421, Gujarat, India.

Healthcare-Therapeutics

SBIRI

CELLUGEN BIOTECH PVT. LTD.

Title of the Proposal

Development of Biologic and Synthetic Scaffolds Seeded with Mesenchymal Stem Cells and Establishment of Safety and Efficacy in Pre-Clinical Study.

Brief description

The products aims to seed and expand stem cells on three dimensional scaffolds to develop a products, such as AminoCell Single layer Amniotic Membrane as a biological Scaffold with benefit of Mesenchymal Stem Cells, SynCell Single layer Synthetic Scaffold with benefit of MSCs and CompoCell Bi- layered Composite scaffold contains both biological and synthetic Scaffold with benefit of MSCs.

Current stage of development

Discovery

Innovative Element(s)

A durable, bioactive allograft for wound healing applications with natural barrier properties which may be stored at ambient conditions for up to 5 years.

Market Potential

The global wound care market is expected to reach $1,563 million by 2023, registering a CAGR of 9.7%.

National/Societal Relevance

Wounds are a major growing problem worldwide and posing social and economic burden to society. According to WHO fact, annually around 2, 65,000 deaths are occurring globally due to burns and over 10 lakhs people are moderately or severely burnt in India.

Project achievements

a. **Progress vis-a vis objectives-**The pre-clinical study for testing of the efficacy of bio composite scaffold in in-vivo wound model and safety studies in the rat model is under process.

b. **Technology/Product (to be) developed –** Technology-focused to develop a products, such as AminoCell Single layer Amniotic Membrane as a biological Scaffold with benefit of Mesenchymal Stem Cells, SynCell Single layer Synthetic Scaffold with benefit of MSCs and CompoCell Bi- layered Composite scaffold contains both biological and synthetic Scaffold with benefit of MSCs.

c. **IP generated/ Potential for IP generation -** Null

d. **Resources Generated -** Manpower employed.

Plans to take innovation further

The clinical trials tie-up is in process with Famicord, Poland for establishing the successful products.

Risks envisaged

scaffold will not be available for immediate use due to difficulty in the preservation of stem cell loaded scaffold for a long duration.

Project coordinator:
Firdosh Mahuvawalla

Team Members:
Jaianand Kannaiyan,
Saurabh Khare and
Shruti Chitare.

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Phase 1, Gurgaon - 122 016,
Haryana, India

Healthcare-Therapeutics

PACE-AIR

CSIR-NATIONAL INSTITUTE OF OCEANOGRAPHY

Title of the Proposal

Development of a novel marine-derived peptide-antibiotic against serious gram-positive infections

Brief description

Project aims to develop a novel potent thiazolyl cyclic-peptide PM181104 antibiotic, isolated from a marine Actinobacterium Kocuria against serious gram-positive infections

Current stage of development:

Discovery

Innovative Element(s)

Novel compound isolated from marine sponge bacteria for multiple indications.

Market Potential

MRSA care in US costs upto USD 60,000/patient (upto USD 9.7 billion/Year), in India: USD 124 per patient.

National/Societal Relevance

India and the rest of the world has tremendous burden of HAI and new drugs with novel mechanism are only options to eradicate drug resistant pathogens.

Project achievements

a. **Progress vis-a vis objectives-** The peptide antibiotic has been produced by fermentation of sponge associated bacterium and its antimicrobial potential, pharmacology/efficacy in disease models has been confirmed.

b. **Technology/Product (to be) developed –** A peptide antibiotic with novel mechanism to tackle AMR in Gram+ve pathogens.

c. **IP generated/ Potential for IP generation -** The scope for new patents exist.

d. **Resources Generated -**Relevant technical man power hired for the project.

Plans to take innovation further

The Company is presently working with industrial partner to take the innovation further.

Risks envisaged

There are no perceived risks

Project coordinator:
Narsinh Thakur

Team Members:
Parvinder Kaur,
Prabha Devi,
Supriya Shet Tilvi

Contact :
Oceanography,
Dona Paula, GOA,
India-682018

Healthcare-Therapeutics

SPARSH

CUOR STEM CELLUTIONS PVT. LTD.

Title of the Proposal

Cell based screening platform using a human mesenchymal stem cell derived model for Alzheimer's disease for novel drug target development.

Brief description

Cell based models (disease-in-a-dish) for Alzheimers disease (AD) is of immense value for studying the progression of the disease in vitro and at the cellular level which will help in novel and specific drug discovery.

Current stage of development

Validation

Innovative Element(s)

There has been no in vitro model created of AD using the renewable, scalable and non-genetically manipulated naturally occurring human adult Mesenchymal Stem Cells (MSCs).

Market Potential

Targeted clients are-Pharmaceutical and biosimilar developers companies, who are interested in the proprietary protocols.

National/Societal Relevance

AD is one of the most devastating of neurodegenerative diseases.Reliable in vitro models are needed, to screen the novel and specific drug molecules.

Project achievements

a. **Progress vis-a vis objectives-** The applicant has developed a robust model of AD in a dish and validated it successfully using well known AD drugs.

b. **Technology/Product (to be) developed –** The applicant is testing the stem cell derived AD platform with few promising AD drugs presently.

c. **IP generated/ Potential for IP generation -** One patent filing under process and one more is expected.

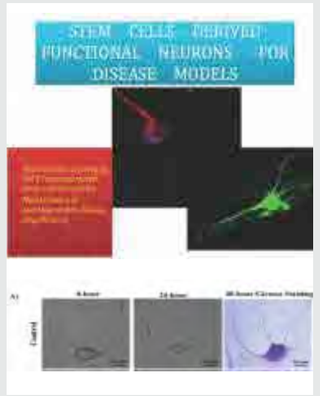
d. **Resources Generated -** Employed research fellows, started up company Cuor Stem Cellutions Pvt Ltd and drug testing beta trials undertaken with Novartis, talks with venture capitalists for further funding.

Plans to take innovation further

The applicant is in talks with venture capitalists in the healthcare sector for partnerships and for marketing assistance.

Risks envisaged

The drug testing for new AD drugs is a niche area. Drug manufacturers typically go directly into animal models rather than testing in vitro.



Project coordinator:
Sudha Warrier

Team Members:
E Arunkumar

Contact :
School of Regenerative Medicine,
Bangalore, Karnataka,
India-560065

Healthcare-Therapeutics

SBIRI

EXOCAN HEALTHCARE TECHNOLOGIES PVT. LTD.

Title of the Proposal

Development of Clinical Grade Exosome Formulations

Brief description

The project is aimed at developing a process for clinical grade exosome preparations

Current stage of development

Validation

Innovative Element(s)

Novelty lies inRapid process to purify exosomes preparations

Market Potential

Above 10 billion USD

National/Societal Relevance

Useful for developing diagnostic assays in cancer

Project achievements

a. **Progress vis-a vis objectives-**Optimization of the ration of triphasic formulation and validation through BSA and liposomal vesicle precipitation has been done

b. **Technology/Product (to be) developed –** Product for purifying exosome preparations

c. **IP generated/ Potential for IP generation –** IP has been filed

d. **Resources Generated -** One manpower has been employed

Plans to take innovation further

Licensing, partnering

Risks envisaged

Early stage adaptation of emerging technologies is one of the potential risk for commercialization

Project coordinator:
Aman Sharma

Team Members:
Aman Sharma

Contact :
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Dr Homi Bhabha Road, Pashan,
PUNE, MAHARASHTRA,
India-411008

EYESTEM

Title of the Proposal

Proof of concept study to evaluate safety and efficacy of two dimensional 2D photoreceptors vis-a-vis three dimensional 3D optic cup like retinal organoids in in animal models of retinal injury

Brief description

Eyestem is developing Eyecyte-PRP our photoreceptor product to treat Retintiis Pigmentosa with a unique, patent pending protocol. Our photoreceptors have been shown to be effective in vitro and are currently in invivo experiments to demonstrate efficacy.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Eyestem has a unique protocol that allows it to create photoreceptors in a more consistent, predicable way. Retinal organoid has been shown to demonstrate all the structures of the human retina and has great potential for the future.

Market Potential

There is no cure for Retinitis Pigmentosa globally. The global market potential for the first few companies to achieve success in this area is possibly in the billions of dollars.

National/Societal Relevance

There are more than 15 lac kids suffering from Retinitis Pigmentosa- an incurable disease that presents around 5 years and leads to blindness in adulthood. The impact of a cure would be transformational and will address a huge unmet need for such patients

Project achievements:

a. **Progress vis-a vis objectives-** Animal studies are going on currently, blind mice have been injected with photoreceptors to show that the mice can regain sight, results of animal studies has been anticipated in January 2020.

b. **Technology/Product (to be) developed –** Two dimensional 2D photoreceptors vis-a-vis three dimensional 3D optic cup like retinal organoids

c. **IP generated/ Potential for IP generation -** Patent pending IP

d. **Resources Generated –** Funds have been mobilized from India and abroad, scientists have been recruited, manufacturing contract given to local manufacturer,

Plans to take innovation further

Currently raising funds for first in human studies

Risks envisaged

Ensuring synaptic integration of the photoreceptors in humans and ensuring survival and engraftment

Project coordinator:
Rajarshi Pal

Team Members:
Jogin Desai, Rajani Battu, Vijay Bhaskar, Harshini Surendran, Sushma Swamy, Abinaya Sundari, Swapna Nandakumar

Contact :
106A Shagun Complex, B-93, Swastik Society, Navrangpura, Ahmedabad-380009

GENZIR TECHNOLOGIES PVT. LTD.

Title of the Proposal

Development of kits for isolation of adipocyte-derived stem cells for prolotherapy and other regenerative medicine.

Brief description

Product 1- GenAdipose device - designed to facilitate fat washing during fat grafting cosmetological or wound healing surgical procedures. Product 2- GenTissue - designed to facilitate isolation of SVF from adipose tissue. It can also be used to isolate primary cells from organs/tissues following digestion with enzymes.

Current stage of development

GenAdipose at Commercialization stage. GenTissue at validation stage.

Innovative Element(s)

GenAdipose is unique device for recollection of fat following washing step- not seen in other devices with similar function.

Market Potential

The regenerative medicine market is expected to register a CAGR of nearly 19.81% during the forecast period, 2019-2024.

National/Societal Relevance

Tremendous potential in the use of adipose tissue itself or adipose-derived stem cells for treatment of a large number of chronic ailments and tissue/organ injuries. Hence, provides a direct measure to the marketability of these devices.

Project achievements

a. **Progress vis-a vis objectives-** Using GenTissue device the applicant has obtained the higher number of viable cells from Adipose tissue that can differentiate into different cell types.

b. **Technology/Product (to be) developed –** Technology will be completely developed in two months.

c. **IP generated/ Potential for IP generation -** Indian Patent awarded in October 2019 for GenTissue GenStem/Genzte device.

d. **Resources Generated -** Man power generated-5.

Plans to take innovation further

In the process of fund raising.

Risks envisaged

Risks include market penetration.

Project coordinator:
Wasia Rizwani

Team Members:
Arif, Radhika, Razzaq, Dushyanth and Vijay

Contact :
H. No. 12-2-876/1/6, Asifnagar, Hyderabad, India-500028

Healthcare-Therapeutics

BIG

HANUGEN THERAPEUTICS PVT. LTD.

Title of the Proposal

Scale-up and Automation of synthesis of novel Morpholino Nucleic Acid as therapeutic potential for Duchenne Muscular Dystrophy

Brief description

Duchenne Muscular Dystrophy is a rare, severe, progressive muscle-wasting disorder due to lack of a protein called Dystrophin. This occurs when there are changes in the reading frame of amino acids, thereby resulting in truncated proteins, leading to less than required levels of Dystrophin. Novel AON candidate with a morpholino ring containing a phosphodiester/phosphorothioate backbone is being developed as therapeutic potential for Duchenne Muscular Dystrophy.

Current stage of development

commercialization

Innovative Element(s)

Novel AON candidate with a morpholino ring containing a phosphodiester / phosphorothioate backbone.

Market Potential

Monogenetic disorders affect more than 400 million people worldwide with a huge percentage of it in India. Its a rapidly growing market.

National/Societal Relevance

Frequency of mutations is relatively higher than reported in most of the other studies. There are large number of studies describing its natural source from India.

Project achievements

a. **Progress vis-a vis objectives-** Morpholino uridine nucleic acid has been synthesized and characterized by MALDI-TOF. Cell viability assay and profiling has been completed. Exon skipping at mRNA level was performed and validated

b. **Technology/Product (to be) developed –** synthesis of novel Morpholino Nucleic Acid as therapeutic potential for Duchenne Muscular Dystrophy

c. **IP generated/ Potential for IP generation -**

d. **Resources Generated -** IP is in the process of being generated.

Plans to take innovation further

In the process of fund raising and bring on board equity partners.

Risks envisaged

Major Risk is entrant of new CRO in to this new and nascent field

Project coordinator:
Arun Shastry

Team Members:
K. Sabareesan, Berty Ashley, Ravi Hindupur, Keerthi Ramesh, Deepika K, Ravi Kumar

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Healthcare-Therapeutics

BIPP

HIMEDIA LABORATORIES PVT. LTD.

Title of the Proposal

Designing & commercialization of affordable chemically defined serum free media & feed for high value Biosimilars manufacture.

Brief description

The applicant developed a Serum Free Media (SFM) at affordable prices, which can be used by biopharmaceutical companies especially monoclonal antibodies (mAb) produced by CHO cells.

Current stage of development

Validation

Innovative Element(s)

Only Indian company that manufactures clone specific customized SFM. Use of Cryomill & ultra-rapid mixer for blending components to form perfect media blend in a highly soluble & bioavailable form. Granulation using the Roll Compaction Granulator technology.

Market Potential

High market potential in India.

National/Societal Relevance

Expensive treatments for cancer and other deadly & debilitating diseases Rheumatoid arthritis, autoimmune diseases necessitates the production mAb and protein producing clones be made available at affordable costs. This can be achieved by using SFM.

Project achievements

a. **Progress vis-a vis objectives-** Media & feed validation Herceptin clone - shake flasks complete. Media & feed validation Avastin clone - shake flasks complete. Scale up at 10L bioreactor scale both clones – Ongoing.

b. **Technology/Product (to be) developed –** Clone specific serum-free, animal component free, protein free, chemically defined media for production of Herceptin.

c. **IP generated/ Potential for IP generation –**Null.

d. **Resources Generated -** Upstream Bio Production facility Up to 10L Volume established at HiMedia Laboratories Pvt. Ltd.

Plans to take innovation further

After completion of all technical milestones, the project will be considered for pilot scale studies with fund raising schemes from BIRAC/DBT.

Risks envisaged

Established brands of SFM already being used for mAb production. Industries are reluctant to switch over to another media. Multiple sampling required for performance validation. Development process delays due to this.

Project coordinator:
Vishal G. Warke

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Healthcare-Therapeutics

PACE-CRS

INTERNATIONAL CENTER OF GENETIC ENGINEERING AND BIOTECHNOLOGY

Collaborator Name: Syngene International Limited

Title of the Proposal

A Phase I, clinical trial to assess the safety and immunogenicity of P.falciparum vaccines.

Brief description

Proposed Phase 1 clinical trial will assess the safety and immunogenicity of two P. falciparum vaccines: Monovalent malaria vaccine and Bivalent malaria vaccine. Both vaccines are formulated with Alhydrogel.Monovalent vaccine antigen PfMSPFu24 is a chimera of PfMSP-119 induces invasion inhibitory antibodies and PfMSP-311 induces inhibitory antibodies involved in antibody dependent cellular inhibition, ADCI. Bivalent vaccine consists of a combination of PfMSPFu24 and PfF2 receptor-binding F2 domain of PfEBA175. This combination vaccine would induce antibodies against PfF2 that block EBA175-glycophorinA interaction, against PfMSP-119 that block MSP1 processing to inhibit parasite invasion and against PfMSP-311 that inhibit parasite growth by ADCI.

Current stage of development

Proof-of-Concept

Innovative Element(s)

There is no licensed malaria vaccine. Monovalent and Bivalent falciparum malaria vaccines may provide protection against malaria by targeting parasite growth.

Market Potential

There are no vaccines available for falciparum malaria. An efficacious malaria vaccine has a high market potential both in India and areas such as Africa, South East Asia and South America where P. falciparum malaria is a leading cause of morbidity and mortality primarily in children.

National/Societal Relevance

Malaria in India is present both in urban and rural areas. There is no vaccine available for malaria yet and there are issues with drug resistance and compliance with completion of drug course. An efficacious malaria vaccine will be an effective tool to prevent malaria in India.

Project achievements

a. **Progress vis-a vis objectives-** IND dossier presented at DCGI/CDSCO. CDL-Kasauli has approved the test vaccine for Phase I clinical trial.

b. **Technology/Product (to be) developed –** The vaccines are composed of recombinant antigens. The Drug substances PfMSPFu24 and PfF2 and Drug Products Monvalent and Bivalent formulated with Alhydrogel have been manufactured under cGMP at Zydus, Ahmedabad.

c. **IP generated/ Potential for IP generation –** The vaccine formulations have the potential for IP generation.

d. **Resources Generated –** Relevant technical man power hired for the project.

Plans to take innovation further

After Phase Ia trial and subsequent proof of concept efficacy Phase IIb trial in malaria endemic areas, we will seek partnership with industry for commercial manufacturing and licensing.

Risks envisaged

New vaccine development is expensive and will remain costly until the recovery costs have been paid off.

Project coordinator:
Virander S Chauhan

Team Members:
Chetan Chitnis,
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Anil K, Arpita Mishra
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Healthcare-Therapeutics

SBIRI

IGY IMMUNOLOGIX PVT. LTD.

Collaborator :Vipragen Biosciences Private Limited

Title of the Proposal

Novel Interleukin-1 receptor-associated kinase 4 IRAK4 inhibitor for the treatment / prevention of sepsis shock

Brief description

IRAK4 is key enzymes which control overproduction of cytokine mediators hence reduce chances of septic shock. IRAK4 inhibitors are being developed for the treatment / prevention of sepsis shock

Current stage of development

Validation

Innovative Element(s)

Novel series of chemical entity for IRAK4 enzyme which might be unique molecules for sepsis control as well as other inflammatory diseases.

Market Potential

IRAK4 inhibitors are very much in need for cancer and autoimmune disorder. Hence, high market potential expected.

National/Societal Relevance

A potentially life-threatening complication of an infection, mortality rates for septic shock in Indian hospitals is between 20% and 50%.

Project achievements

a. **Progress vis-a vis objectives-** New chemical entity for IRAK4 inhibitor has been developed and clinical candidate is in the process of development.

b. **Technology/Product (to be) developed –** IRAK4 inhibitors hit compounds

c. **IP generated/ Potential for IP generation -** Nil

d. **Resources Generated -** trained manpower and developed three scientists for chemistry work

Plans to take innovation further

To raise funds for developing IND candidate

Risks envisaged

Nil

Project coordinator:
Lavleen Kumar Gupta

Team Members:
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Mona Gupta,
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Healthcare-Therapeutics

NBM

INDIAN IMMUNOLOGICALS LTD.

Title of the Proposal

Live attenuated Tetravalent Dengue Vaccine Development.

Brief description

Indian Immunologicals Limited has licensed the live attenuated strains from NIH for the development of a live attenuated Tetravalent Dengue Vaccine. IIL has successfully developed a process for the propagation of all the four serotypes in Bioreactor and a stable vaccine formulation. Currently pre-clinical toxicology studies have been completed and manufacture of Phase 1 clinical batches under progress.

Current stage of development

Proof-of-concept

Innovative Element(s)

The currently available vaccine Dengvaxia is not effective in Dengue naive population. Currently available vaccine Dengvaxia requires three administrations while the current proposed vaccine is a single administration which can be more affordable to the people in need.

Market Potential

Dengue fever DF is one of the most common vector-borne infections causing great social and economic burdens globally. Annually, more than 390 million cases are infected, and 4 billion people live in epidemic and endemic regions, particularly in tropical and subtropical countries. Based on the initial estimates considering the licensed territories a conservative estimate of 10 million doses demand is projected considering 10 to 20 of the market share.

National/Societal Relevance

Currently there is no vaccine available in India. Incidences of Dengue are increasing day by day.So there is a need for effective vaccine against Dengue viral infection.

Project achievements

a. **Progress vis-a vis objectives-** The process for the manufacture of Drug Substance and Drug Product has been standardized. Currently, IIL completed the Pre-clinical toxicology studies and the vaccine formulation proven to be safe and stable. Phase I clinical trials will start in 2020.

b. **Technology/Product (to be) developed –** Stable freeze dried live attenuated tetravalent dengue vaccine has been developed.

c. **IP generated/ Potential for IP generation –** IP is owned by NIAID NIH, USA.

d. **Resources Generated –** As a part of the project requirement IIL will be creating additional manpower Manufacturing, QC, Clinical Services, Clinical Immunology and also planning to create new manufacturing facility.

Plans to take innovation further

IIL are planning to further improvise final vaccine presentation in terms of delivery and thermo-stabilization.

Risks envisaged

None.

Project coordinator:
Rajendra Lingala

Team Members:
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Healthcare-Therapeutics

SBIRI

INTEGRAL BIOSCIENCES PVT. LTD.

Title of the Proposal

To generate a pre-clinical proof-of-concept of a novel small molecule multi kinase inhibitor IBS-018 in a xenograft model of pancreatic cancer.

Brief description

Company has discovered a novel multikinase inhibitor IBS-018, originated from a structure based design of dual acting ALK5, P38a inhibitor. This orally bioavailable inhibitor inhibits many FDA approved kinases. Company is profiling this compound further in an in-vivo experiment to generate a pre-clinical proof-of-concept in a xenograft model of pancreatic cancer.

Current stage of development

Discovery

Innovative Element(s)

The treated tumours recur as resistance to these targeted therapies develops. One of the potential ways of overcoming this is via targeting multiple kinases responsible for cancer like multikinase inhibitor IBS-018.

Market Potential

The global pancreatic cancer therapy market is expected to reach US$ 4,056.4 Mn in 2025. The market is estimated to grow with a CAGR of 8.1% from 2018-2025. It is the 13th most common cancer, the eighth most frequent cause of death from cancer.

National/Societal Relevance

The incidence of pancreatic cancer in India is 0.5 -2.4 per 100,000 men and 0.2-1.8 per 100,000 women. Survival rates of pancreatic cancer are among the worst for any tumour, being the mortality to incidence ratio of 98%.

Project achievements

a. **Progress vis-a vis objectives-** It has been shown that the molecule has achieved good cell potency MiaPaCa-2/PanC-1 and has shown synergy with gemcitabine and paclitaxel. Good oral exposure up to 90 mg/kg QD in mice has been shown. Maximum tolerated dose MTD studies are in progress.

b. **Technology/Product (to be) developed –** A novel small molecule multi kinase inhibitor IBS-018 in a xenograft model of pancreatic cancer.

c. **IP generated/ Potential for IP generation -** Indian patent published on 19th July 2019 201711025533, US filing is pending.

d. **Resources Generated –**Man power employed.

Plans to take innovation further

Engaged an Indian consultant firm for the potential out-licensing activities.

Risks envisaged

Potential approval of other targeted therapies for pancreatic cancer.

Project coordinator:
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Healthcare-Therapeutics

PACE-CRS

JAMIA HAMDARD, NEW DELHI

Collaborator Name: Vimta Labs Limited, Hyderabad, India, National Institute of Pathology, New Delhi, India

Title of the Proposal

Preclinical evaluation of Centrin knockout live attenuated Leishmania clinical grade parasite vaccine against visceral leishmaniasis

Brief description

No vaccine is available for leishmaniasis. Dr. Selva and their co-worker's effort through Indo-US Vaccine Action Program yielded, a Leishmania donovani strain that is devoid of a growth regulating gene called "centrin". This parasite did not survive either in mice, hamsters or dogs beyond five weeks and protected these animals from virulent challenge. Through this project with BIRAC fund they study the preclinical safety, toxicity and immune responses of the cGLP grade in animal models and in human cells ex vivo to ensure the consistency of the results with the laboratory grade as a prerequisite to test in human clinical trials subsequently.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Gene deleted live attenuated Leishmania parasite did not survive either in mice, hamsters or dogs beyond five weeks and protected these animals from virulent challenge. This is the first of a live attenuated vaccine candidates to be tested clinically after toxicity validation.

Market Potential

The total market size in South East Asia is about 300million with 100million in India alone. The market size would be much larger if extended to other countries where VL is endemic.

National/Societal Relevance

The programs to eliminate VL running in India since 2005 with an aim to reduce the incidence of VL to 1 per 10,000 people, have not met their goals due to the lack of effective vaccines. With VL a disease of poverty, over 350 million people worldwide at are at risk of developing leishmaniasis. Development of a new prophylactic vaccine will have a major positive impact on global health.

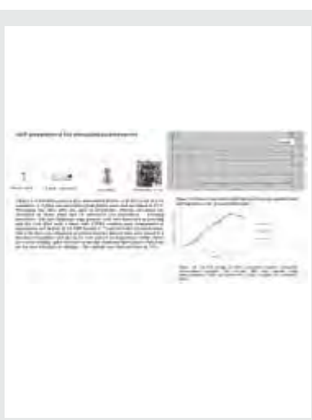
Project achievements

a. **Progress vis-a vis objectives-** preclinical toxicity test is ongoing.

b. **Technology/Product (to be) developed –** After the ongoing preclinical toxicity test, the product will enter in the clinical trials of 3 years, followed by in market.

c. **IP generated/ Potential for IP generation –** There are prevailing IPs on which the project is now in progress.

d. **Resources Generated –** Man power generated -3



Plans to take innovation further

Clinical trial, fund raising.

Risks envisaged

None.

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Healthcare-Therapeutics

PACE-AIR

JAMIA HAMDARD, NEW DELHI

Title of the Proposal

Development of IT Tool for Identity of Crude Powdered Botanicals through Analytical Microscopy

Brief description

A computer based approach based on the general and specific features of selected plants approx. 750 will be developed to provide the fingerprint of the respective crude drug parts in a short time.Computer based technology will help to search the correct identity of the plant species or adulterant or substitute in the powdered form, a key to develop quality herbal formulations.

Current stage of development

Proof-of-Concept

Innovative Element(s) A computer based technology based on database with microscopic features, segregated as per specific part of the drug to provide correct botanical identity within seconds along with documentation and zero chances of error. Currently, no database is available, done manually by non pharmacognosists, which is tedious, without proper documentation, leaving doubts about quality control of herbal drugs.

Market Potential

Herbal Industry, globally emphasizes for powder microscopy as it is effortless, minimum equipment and expertise is required. This software will facilitate to do the same. No such software is available in India or abroad. The industrial usage of plants and their parts has gone- up, the technology confirming their botanical identity is still questionable.

National/Societal Relevance

Most of the crude herbal drugs supplied in industry are in powdered form, making it vulnerable to adulteration. The software databse will help develop quality herbal products ensuring their safety and efficacy and will also assist required compliance for authentication of drugs.

Project achievements

a. **Progress vis-a vis objectives-** Selection, collection, authentication and morphological study of selected crude drugs/adulterants/substitutes approximately 750 are in progress

b. **Technology/Product (to be) developed –** Computer based technology will help to search the correct identity of the plant species or adulterant or substitute in the powdered form. The technology will enter the market in 18 months.

c. **IP generated/ Potential for IP generation -** IPR experts will be consulted on possibility of protecting the IT tool, database and the very idea of the tool.

d. **Resources Generated -** The project has just initiated.

Plans to take innovation further

Based on database, the lab may apply for licensed test house under Drugs and Cosmetic Act, 1940 and issue test report.

Risks envisaged

Inadequate focus by certain sections of the industry not to invest in quality assurance of raw herbs may not use the database.

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JUBELN LIFESCIENCES

Title of the Proposal

Novel Drug eluting Bio film platform for Oral and Topical delivery with extensive applications for the Nutraceutical, Pharmaceutical, Cosmetics & Personal Care industries.

Brief description

The applicant has developed oral/topical multi-purpose drug eluting biofilms platform. Bio film platform has the following advantages: Exhibit properties including and not limited to higher drug loading, fast dissolving, mucoadhesion, skin adhesion, taste masking, delayed release, etc.

Current stage of development: Commercialized

Innovative Element(s)

The current marketed films are made through solvent casting method. Bio film platform has following advantages- Continuous manufacturing process. More Stable, Flexible thin films & less toxicity through Non aqueous /non solvent based. Better skin adhesion, taste masking, delayed release, etc. Less energy intensive, single step, industrially scalable, less foot print.

Market Potential

The total thin films market is approx. $ 2 billion.

National/Societal Relevance

Biofilm platform being the most advanced form of delivery technology, it is very suitable for paediatric, geriatric patient's uncooperative, nauseated patients, bedridden patients and patients suffering from dysphagia in all age groups.

Project achievements

a. **Progress vis-a vis objectives-** The technology has been already commercialized.

b. **Technology/Product (to be) developed –** The platform has been fully developed. The technology has been already commercialized for food supplements and cosmetic products as oral thin films and cosmetic films.

c. **IP generated/ Potential for IP generation -** Oral Dispersible Film Composition Indian Patent Application number: 201741000424 - Granted. Formulation and development of topical or transdermal film provisional Indian patent application: PD025586IN-SC Complete patent filed.

d. **Resources Generated -** Manpower - 15, Pilot scale facility with required regulatory approvals has been established.

Plans to take innovation further

Three angel investments have been received. The products are launched in collaboration with marketing partners.

Risks envisaged

Company is selling products under own brands. This requires investment in marketing and branding.

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KAS INSTITUTE OF RESEARCH PVT. LTD.

Title of the Proposal

Development of QPCR product components for detection of DNA impurity in biologics drug production and for clinical diagnostics application.

Brief description

The applicant has developed QPCR product components for detection of DNA impurity in biologics drug production and for clinical diagnostics application. This product has longer stability, economical, simpler and rapid method for biopharmaceutical and clinical applications.

Current stage of development

Validation.

Innovative Element(s)

Unique primers and probes for the targets, Novel probe labelling dyes /Flurophores and conjugation chemistry, Novel Formulation of Proprietary sensitive DNA extraction reagent components, PCR enhance reagent that enhances signal and makes the quantification sensitive, Improved and longer shelf life stability at Room temperature.

Market Potential

Target Customers are national and international Biopharma industries, Clinical diagnostics, forensic laboratories, gene therapy developers and Academic laboratories.

National/Societal Relevance

This product will cut down the huge logistic cost, duties and taxes paid in foreign currencies along with product cost, which is being paid to import the similar product.

Project achievements

a. **Progress vis-a vis objectives-** All milestones are successfully achieved and the product will be commercialized in few months.

b. **Technology/Product (to be) developed –** Proposed Product is developed and under validation.

c. **IP generated/ Potential for IP generation –** One new IP will be generated.

d. **Resources Generated –** Four candidates are being hired.

Plans to take innovation further

Raising funds to set up a dedicated facility to manufacture the product in large scale to cater the needs of market demand for various application is under progress.

Risks envisaged

Scaling up single batch material to suffice market requirement.

Project coordinator:
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Healthcare-Therapeutics

BIG

LUXMATRAINNOVATIONS PVT. LTD.

Title of the Proposal

Nano-BiomineralTheranostic Agent for Image Guided RF Hyperthermia of Liver Tumor

Brief description

Focused on a novel nano-biomaterial to enhance the scope of clinical RF ablation therapy combined with immuno-activation to treat liver tumors of size more than 5cm such that larger population of patients can be benefited from this otherwise low-cost and effective treatment. Currently, we have developed proof-of-concept data in vivo indicating the potential of doped calcium phosphate nanoparticle to enhance clinical RFA efficacy while the same nanoparticles can activate liver macrophages to pose a secondary immune response against tumor.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Biodegradable and biocompatible nanoparticles for augmented RF ablation therapy combined with the activation of innate immune response. Further, our nanoparticles can be imaged using CT or MRI and injected directly to the tumor, thereby avoiding systemic exposure.

Market Potential

RF Hyperthermia current clinical market is USD 6 Billion. Cancer-immunotherapy is estimated to be at USD 100Billion by 2020. Even if cover 10 of the cancer immuno market with our augmented RF hyperthermia nanotechnology, an expected market size is of 10-20 billion by the time we hit the clinical phases by 2021.

National/Societal Relevance

RFA has emerged as the most effective procedure for treating 1-5cm tumors due to better therapeutic efficiency, low-cost, patient compliance and safety.

Project achievements

a. **Progress vis-a vis objectives-**Developed the nano-RF-immunotherapy technology and demonstrated proof of concept using in vivo tumor models

b. **Technology/Product (to be) developed -** RF-Immunotherapeutic nanomaterial for Liver tumor therapy. Expected time to reach first in human testing 2022.

c. **IP generated/ Potential for IP generation -**Radiowave responsive nanoparticles for cancer imaging and therapy Manzoor Koyakutty, Anusha Ashokan, Vijay Harish and, Shanti Nair, Application submitted to Indian patent office. CHE/6495/2015. PCT filing done Dec 2016.

d. **Resources Generated -** Total 04 scientific staff, one business manager and one finance manager , Secured secone layer of funds from angels.

Plans to take innovation further:

The proof of concept was tested using BIG grant. Further they are planning to do Regulatory Toxicity GLP animal data and scale-up with the already received funds from private investors.

Risks envisaged

As the product is an anti-cancer therapeutics, risk lies in translation.

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Healthcare-Therapeutics

NBM

MYNVAX PVT. LTD.

Title of the Proposal

Development of a novel recombinant, low cost, rapidly producible influenza vaccine

Brief description

Current vaccines for human influenza viruses are primarily made in hens egg. The production of these vaccines are drawn out further egg adapted mutations often time make the vaccine ineffective due to mis-match between the circulating and vaccine strains. Additionally, the vaccine has to be updated annually. The current production technology also limits the ability to respond to a pandemic outbreak due to a large reliance on egg based production. Mynvax has licensed intellectual property from IISc and is further developing this novel, recombinant influenza vaccine that can be rapidly produced and are broadly protective with longer lasting immunity.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Recombinant protein based vaccine that does not require a virus production in eggs. The vaccines candidates include immunogens that are broadly protective to antigenic drifts and shifts.

Market Potential

The Global Influenza Vaccine market is estimated to be about USD 6 Billion. In India the market penetration is about 1 Million doses sold with a market value of about Rs.200 Crores.

National/Societal Relevance

Respiratory infections are highly contagious. The vaccine will protect the high risk groups. Therefore this will greatly contribute to improved public health. The most important contribution will be a high level of preparedness for any pandemic outbreak.

Project achievements

a. **Progress vis-a vis objectives-** Currently the vaccine candidates are under development and are being tested in mice and guinea pig models.

b. **Technology/Product (to be) developed –** Design and Development of recombinant influenza vaccines. Low-cost and scalable recombinant, microbially expression technology.

c. **IP generated/ Potential for IP generation –** The design of the immunogens, process employed for immunogen design will be protected under relevant IP laws globally.

d. **Resources Generated –** Mynvax has a dedicated laboratory and has a team of 10 dedicated scientists working.

Plans to take innovation further

Mynvax will be raising additional funding in due course to advance its products to Clinic.

Risks envisaged

Mynvax envisages that a lesser than expected immunogenicity in a Phase 1/2 clinical study might require additional development of immunogen candidates.

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NATIONAL CENTRE FOR ANTARCTIC AND OCEAN RESEARCH

Collaborator Name: Foundation for Neglected Disease Research & Anthem Biosciences Private Limited

Title of the Proposal

Development of PM181108 as an anti-tubercular agent

Brief description

PM181108A is a novel, first in class, anti-tubercular peptide antibiotic. It is a natural product derived from Streptomyces species from Antarctica. It is a protein synthesis inhibitor with a novel mechanism of action. It has highly bactericidal with excellent in vitro and in vivo activity in tuberculosis infection models, including promising results against MDR-TB clinical isolates. PM81108A works in combination with first and second line TB drugs suggesting its fitment for developing novel combinations. The compound has been scaled up to gram scale. It is being developed in partnership with Foundation for Neglected Disease Research and Anthem Biosciences Pvt Ltd.

Current stage of development

Discovery

Innovative Element(s)

PM181108A kills TB through a novel mechanism of action by inhibiting ribosome associated GTPase activity blocking protein translation.

Market Potential

Tuberculosis is a deadly disease with more than 2.6 million cases in India alone out of which 130,000 have MDR/XDR-TB. Global TB incidence is around 10 million cases. New medications with novel mechanisms of action will be required as anti-microbial resistance grows and more patients get MDR/XDR-TB.

National/Societal Relevance

India represents an estimated 25 of the global tuberculosis burden India has approximately 130,000 cases of MDR/XDR TB with treatment success rate of 48 MDR-TB, 30 XDR-TB. TB causes immense pain and suffering to patients in India and new treatments are required to reduce treatment times.

Project achievements

a. **Progress vis-a vis objectives-** The compound has been scaled up to gram scale.

b. **Technology/Product (to be) developed–** PM181108A is expected to complete GLP toxicology in 2020 and be ready for IND filing and eventually Phase 1 in healthy human volunteers in 2021.

c. **IP generated/ Potential for IP generation -** PM181108A has been patented both as an isolated entity in India and several other leading geographies including the US, EU and Japan. IP is jointly held by NCPOR and FNDR.

d. **Resources Generated-**The project partners have utilized and trained manpower to be able to carry out the project.

Plans to take innovation further

FNDR and NCPOR are looking for funding partners to perform Phase 1 safety and Phase 2 clinical trials of PM181108A.

Risks envisaged

There is a long road for PM181108A from pre-clinical development to market and multiple traditional risks which are associated with drug discovery are present

Project coordinator:
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NITIN YADAV

Title of the Proposal

Development of Conformationally Restricted Cationic Peptides as Antimicrobial Agents against Multidrug Resistant Bacteria

Brief description

Antimicrobial peptides AMPs are an important class of antimicrobial agents having very low propensity of developing resistance compared to commonly used antibiotics due to their distinct mechanism of action. However, AMPs in general have short half-life due to their susceptibility to enzymatic degradation. Medium length cationic helical peptides form an important class of AMPs that can form the basis for designing highly potent and stable peptide-based antibiotics.

Current stage of development

Proof-of-Concept

Innovative Element(s)

VS2 like peptide, a conformationally restricted short cationic peptide with inherent longer half-life will represent a novel class of compounds which will be very exciting to develop for therapeutic purposes. Easy to synthesise, characterize, with high biocompatibility.

Market Potential

If VS2 or any similar molecule show reasonable activity in animal model experiments, these will be quickly taken up for further development with appropriate industry for commercialization.

National/Societal Relevance

Development of new antibiotics, the infectious diseases have become a major health problem and now the second leading cause of death worldwide, mainly because of developing widespread drug resistant bacterial, fungal and viral strains.

Project achievements

a. **Progress vis-a vis objectives-** In the new series of peptides, based on VS2 template, they propose to introduce amino acid residues with high propensity of occurrence in natural antimicrobial peptides choosing them from antimicrobial peptide database

b. **Technology/Product (to be) developed –** Development of highly stable and active designed peptide-based antimicrobial agents

c. **IP generated/ Potential for IP generation -** The process of filling a pre-patent application is underway.

d. **Resources Generated -** One JRF and one project manager are working on this project while the scientific advisors have an equal contribution in this project.

Plans to take innovation further

Taking the leads with industrial partners for their further development

Risks envisaged

Risk is involved if peptide VS2 and/or its analogues yet to be designed and synthesized do not show the same potency of antimicrobial activity in animals.

Project coordinator:
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Team Members:
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Healthcare-Therapeutics

PACE-AIR

NMAM INSTITUTE OF TECHNOLOGY

Title of the Proposal

To develop adjunct anti-venom therapy for snake venom from the pharmaceuticals obtained from Coixlacrymajobi root extract

Brief description

Polyvalent/monovalent antivenom is the only therapeutic agent available throughout the world. Herbal treatment for snake bite is considered as an effective therapy alone or in combination with conventional antivenoms. Hence they aim to validate the antivenom property of Coixlachrymajobi root extract on venoms of Najanaja and Daboia russelli.

Current stage of development

Validation

Innovative Element(s)

Herbal treatment using antivenom property of Coixlachrymajobi root extract and the pharmaceuticals extracted from the root extract on venoms of Najanaja and Daboia russelli.

Market Potential

Globally, snakebite represents a highly relevant public health issue. Most of the snake bite cases occur in rural areas, and far away from the reach of medical help. The incidences of serious bites are significantly higher in the tropics than industrialized nations of West. Among the various states in India, Maharashtra records highest number of snake bites and deaths Pillay, 2008. Hence market potential is very good

National/Societal Relevance

An estimated 330 snake species exists in India, of which 70 species are venomous Pillay, 2008. The snakes commonly associated with human mortality in India are cobra Najanaja , krait Bungaruscaeruleus , Russellâ€™s viper Daboiarusselli and saw scaled viper. Many others like green pit viper, large spotted viper, horse-shoe viper etc. are less commonly encountered.

Project achievements

a. **Progress vis-a vis objectives-** Extract preparation is over.

b. **Technology/Product (to be) developed –** Ethanolic extract as an antidote to snake venoms made available though the Ayurvedic outlets.

c. **IP generated/Potential for IP generation -** E-45/5530/2018/CHE, E-45/5529/2018/CHE.

d. **Resources Generated -** A lyophilizer has been purchased, which can be used for producing lyophilized root extract product.

Plans to take innovation further

In contact with Ayurveda drug industry and appropriate licensing for the product sale in the market.

Risks envisaged

Delay is getting appropriate approvals from authorities.

Project coordinator:
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Healthcare-Therapeutics

BIG

ONCOSIMIS BIOTECH PVT. LTD.

Title of the Proposal

Establishment of AcceT technology for higher yield production of biologic drugs in CHO cells

Brief description

AcceTT®: The technology facilitates rapid and high yield production of biologics couple with robust cell growth. AcceTT® is a fully integrated technology platform that comprise of vectors, media toolbox and cell line to establish ultra-high producing cells in short period of time.

Current stage of development

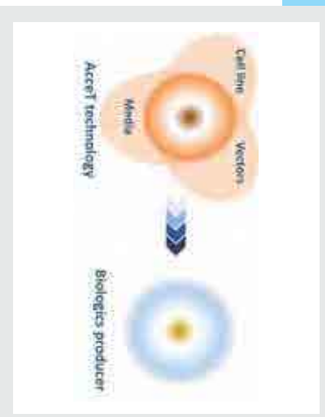
Validation

Innovative Element(s)

The complete approach involves cloning and over-expression of the transactivator system for different protein classes since some proteins will be difficult to express and others may not translate as well. The proprietary plasmid, couples readily with the transactivator system and facilitates the transient expression of the protein in any selectable CHO cells.

Market Potential

AcceTTÂ® is on the verge of commercialization, currently in confidential and advanced talks with several manufacturing clients in India and abroad.



National/Societal Relevance

In the context of an emergent economy country including India, with an ever-increasing need for targeted therapy for various cancers, the demand for next-generation drugs at an affordable cost in the health industry remains high indicating a need for developing and testing novel technologies such as the one proposed for their production by the novel process of fermentation that can be adapted by the biopharma industry throughout the world.

Project achievements:

a. **Progress vis-a vis objectives-** Completed all objectives

b. **Technology/Product (to be) developed –** The innovative platform has been developed

c. **IP generated/ Potential for IP generation -** Filed a patent.

d. **Resources Generated -** 10 employees, Two Tech platforms beyond POC, 6 Patents filed and 2 under process, EOIs with several major industry and academia players

Plans to take innovation further

Looking for potential partners and strategic investors.

Risks envisaged

Radical disruption by some currently unknown stealth technologies “Research and Development” is an extremely esoteric and equally discreet specialty. The best way to mitigate this risk is to accelerate go-to-market deadlines.

Project coordinator:
Sridhar Rao and
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ONIOSOME HEALTHCARE PVT. LTD.

Title of the Proposal

Development and validation of Nanofibrous Ocular Patch

Brief description

The present project has been undertaken for the development of nano-patch (a simple, inexpensive topical nanofibrous ocular patch) approach to provide an improved dosage form for ophthalmic drugs as a new ocular dosage form. Ocular nano patch is easy to use and provides controlled drug delivery over a prolonged period of time. The aim is further extended to process validation to generate a reproducible manufacturing process for the production of clinical-grade ophthalmic formulations.

Current stage of development

Validation

Innovative Element(s)

Feasibility of nanofiber for the delivery of drugs to the anterior and posterior segments of the eye have been explored for the first time. Further, the invention provides a continuous scalable process and to produce preservative-free unit dosage and sterilized ophthalmic products with controlled drug release behavior.

Market Potential

Present inventions, being a solid unit ophthalmic product significantly improve product life and thus serve a real value addition for product commercialization. Further, simple easy fabrication process under the aseptic environment with minimum unit operation steps significantly reduces the product cost.

National/Societal Relevance

The proposed invention is used for the first time ever to deliver drugs to the eye. Therefore, in addition to economic efficiencies, it has the initiative in the context of the national development strategy. The outputs of this research program will seek to enhance sustainable development in urban and rural regions aiming to provide sustainable solutions for challenges faced in our current and future society.

Project achievements

a. **Progress vis-a vis objectives-** Development, optimization, validation has completed and preclinical studies is undergoing.
b. **Technology/Product (to be) developed –** A simple, inexpensive topical nanofibrous ocular patch is under development.
c. **IP generated/ Potential for IP generation -** Proposed product has a greater potential of IPR is undergoing.
d. **Resources Generated –** Data Not available.

Plans to take innovation further

Data Not available.

Risks envisaged

No risk was identified.

Project coordinator:
Sarvesh Malviya

Team Members:
Sandeep Jain

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ONIOSOME HEALTHCARE PVT. LTD.

Title of the Proposal

Pre-clinical studies of Bleomycin Sulphate bearing nano-structured lipid particles for targeting Brain Cancer.

Brief description

Currently, available chemotherapy regimen and surgery for brain cancer is highly expensive and uncomfortable to patient owing to side-effects. Therefore, Oniosome have developed nanoformulation for crossing the blood-brain barrier. In vitro data indicating the superior sustained release pattern from their nano-particles in comparison to immediate release market preparation.

Current stage of development

Validation

Innovative Element(s)

USFDA has approved several chemotherapeutic drugs for the treatment of brain cancer. In this framework, bleomycin sulphate is recommended by the physician for the treatment of brain cancer. However, owing to hydrophilic nature bleomycin sulphate does not cross blood brain carrier. Therefore we have formulated Nano-structured particles of bleomycin sulphate.

Market Potential

USFDA approved bleomycin sulphate for the treatment of brain cancer. Oniosome formulation has high market potential because it will enhance revenue as well as patient compliance by increasing the treated patients, enhance the survival time of a patient with reduced side effects as compared to market preparation.

National/Societal Relevance

Oncology is expected to emerge as one of the largest therapeutic segments in the domestic market in five years. Oncology drugs segment was of approximately $80 billion around Rs. 4.9 trillion in 2012. It was expected to be about $110 bn in five years. In India, the anti-cancer drug market touched about Rs. 2,000 crore in fiscal 2013 and is forecast to grow to Rs. 3,831 crore by fiscal 2017 Frost and Sullivan report. With an increase in emphasis on health coverage both by central and state governments, spending on coverage of medicines for oncology will see substantial rise.

Project achievements

a. **Progress vis-a vis objectives-** Development and validation of product has completed and preclinical study is undergoing.
b. **Technology/Product (to be) developed –** The preclinical study is undergoing.
c. **IP generated/ Potential for IP generation –** Developed product has great potential for IPR.
d. **Resources Generated –** NA.

Plans to take innovation further

NA.

Risks envisaged

None.

Project coordinator:
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Team Members:
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Healthcare-Therapeutics

BIG

PLABELTECH PVT. LTD.

Title of the Proposal

Protein Labelling Technologies.

Brief description

The Technology Enables: Precision engineering of proteins, precise single-site labelling of proteins, homogeneous antibody-drug conjugates, allows choice of probes and drugs for conjugation, ordered single-site immobilization of proteins, Sensitivity boosters for mass spectrometry

Current stage of development

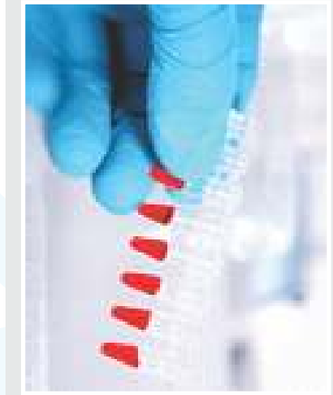
Validation

Innovative Element(s)

The precision engineering of proteins is based on patented technological platforms that enable modular and precise single-site protein engineering.

Market Potential

Low-risk, low-rewards segments: Biophysical tools, biochemical tools, Immobilized enzymes; Low-risk, high-reward segments: protein-based therapeutics, homogeneous antibody-drug conjugates for directed cancer chemotherapeutics, synthesis of conjugate vaccines; High-risk, high-reward segments: Covalent inhibitors for precision therapeutics



National/Societal Relevance

The patented protein labelling technologies make it possible to have precision engineering of proteins in the fields of Life Sciences, Chemistry, Chemical Biology, and Material Science. The huge market size of these non-selective technologies also indicates how the developed technologies could disrupt the whole segment globally.

Project achievements

a. **Progress vis-a vis objectives-** All proposed milestones have been successfully achieved.

b. **Technology/Product (to be) developed –** Four biotech products are already available through Plabeltech.B2B services are available.

c. **IP generated/ Potential for IP generation -** The IP is protected by five patents.

d. **Resources Generated -** The workforce employed: 1 permanent , 3 temporary; A furnished laboratory created. Enterprise created: Plabeltech Pvt. Ltd. was established in March 2018.

Plans to take innovation further

Partners with a global presence are invited for discussion.

Risks envisaged

Partners for global sales and marketing. Raising funds.

Project coordinator:
Vishal Rai

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Healthcare-Therapeutics

BIPP

PNB VESPER LIFE SCIENCE PVT. LTD.

Title of the Proposal

Clinical development of Novel CCK receptor antagonists for the treatment of inflammatory pain

Brief description

PNB-001 is the lead molecule under Cholecystokinin CCK program. PNB-001demonstrated, in both in vitro and in vivo preclinical pharmacology models, excellent CCK inhibitory and anti-nociceptive activities to treat variety of pain resulting from neuropathy, inflammation, surgery, and others. It has very good bioavailability and has completed SAD clinical trial and waiting for the approval for the conduct of MAD study. No adverse effect was reported in the SAD study.

Current stage of development

Discovery

Innovative Element(s)

PNB-001 can be easily manufactured with few steps of manufacturing process, hence the requirement of chemicals is minimum.

Market Potential

Global pain relieving drug market analysis 2010-2025, report publication date April 2010. Of this, inflammatory pain market alone is close to $15 billion.

National/Societal Relevance

According to a recent report, pain is a significant public health problem that costs society at least $560-$635 billion annually. Pain is currently treated with opiods, which are considered as a major reason for several deaths

Project achievements

a. **Progress vis-a vis objectives-** SAD clinical trial completed no adverse effect was reported. Waiting for the approval communication for the MAD clinical trial from DCGI

b. **Technology/Product (to be) developed –** Manufacturing and formulation technologies have already been developed.

c. **IP generated/ Potential for IP generation -** Indian applications 1.1 CCK Ligands: Application No. 1994/CHE/2011 dated 13 Jun 2011. This application has been published. 2. PCT applications: 2.1 CCK Ligands: Application No. PCT/IN2012/000469 dated. 2 Jul 2012

d. **Resources Generated -** PNB-Vesper is planning to recruit 2 personnel each for administration and marketing, and 4 scientists in January/February 2010.

Plans to take innovation further

Discussion is in advanced stage for collaborating research with a leading hospital in Mumbai and other one in Kochi

Risks envisaged

risk associated with developing a pharmaceutical cannot be overlooked..

Project coordinator:
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Porthrip Lattmann

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Healthcare-Therapeutics

BIG

RAMAN PARKESH

Title of the Proposal

Venoms derived drugs for multi drug resistant-tuberculosis

Brief description

The idea is to explore venoms to derive potent leads for MDR-TB. They have characterized active venom fractions using mass spectrometry and computational tools, and using that knowledge and have generated stapled and constrained peptides which also show anti-tuberculosis activity.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Venoms consist of peptides, alkaloids and organic molecules, which are evolutionary optimized and naturally have favourable pharmacokinetics. Most of biological processes including innate immunity are linked with peptides. Peptides kill bacteria via membrane disruption and activating host innate immune system. Thus, acquiring resistance against peptides is very difficult for Mtb

Market Potential

The total market size of anti-TB drugs was estimated at $ 1,046 million in 2017 and is expected to reach $ 1,432 million in 2024 (globenewswire.com). The serviceable market in India is worth $ 480 million.

National/Societal Relevance

According to India Spend report 2019, India has highest share i.e. 27 percent of the world TB. Also, India highest occurrence of drug-resistant TB cases i.e. 24 percent. In 2017, 124,200 cases were reported to be multi-drug resistant TB in India. The rising burden of TB and MDR-TB in India demand new and potent drugs for TB which possess drug like properties naturally.

Project achievements

a. **Progress vis-a vis objectives-** Procurement of crude venoms and venom fractionation, and determination of bioactivity of venom fractions are completed. Purification and characterization of all biologically active hits is Ongoing

b. **Technology/Product (to be) developed –** Efficacious and safe lead molecule against TB. They have identified few venom fractions active against TB. It will take approximately 3-4 years to enter market

c. **IP generated/ Potential for IP generation -** Since the proposed idea is original and patentable, the successful lead molecules will lead to commercialization. They plan to file patent, once the characterization of identified fractions is completed

d. **Resources Generated -** Man power generated - 3

Plans to take innovation further

In process to establish collaborations with Insecticides India Ltd. and Smartox biotech.

Risks envisaged

The major challenge that they envisage is to raise fund for clinical trials and time-consuming process of clinical trials

Project coordinator:
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Healthcare-Therapeutics

BIPP

RASAYANI BIOLOGICS PVT. LTD.

Title of the Proposal

Evaluation of NTPX-07 for the potential treatment of Cancers

Brief description:

Bioplatin is a First, indigenously developed, oral platinum based anti-cancer compound with potential use in therapy for prevention of metastasis and secondary tumors. The compound is currently undergoing Phase I clinical study at leading oncology centers in India and is expected to be completed by February 2020. The results till date indicate excellent safety profile and extended therapeutic benefits including overall survival OS and Quality of Life The company is currently exploring opportunities for strategic partnerships with companies having global reach for the above product as a Phase II Licensing opportunity: Novel oral platinum complex for prevention of metastasis

Current stage of development

Validation

Innovative Element(s)

NTPX-07 is prepared with an innovative technology and the product has been patented in USA, EU and India. Uniqueness stems from the fact that NTPX-07 can be orally administered, has favorable toxicity profile and has selective action against cancerous cells without affecting normal cells which is not found in the current platinum analogues.

Market Potential

There is a good market potential for platinum based chemotherapeutic agents. Platinum analogues are used in the management of all types of cancer as first line treatment in combination chemotherapy.

National/Societal Relevance

Oral Platinum analogues are important as they can be administered in OPD. This has immense importance as this reduces hospitalization, nursing and other allied costs that are equivalent to almost 70 of the treatment costs. Hence an approved oral Platinum intervention is eagerly awaited by Oncologists. Impact of NTPX-07 in Metronomic setting will reduce direct and indirect cost of treatment making it affordable.

Project achievements

a. **Progress vis-a vis objectives-**To Determine the MTD and DLT in patients with advanced solid tumorsand investigate the safety profile of NTPX-07 Completed Cohort I, II and III. Cohort IV in final stage.

b. **Technology/Product (to be) developed-**The MTD by the oral route DLT , Recommended dose to be used in Phase II studies, Pharmacokinetics, Safety profile,

c. **IP generated/ Potential for IP generation-** None.

d. **Resources Generated-** Not applicable.

Plans to take innovation further

Exploring opportunities for strategic partnerships with companies having global reach for the above product. Phase II Licensing opportunity: Novel oral platinum complex for prevention of metastasis.

Risks envisaged

Risk is involved in getting Regulatory approvals on time which plays a major role in drug development

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Healthcare-Therapeutics

BIPP

REGROW BIOSCIENCES PVT. LTD.

Title of the Proposal

A Prospective, Open-label, Multicentric Study to Assess the Safety and Efficacy of Autologous Adult Live Cultured Buccal Epithelial Cells UregrowTM in Subjects with Urethral Stricture

Brief description

To overcome the problem of Urethral Stricture, a cell based product, Uregrow Autologous Adult Live Cultured Buccal Epithelial Cells with advantages like minimally invasive, less post-surgical complications, allows reconstruction of larger urethral strictures up to 04 cm, less post-surgery erectile dysfunction and surgery procedure with 30 minutes as compared to other available treatment procedures.

Current stage of development

Validation

Innovative Element(s)

Recurrence of urethral stricture after urethroplasty is very high. New Innovative developed product UregrowTM for treating urethral stricture benefits less painful, local implantation with minimum invasion and faster recovery

Market Potential

In 2019, urethral stricture market in India was expected to be 73.9 USD which can be expected to 109.3 USD by the year 2024 at a CAGR rate of 8.16% as per global market report.

National/Societal Relevance

No similar product or technology in the world till date. To offer this treatment to patients with unmet medical need and improve the standard of care for this disease.

Project achievements:

a. **Progress vis-a vis objectives-** Successfully completed the clinical trial as per objectives

b. **Technology/Product (to be) developed –** Permanent curative, easy method, minimally invasive procedure and, implantation can be done easily via cystoscopy.

c. **IP generated/ Potential for IP generation -** Completed national phase filing of the proposed product with patent Application number 201621038900

d. **Resources Generated -** More than 20 people trained in cell culture and analysis of cells and conducted Phase IIb clinical trial

Plans to take innovation further

In India, take to market and commercialize, for China- working on technology transfer, USA & EU- Registration of the biological product by early next year in 2020.

Risks envisaged

Regulatory issues.

Project coordinator:
Satyen Sanghavi

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Healthcare-Therapeutics

BIG

RETHI MADATHIL

Title of the Proposal

Bio-inspired Small Molecule Mimetics of Host Defense Peptide to Treat Acute Bacterial Skin and Skin Structure Infections ABSSSI

Brief description

They are developing high impact drug for acute Bacterial Skin and Skin Structure Infections called ABSSSI. It is a deleterious polymicrobial infection of surgical, burn, bite and accidental wounds. ABSSSI has four layers of complexity with infections from gram negative, gram positive, drug resistant and biofilm bacteria. Currently FDA approved treatment for ABSSSI in India only treat gram positive & MRSA.

Current stage of development

Proof-of-concept.

Innovative Element(s)

Their small molecules will be active against ABSSSI relevant gram negative & positive, drug resistant and biofilm bacteria to become a powerful drug for ABSSSI. Current treatment available in India ceftriaxone, daptomycin, linezolid and vancomycin only treat gram positive and MRSA. Baxdella is highly expensive & not available in India

Market Potential

The global market size for ABSSSI is ~15 billion. Current ABSSSI antibiotics & pipelines are variance of existing antibiotics. Hence develop resistance with time. In India wound infection are deadly & prevalent. Therefore, a cheap, multi-active drug for ABSSSI will positively impact the economic & social well-being.

National/Societal Relevance

In India wound infection are deadly & prevalent. Therefore, a cheap, multi-active drug for ABSSSI will positively impact the economic & social well-being.

Project achievements

a. **Progress vis-a vis objectives-** They are working on chemically modifying the natural compounds using simple synthetic protocols to obtain seven HDP mimetic lead molecules and later will check antibacterial activity.

b. **Technology/Product (to be) developed –** proof of concept for small molecules leads for an innovative drug to treat ABSSSI and MDR-ABSSSI.

c. **IP generated/ Potential for IP generation -** The product is distinct small molecules with totally new structures that can be patented as original ABSSSI antibiotic

d. **Resources Generated –**They are currently recruiting people. They are in the process of incorporating biotech start-up with facilities such as medicinal chemistry, drug discovery and antibiotic discovery.

Plans to take innovation further

Exploring public funding, partnership and networking and licensing will be given high priority. They will progress one best molecule as ABSSSI antibiotic from lab to market.

Risks envisaged

The costly infrastructure and scale up issues can slow the progress.

Project coordinator:
Rethi Madathil

Team Members:
None

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Chandigarh-160036

Healthcare-Therapeutics

PACE-AIR

SASTRA UNIVERSITY, THANJAVUR

Collaborator Name: PSG College of Arts & Science, Coimbatore, Tamilnadu

Title of the Proposal

Generation, Characterization and Pre-clinical Evaluation of Chicken Egg Yolk sourced Anti-Snake Venom IgY against venoms of Cobra, Krait, Russells Viper and Saw-scaled Viper

Brief description

Presently, equine- and ovine-derived Anti-snake-venom ASV is the only effective and medically accepted remedy for systemic snake envenomation. Nevertheless, the high cost of generating antibodies in horses and side effects are the bonafide problems coupled with conventional ASV therapy. The current study is aimed to generate chicken egg-yolk sourced ASV against venoms of Big four snakes Cobra, Krait, Russells viper and Saw Scaled Viper as a promising alternative to mammalian antibodies due to its low cost and high yield.

Current stage of development

Proof-of-Concept

Innovative Element(s)

This study aims to evaluate the anti-inflammatory effect of chicken egg yolk sourced ASV to resolve venom mediated pathophysiological effect. Since, the production of animal sourced monovalent ASV is cost-intensive the feasibility of monovalent ASV-IgY production would also be assessed in this study.

Market Potential

Use of polyvalent antisera of equine origin has been existing as a proven treatment against snake envenomation in India. The present investigation will result in a significant assessment of chicken sourced ASV as a promising alternative to currently available antivenom leading to a ray of hope for commercialization with appropriate pre-clinical assessments and requisite regulatory approvals.

National/Societal Relevance

Snake bite has been a consistent health concern nationwide, especially in rural populations. In India, snake envenomation takes a heavy toll of human lives with the highest number of snake bites 81,000 and deaths 11,000 per year, warranting serious attention.

Project achievements

a. **Progress vis-a vis objectives-** Antibody preparation is done and in-vitro & in-vivo evaluation is done.

b. **Technology/Product (to be) developed –** A cost effective, novel and innovative approach, leading to mass production of ASV for the effective clinical management of snake envenomation.

c. **IP generated/ Potential for IP generation -** None

d. **Resources Generated -** Man power employed - 6.

Plans to take innovation further

Validation of Chicken sourced ASV-IgY in Central Research Institute CRI, Kasauli.

Risks envisaged

The production of anti-snake venom from large mammals blood has been found to be low-yielding and arduous, consequently, antivenom immunoglobulins for treatment are achieved regularly as polyvalent serum.

Project coordinator:
Senthil VisagaAmbi

Team Members:
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K. Uma Maheswari,
Panchapakesan,

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Healthcare-Therapeutics

BIG

SAMARTHAKRUPA LIFESCIENCES PVT. LTD.

Title of the Proposal

To demonstrate proof of concept for autologous regenerative therapy using platelet rich fibrin enriched with human herniated intervertebral disc tissue to enhance regeneration of human herniated intervertebral disc.

Brief description

Removal of herniated spinal disc tissue is the commonest performed surgical procedure. The removed disc tissue is discarded at present world over in millions per year. Loss of the disc tissue results in the physical and structural loss of function of the disc. On the other hand there is growing evidence to suggest that there are regenerative cells in the disc. Proposed technology is towards recovery of valuable cells from the discarded disc fragments using non xenogeneic culture conditions. Proposed product of regenerative cells grown in autologous serum is now waiting for clinical trials

Current stage of development

Proof-of-Concept

Innovative Element(s)

A process have been standardized for obtaining good quality regenerative cell population from to-be-discarded disc fragments which is also conditioning the media with anabolic factors. Using an autologous product without the use of any xenogenic additives, they have been successful in obtaining a good number of quality cells.

Market Potential

Market potential is immense but being a novel therapy, would require the idea to percolate through the stake holders.

National/Societal Relevance

Degenerative disc problems are on the increase because of long hours spent in the chair, lack of abdominal muscle tone and probably the worst being the forward tilt of the head in messaging and using hand held putting a high bending stress on the spine. Hence, there is a need for solutions that will keep the spine supple instead of making it rigid as is often the case in surgeries using spinal implants. Our process and product we expect would aptly fulfil that demand in the coming years.

Project achievements

a. **Progress vis-a vis objectives-** Established a GMP laboratory in a well-equipped operation theater facility

b. **Technology/Product (to be) developed –** An autologous regenerative therapy using platelet rich fibrin enriched with human herniated intervertebral disc tissue

c. **IP generated/ Potential for IP generation -**IP has been applied

d. **Resources Generated -**A GMP like facility in a very rural area which has a lot of young research fellows.

Plans to take innovation further

To go for Phase 1/2 Clinical Trials and limited marketing in 2 years. The lab can be a central facility where herniated disc tissues from various labs across the country are collected and cultured.

Risks envisaged

Novel solution with no benchmarks so our clinical progress would require cautious evaluation at each stage.

Project coordinator:
Sunil Nadkarni

Team Members:
Rita Mulherkar

Contact:
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SERUM INSTITUTE OF INDIA PVT. LTD.

Title of the Proposal

To develop low cost and affordable Biosimilar Herceptin

Brief description

To develop an affordable biosimilar of Herceptin for use in low and middle-income countries. The developed NeuCeptin biosimilar is highly biosimilar to Herceptin in in-vitro assays and in pharmacokinetics studies in non-human primates. Improvements in manufacturing processes have substantially lowered the cost of producing NeuCeptin compared with Herceptin, allowing NeuCeptin to ultimately be provided at a significantly lower price, supplying a huge unmet global need.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Improvement of yield & productivity using novel continuous manufacturing techniques to decrease final cost of the product.

Market Potential

The current originator market in the US and EU is around USD 6.8 billion. Our plan is to market the biosimilar in India, which has about double the incidence rate and prevalence, at 1/10 of the originator cost. The potential market in India alone would, therefore, total around USD 1.4 billion.

National/Societal Relevance

Her2 over expressing breast cancer has a worldwide annual incidence of 0.5 million and a prevalence of 20 million. There is a huge unmet need for affordable treatment in the developing world since there is a cost barrier to treatment with the originator product. The biosimilar in development could meet some of this so far unmet need.

Project achievements

a. **Progress vis-a vis objectives-** Compliance report for characterization of GMP cell bank, product characterization, virus clearance study completed; Initiation of Pre-clinical toxicity studies ongoing

b. **Technology/Product (to be) developed –** Development of technology completed followed by pre-clinical & Clinical studies in progress. Final manufacturing process will be completed by end of 2021.

c. **IP generated/ Potential for IP generation -** NA

d. **Resources Generated -** As many as ~100 new recruitments of technical persons & ~50 new non-technical persons will be generated.

Plans to take innovation further

The proposed continuous manufacturing technology will be implemented to get better yield to reduce manufacturing cost.

Risks envisaged

None.

Project coordinator:
Umesh Shaligram

Team Members:
Vistasp Sethna,
Amar Srivastava,
Jayachandran Ramlingam,
Rahul Nerlekar

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SUN PHARMACEUTICAL INDUSTRIES LTD.

Title of the Proposal

Four-in-one subunit dengue vaccine development program

Brief description

Sun Pharma is developing safe, effective and affordable recombinant Dengue Subunit Tetravalent vaccine DSV4 , whose design eliminates disease-enhancing responses that are associated with whole virus based dengue vaccine. DSV4 is composed of Envelope domain III EDIII of all four dengue viruses genetically fused to the Hepatitis B surface antigen S DS . The DS in turn is co-expressed with four copies of S antigen in P. pastoris and assembled as nanoparticles displaying EDIIIs of all four DENV serotypes in cost-effective manner.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Development of dengue vaccine has been difficult, since predominant immune response in humans to the four-dengue virus serotypes is serotype cross-reactive and cross enhancing but not cross protective. The innovative DSV4 vaccine is designed to elicit protective immune response against all four dengue viruses without the induction of disease-enhancing response.

Market Potential

Estimates indicate 390 million dengue infections per year with 3.9 billion people at risk globally. Published capacities of the licensed and late-stage vaccines is expected to address only a small fraction of this demand. A vaccine like DSV4, offering superior safety profile with cost-effective manufacturing, will address significant gaps in dengue vaccination.

National/Societal Relevance

India contributes 34% of the dengue virus infections estimated to have occurred globally.

Project achievements

a. **Progress vis-a vis objectives-** Process development, its scale up as well as assay development is ongoing in preparation of preclinical toxicology studies and Phase I clinical material manufacturing.

b. **Technology/Product (to be) developed –** Tetravalent Vaccine against Dengue fever..

c. **IP generated/ Potential for IP generation –** Indian Patent Application: 2478/DEL/2014 PCT Application: PCT/IB2015/056352 Countries filed: USA, Canada, Malaysia, Brazil, China, Japan, Mexico, Thailand, EPO, South Africa, Indonesia, and Vietnam.

d. **Resources Generated –** Manpower employed- 5.

Plans to take innovation further

Sun is open to partnerships at all stages of development and is actively working with key stakeholders with the aim to synergistically accelerate development and availability of DSV4 vaccine globally.

Risks envisaged

None.

Project coordinator:
Sachin Kale

Team Members:
Altaf Lal, Sanjay Mandhane,
Satish Panchal,
Upasana Arora, Saif Ismail,
Hemalatha Beesetti,
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Healthcare-Therapeutics

NBM

TERGENE BIOTECH PVT. LTD.

Title of the Proposal

Development of an Affordable, Asia specific 15 valent Pneumococcal Polysaccharide-CRM 197 Protein Conjugate Vaccine

Brief description

Tergene's, Asia specific 15 valent Pneumococcal Polysaccharide – CRM 197 Protein Conjugate Vaccine candidate is powered by its twin USPs - being the only 15 valent vaccine in the national pipeline with broader coverage and a more Asia specific Target Product Profile TPP, and greater cost effectiveness from indigenous technology developed for manufacturing of CRM 197 carrier protein.

Current stage of development

Validation

Innovative Element(s)

The Pneumococcal Conjugate Vaccine, 15 valent PCV-15 under development at Tergene Biotech relates to a vaccine composition that includes polysaccharide antigens isolated from 15 different serotypes of S.pneumonia, individually conjugated to a carrier protein, CRM-197. This is the only 15-valent PCV being developed with two specific serotypes that are emerging in the Asian region.

Market Potential

Pneumonia is the most common form of serious pneumococcal disease, making it one of the leading causes of death among young children. Annually India witnesses 45 million pneumonia cases among children under 5 years of which 370,000 die due to the disease. There is a huge unmet PCV need in India as 26 million children born in India every year and vaccine schedule will target children between 2 months to 59 months. This translates to 78 Million doses every year.

National/Societal Relevance

Increasing incidence of streptococcal infection in the young and elderly, wide-spread antimicrobial resistance AMR, and diversity in regional serotype distribution are key factors that necessitate the need for an Asia specific, indigenous and cost effective vaccine for S.Pneumoniae.

Project achievements

a. **Progress vis-a vis objectives-** Phase II Clinical Trial is underway and expected to be completed by Nov 2019. Phase III CT will be initiated subsequently.

b. **Technology/Product (to be) developed –** Pneumococcal Conjugate Vaccine 15 valent. Expected time to enter market is 2021.

c. **IP generated/ Potential for IP generation –** Indian Patent and PCT Application filed.

d. **Resources Generated –** Manpower trained: ~30, Total Employment to be: ~150.

Plans to take innovation further

Tergene is aiming at getting the vaccine pre-qualified by WHO which will give access to supplying the vaccine to UNICEF and other developing countries.

Risks envisaged

Risks envisaged in conduct of clinical studies.

Project coordinator:
M. Kuppusamy

Team Members:
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K. Sathyan
S. Sundar, Kapil,
Antony Madhan

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Turkapally Village, Shamirpet Mandal, RR District,
Hyderabad-500078

Healthcare-Therapeutics

BIG

TRANALAB PVT. LTD.

Title of the Proposal

Cost-effective Platform Technology for Production of Biotherapeutics

Brief description

To create Platform technology for affordable biosimilars to reduce annual cost to patient from current INR 40 Lakhs by 90%for a rare disease therapeutic where lifelong treatment is required. Novel expression system to disrupt the costs. Agreement signed for validation and licensing of technology with a national institute of repute, to create novel application of existing technology.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Novel recombinant protein expression system to disrupt the cost. Agreement signed for technology validation and licensing with a national institute of repute, to create novel application of existing technology.

Market Potential

Current global market INR 9000 Cr. Addressable market is INR 800 Cr. considering one-tenth current cost and India market alone which is 20,000 patients.

National/Societal Relevance

At present only 120 out of estimated 20000 patients are under treatment. No treatment leads to poor quality of life and death. Aim is to bring the annual cost below INR 5 L limit of Ayushmaan Bharat scheme will allow the patients to be treated.

Project achievements

a. **Progress vis-a vis objectives-** Transformation of target rare disease Biosimilar into the novel platform expression system completed. Two additional biosimilar targets are being transformed, to demonstrate potential of platform.

b. **Technology/Product (to be) developed –** A biosimilar to treat a rare disease, produced using a novel platform expression technology to disruptively reduce cost. Expected time to enter market is estimated to be 5-7 years.

c. **IP generated/ Potential for IP generation -** Licensing agreement in place with a reputed national Institute for background IP and additional work is underway for new IP generation.

d. **Resources Generated -** Man power generated - 2

Plans to take innovation further

Current funding is INR 1.15 Cr. through three Grants and Services. They will seek further funding using Grants, Seed funding and Equity routes.

Risks envisaged

Regulatory processes for novel expression system. Scale-up and downstream processing.

Project coordinator:
Chandramowli Ganesh

Team Members:
Nitin S. Deshpande,
Ganesh C,
Kheta Ram Tak,
M Muniyappa

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Chinnappanahalli,
Bangalore-560037

Healthcare-Therapeutics

PACE-CRS

TRANSLATIONAL HEALTH SCIENCE AND TECHNOLOGY INSTITUTE (THSTI)

Collaborator Name: Bioneeds India Pvt. Ltd. & NCCS, Pune

Title of the Proposal

Development and PoC validation of a novel approach to treat HIV infection by integrating anti-viral activity with stimulation of host cell innate immunity

Brief description

Team is working on the development of a new drug lead possessing novel and dual pharmacology, as a treatment option for HIV-1 infection. They have identified a novel lead molecule and its congeners, which are not only potent inhibitors of virus integrase but also, boost host immunity by inducing autophagy in host cells.

Current stage of development

Proof-of-Concept

Innovative Element(s)

A unique approach of dual action which is to boost host cell innate immunity along with regular anti-viral approach which may have a potential to wider the efficacy potential over existing therapies and drug resistant strains

Market Potential

Integrase inhibitors standalone or in combination with ART are front line drugs for HIV-1 infection and huge global market. It is expected that the newly identified lead can trap the complete market of integrase inhibitors after successful pre-clinical and clinical development

National/Societal Relevance

HIV-1 infection is a disease of national importance just like any other infectious disease. Presently, there is no Indian drug in market. The identified lead could provide a cost effective replacement to expensive foreign drugs.

Project achievements

a. **Progress vis-a vis objectives-** At present this lead is being evaluated for efficacy studies in HIV-1 infected humanized mice model.

b. **Technology/Product (to be) developed** – A lead compound with efficacy and limited safety data to combat against HIV infection.

c. **IP generated/ Potential for IP generation -** THSTI has already filed an Indian patent application. Post successful of the animal efficacy studies, a new patent application shall be filed in India as well as different jurisdictions such as US, Europe and JP

d. **Resources Generated -** Man power generated - 2.

Plans to take innovation further

As mentioned above, post the successful outcome of animal efficacy study, a suitable collaborator shall be identified for further co-development i.e. GLP studies and clinical developments.

Risks envisaged

The add on pharmacology i.e. Autophagy induction provide additional and host dependent MoA, which alleviate infection.

Project coordinator:
Dinesh Mahajan

Team Members:
Debashis Mitra,
Shilpa Jamwal,
Shailender Asthana,
Sameena Khan
Kanury Rao

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3rd Milestone,
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Healthcare-Therapeutics

PACE-AIR

UNIVERSITY OF MYSORE

Title of the Proposal

Mixture of small molecules as first aid therapeutics, complementing anti-snake venom therapy against ˜Big Four" snake venom induced lethality

Brief description

Anti-venoms are administered only in tertiary hospitals, Time is very critical upon snake bite envenomation and timely administration of anti-venom decides the survival chance of the victim. So far, no scientific reports regarding the first aid therapy and prophylactic treatment for snake bite victims. In this regard, finding of small molecules cocktail that neutralizes major toxins of Big Four can be exploited as first aid therapy to enhance survival chances of victims in remote area, on the way to hospitals with facilities to treat victims with anti-snake venom.

Current stage of development

Validation

Innovative Element(s)

Formulation of a small molecule cocktail which has minimal side effects on snake bite victims can be exploited as a first aid therapy. Small molecule cocktail as first aid treatment in preclinical set up. And also, prophylactic use of the same cocktail may reduce the mortality in snake bite prone regions

Market Potential

The components of proposed cocktail are simple chemicals with minimal side effects. As a complimentary treatment to ASV, the proposed cocktail can be patented and commercialized as first aid treatment. Hence, high market potential is expected.

National/Societal Relevance

Unlike other diseases, snake bite therapy is region specific issue because venomous snakes distribution varies from one habitat to another. In India, four venomous snakes are responsible for most of the fatalities and are named as Big Four.

Project achievements

a. **Progress vis-a vis objectives-** A fresh batch of BD1 was synthesized and checked for protease inhibition. It inhibited protease to similar extent of that of the old batch

b. **Technology/Product (to be) developed –** First aid therapy against Big Four snake bite

c. **IP generated/ Potential for IP generation –**May yield one IP.

d. **Resources Generated -** One project assistant was hired.

Plans to take innovation further

The small molecules in the proposed cocktail are simple chemical compounds and cost effective to synthesize. Since the cocktail compensate the dose of ASV, this can be easily commercialized.

Risks envisaged

Although the proposed cocktail is very simple as first aid therapy against snake bite envenomation, it requires medically qualified/authorized person to administer cocktail to the victim in the ambulance or primary health centres

Project coordinator:
B S Vishwanath

Team Members:
Rajesh Rajaiah
Joy Elvin Dhinakar

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Chemistry, Manasagangotri,
Mysore, KARNATAKA,
India-570006

VANDITA KAKKAR

Title of the Proposal

Proof of Concept Studies on Combinatorial Novel Nanolipid Hybrid of White Curcumin and Tacrolimus for Dermatitis

Brief description

The aim of the project is to developformulation of a topical ointment involving nanopharmaceuticalcouturing of a folklore phytochemical white curcumin also known as tetrahydrocurcumin and its combination with a calcineurin inhibitor tacrolimus to achieve a patient friendly, cost effective therapy with minimal side effects for treatment of atopic dermatitis.

Current stage of development

Validation

Innovative Element(s)

The proposed product has novel combination of lipidic nanoparticles of tetrahydrocurcumin 0.2-4 in concentrated form along with tacrolimus at its lowest approved concentration 0.03 for the skin inflammatory conditions including atopic dermatitis and psoriasis.

Market Potential

Atopic dermatitis is a chronic inflammatory disorder that affects over 30 million people in USA. It has been estimated that it costs over $5 billion dollars annually.

National/Societal Relevance

The product provides a unique solution for treating skin inflammatory disorders especially atopic dermatitis to do away with the use of steroidal formulations.

Project achievements

a. **Progress vis-a vis objectives-** Cell line studies is to be performed for the developed product.
b. **Technology/Product (to be) developed –** The product is currently under development with validation of the finished product. It will take 1-2 years to enter into the market.
c. **IP generated/ Potential for IP generation -** IP has been filed in India
d. **Resources Generated –**3 manpower employed

Plans to take innovation further:

The Company is in the process of validation of the final product and looking for further funding for conducting the clinical trials.

Risks envisaged:

The Challenge to enter the Market and the grant for conducting the clinical trials.

Project coordinator:
Vandita Kakkar

Team Members:
Dinesh Singla,
Bikash Medhi

Contact :
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Pharmaceutics, UIPS
Sector-14, Panjab University,
Chandigarh-160014

VIDYA K.C

Title of the Proposal

Nano-particle Impregnation on Surgical Silk Suture to reduce its Capillarity and Tissue reaction- A Novel Approach

Brief description

The aim of the proposal is to impregnate titanium dioxide nanoparticles on Surgical Silk Suture to reduce its Capillarity and tissue reaction.

Current stage of development

Proof-of-concept.

Innovative Element(s)

Titanium dioxide impregnated silk is expected to be a suture material of good physical and handling properties and biocompatible.

Market Potential

Sutures accounts for 57 of total surgical implants at the global surgical equipment market. A considerable growth is seen for both absorbable and non-absorbable suture products in the surgical suture segment of the health care industry with a market share up to USD 649 million.

National/Societal Relevance

The market for antibacterial sutures in India is in nascent stage 5-6 of the overall surgical sutures market.

Project achievements

a. **Progress vis-a vis objectives-** Preparation and Characterization of Titanium dioxide nanoparticles and evaluation of the physical and mechanical properties of suture materials has been done. Technology/Product (to be) developed – Titanium dioxide impregnated silk based suture material
b. **IP generated/ Potential for IP generation –** The product is having IP potential.
c. **Resources Generated -**Nil

Plans to take innovation further

The Grantee intends to raise funds for clinical safety testing

Risks envisaged

Nanoparticle impregnated surgical silk may be less biocompatible, exhibiting more tissue reaction

Project coordinator:
Vidya KC

Team Members:
Dindyal Mandal,
Gopal Chowdhary

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Surgery, Kalinga Institute of
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Healthcare-Therapeutics

NBM

VITANE BIOLOGICS PVT. LTD.

Title of the Proposal

Optimization and scale-up or a high throughput refolding process for production of Insulin Glargine from inclusion bodies of Escherichia coli.

Brief description

The project is aimed to develop a high throughput, robust, scalable and high yielding process for cost effective production of recombinant Insulin Glargine at very large scale.

Current stage of development

Validation

Innovative Element(s)

Improved solubilisation process to maintain the native like secondary structure of the protein to enhance the refolding efficiency for better recovery and yield of biologically active recombinant Insulin Glargine. Optimized refolding condition of Inclusion bodies to improve refolding efficiency for higher yield

Market Potential

The total cost of diabetes treatment approaching $201 billion in the United States and $465 billion worldwide. Nevertheless, use of biosimilars has steadily increased over time in 2009, biosimilars accounted for 75 of all prescriptions written. It is anticipated that the global market of Insulin Analogues will cross USD 19 Billion by 2020

National/Societal Relevance

Diabetes is fast gaining the status of a potential epidemic. The prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. To reduce the disease burden that diabetes creates in India, appropriate government interventions and combined efforts from all the stakeholders of the society are required.

Project achievements

a. **Progress vis-a vis objectives-** Scale up of downstream process and optimization with refolding efficiency of approx. 20% is achieved

b. **Technology/Product (to be) developed –** Scale up of upstream process with consistent yield of 30g/L inclusion bodies. Scale up of downstream process and optimization with refolding efficiency of approx. 25% and final yield of 700 to 800 mg/L

c. **IP generated/ Potential for IP generation -** Acquired right of patent on "Process for obtaining bioactive recombinant protein from inclusion bodies" Application No. 1041/DEL/2007, Patent No. 267617, India

d. **Resources Generated -** Man power generated

Plans to take innovation further

The high throughput and high yielding process will be scaled up to 10000 L scale for commercial manufacturing of Insulin Glargine to cater India, ROW countries and regulated markets including USA. They have filed IND with US FDA

Risks envisaged

Competition from other established market players and high cost of clinical trial for regulated market.

Project coordinator:
Sudip Kumar Majumder

Team Members:
Hari Prasad Nelluri,
Madhavan Omanakuttan,
Vijay Anand, Ankita Hirematha,
Amritan Kachru,
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Maharashtra-400604

Healthcare-Therapeutics

SBIRI

WEINNOVATE BIO SOLUTIONS PVT. LTD.

Title of the Proposal

Novel combination-gel for rapid healing of Diabetic foot ulcers

Brief description

HEALRAP, is a novel patent filed unique formulation in a form of gel. It consists of various contents which help in controlling infection. It also consists of cell growth stimulating molecules allowing blood vessels and adjacent cells to grow rapidly in the wound lumen. HEALRAP is one of its kind formulation which also focuses on other important aspects of wound healing like reducing inflammation and controlling infection.

Current stage of development

Validation

Innovative Element(s)

This is the first time when a combination gel treatment option HEALRAP is proposed for Diabetic foot ulcer healing. Wound healing is a complex process, current products only focus on certain stages of wound healing. HEALRAP is designed to act on different stages of wound, accelerating wound healing.

Market Potential

Global wound care market will reach $20.5 billion by 2020 at a CAGR of 11.9 percent and in India it is increasing by 7.9 percent. Wound ulcers being the highest revenue generating segment worth $7.75 Billion in 2020. HEALRAP being affordable and domestic manufacturing in India will further drive unit sales.

National/Societal Relevance

India is the diabetic capital of the world, with increasing number of diabetics, foot care will be a huge challenge to address. This treatment will avoid the situation of amputation to a larger extent, which will be beneficial especially in rural India. This treatment option will be affordable than the current treatment options.

Project achievements

a. **Progress vis-a vis objectives-** Product realization completed. HEALRAP Gel formulated, assessed and passed for acute oral, acute dermal toxicity, skin sensitization and irritation in animal models. Proved efficacy in diabetic rat wound healing model.

b. **Technology/Product (to be) developed–** HEALRAP will be a first of its kind gel for rapid healing of diabetic foot ulcer. It will be in market within 3 years

c. **IP generated/ Potential for IP generation -** UK: GB 1900381.3, US application: 16310423, Indian Application: 201621025112

d. **Resources Generated -** Man power employed generated - 3

Plans to take innovation further

Long term toxicity studies to be done by grant funding and partnerships for clinical trials. Technology can also be licensed to interested pharma companies.

Risks envisaged

Regulatory pathway ahead and the time required to get clearance for clinical trials. Funds for conducting long toxicity studies in GLP certified labs and clinical trials.

Project coordinator:
Milind Choudhari

Team Members:
Prasad Bhagat
Sandeep Sonawane
Shraddha Kelkar
AashishMokashi
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INNOVATION PROFILES

4S MEDICAL RESEARCH PVT LTD.

Title of the Proposal

See Sound- A novel speech visualization tool for improving auditory perception and speech performance of hearing impaired children and adults using their visual cortex.

Brief description

See Sound Live uses a deaf person's ability to process visual signals to develop speech. Speech efforts of a deaf person are converted into a ˜visual equivalent and shown to the user on a smart phone like device. This feedback allows the deaf person to modulate his efforts and improve his speech outcome.

Current stage of development

Validation

Innovative Element(s)

The deaf and hard of hearing have limited speech since they are unable to hear themselves. SeeSoundLive uses their visual processing ability to provide feedback on their speech. This has never been done before.

Market Potential

There are more than 50 -100 million deaf and partially-deaf people in the world, with approximately 15- 30 million in India.

National/Societal relevance

SeeSoundLive is a potential game-changer in the field of rehabilitation of deaf and hard of hearing people in India and the world. Current options for developing communication skills for the deaf are limited to sign language. However, sign language is poorly understood by normal hearing people. This results in social isolation of the deaf. Speech to text technology is rapidly developing and will help the literate deaf people understand others but when it comes to expressive language, options are very limited. SeeSoundLive enables the deaf person to speak to normal hearing people just like them. The SeeSoundLive technology has been conceived and implemented completely in India.

Project achievements

a. **Progress vis-a vis objectives-**
- The sound engine / algorithm for Visual Equivalence is developed.
- Incorporation of the technology on a smartphone or mobile tablet.

b. **Technology/Product (to be) developed –** The current version of SeeSoundLive is complete and has been launched commercially. Future versions with more improvements, functionality and language potential are under development.

c. **IP generated/ Potential for IP generation -** Copyright Reg. No L-72242/2018 Patent Application No India- 201811050125

d. **Resources Generated -** Collaboration with 40 special schools, several audiology/speech therapy centers, and special educators and trained them on SeeSoundLive technology for implementation in their organization. Developed a strong team which includes Doctors, Audiologists, Speech Therapist, Social work volunteers, Engineers, Sales and Marketing experts etc.

Plans to take innovation further

Negotiation with investors / distribution partners in India and Europe

Risks envisaged

Training the teachers in deaf schools is a challenge. Developing user confidence in technology is also a challenge. Results from SeeSoundLive may take time and perseverance to develop. Protecting intellectual property while increasing user base in India and world.

Project coordinator:
Shomeshwar Singh

Team Members:
Sirisha Singh, Prerna Madhok, Jeetendra Singh, Vivekanand Vellanki, Tanmoy Chaturvedi, Rahul Kapoor

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4S MEDICAL RESEARCH PVT. LTD.

Title of the Proposal

See Sound Live - A smart phone based, novel speech visualization tool to help improve speech performance and communication skills of a deaf and dumb person, currently relying only on sign language.

Brief description

See Sound Live uses a deaf person's ability to process visual signals to develop speech. Speech efforts of a deaf person are converted into a visual equivalent and shown to the user on a smart phone like device. This feedback allows the deaf person to modulate his efforts and improve his speech outcome.

Current stage of development

Commercialization

Innovative Element(s)

The deaf and hard of hearing have limited speech since they are unable to hear themselves. SeeSoundLive uses their visual processing ability to provide feedback on their speech. This has never been done before

Market Potential

There are more than 50 -100 million deaf and partially-deaf people in the world, with approximately 15- 30 million in India.

National/Societal relevance

SeeSoundLive is a potential game-changer in the field of rehabilitation of deaf and hard of hearing people in India and the world. Current options for developing communication skills for the deaf are limited to sign language. However, sign language is poorly understood by normal hearing people. This results in social isolation of the deaf. Speech to text technology is rapidly developing and will help the literate deaf people understand others but when it comes to expressive language, options are very limited. SeeSoundLive enables the deaf person to speak to normal hearing people just like them. The SeeSoundLive technology has been conceived and implemented completely in India.

Project achievements

a. **Progress vis-a vis objectives-**
- Multi-Center Clinical trial ongoing.
- Commercial Launch

b. **Technology/Product (to be) developed –** The current version of SeeSoundLive is complete and has been launched commercially. Future versions with more improvements, functionality and language potential are under development.

c. **IP generated/ Potential for IP generation -** Copyright Reg. No L-72242/2018 Patent Application No India- 201811050125

d. **Resources Generated -** Collaboration with 40 special schools, several audiology/speech therapy centers, and special educators and trained them on SeeSoundLive technology for implementation in their organization. Developed a strong team which includes Doctors, Audiologists, Speech Therapist, Social work volunteers, Engineers, Sales and Marketing experts etc.

Plans to take innovation further

Negotiation with investors / distribution partners in India and Europe

Risks envisaged

Training the teachers in deaf schools is a challenge. Developing user confidence in technology is also a challenge. Results from SeeSoundLive may take time and perseverance to develop. Protecting intellectual property while increasing user base in India and world.

Project coordinator:
Shomeshwar Singh

Team Members:
Sirisha Singh, Prerna Madhok, Jeetendra Singh, Vivekanand Vellanki, Tanmoy Chaturvedi, Rahul Kapoor

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ABIKSHYEET PANDA

Title of the Proposal

Development of Novel Electromagnetic Wave Based Rapid Tissue Fixation and Processing Device

Brief description

Conventional procedures for processing biopsied tissue has evolved from 2 - 3 days to 1 day with automated devices. Although this time-honoured method continues to serve histology laboratories, it has number of shortcomings, such as, delay in diagnosis, need to batch specimens, and toxicity of reagents used. An electromagnetic wave-based automated tissue processor is under development in order to fix and process tissues resulting in production of paraffin embedded tissue blocks within a span of few hours.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Utilization of Electromagnetic Wave in order to accelerate the tissue fixation and processing and use of noxious chemical like Xylene are innovative elements. This will support automation, reducing the laboratory time, need for skilled manpower and ensure same day report generation

Market Potential

Currently available devices are expensive and takes long hours to days to get stained slide on pathologist's table. Proposed device would require processing time of few hours from which Laboratories and Clinical establishments will be enormously benefited.

National/Societal relevance

Present day histopathology laboratory is loaded with biopsy specimens that are signed off as a report only after 5 days of receipt at lab bench. So the proposed device will definitely change the face of early diagnosis and will provide treatment as early as possible

Project achievements

a. **Progress vis-a vis objectives -**
- Alpha Prototype ready for electromagnetic wave source
- Protocols for electromagnetic wave based method for tissue fixation and processing devised and are incorporated into the alpha prototype.

b. **Technology/Product (to be) developed -** An automated electromagnetic wave based tissue fixation and processing device

c. **IP generated/ Potential for IP generation -** Potential Design/Process patent is identified and IP filing is under process

d. **Resources Generated -** Two engineers, one JRF and one Research Assistant appointed.

Plans to take innovation further

Plans for various licensing and Safety Certification followed by market launch as a service initially followed by product. Looking forward for prospective investors and for collaboration.

Risks envisaged

Getting regulatory certification

Project coordinator:
Abikshyeet Panda

Team Members:
Gopal Chowdhary,
Asim Syed Sheeraz,
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Maxillofacial Pathology
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Sciences, KIIT
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ADIUVO DIAGNOSTICS PVT. LTD.

Title of the Proposal

SKINSCOPE - Rapid, non-invasive, reagent-less screening device to detect and classify clinically relevant pathogens causing Skin and Soft Tissue Infections

Brief description

An imaging device that can non-invasively assess wound infection and gives a colour coded wound map by spatially mapping pathogens on the infected area and classify them into its gram-type.

Current stage of development

Pre-Commercialization

Innovative Element(s)

Novel hand-held screening device that captures multi spectral images of the wound region and uses machine learning algorithm on these spectral images obtained to detect and also classify the infecting pathogens both bacteria and fungus non-invasively in under 2 minutes as compared to traditional visual inspection followed by culture method which takes up to 3-5 days for a definitive result. The device also classifies the identified pathogens based on their gram/genus type and assesses the level of infection.

Market Potential

Advanced wound care is a 20B$ Market with annual CAGR of 8% on Medical devices. In India rising Medical Surgeries and increase in Incidence of Acute and Chronic Wounds foster the market growth.

National/Societal relevance

More than 420 million people around the world suffer from Acute, chronic and traumatic wounds. The problem is more compounded in India as we lack a comprehensive Wound Management System: More than 2 third of lower limb amputations are due to ulceration on the foot that are not treated, 7- 10% of Hospitalised patients develop skin infections in ICU wards, Annual Burn incidences in India 6-7% million, secondary infection at the site of surgery is the third most commonly reported nosocomial infection.

Project achievements

a. **Progress vis-a vis objectives-** Validated the device on 800 patients with greater than 85% accuracy. The device is currently in market pilot phase and being tested at 15 hospitals and clinics exploring various revenue models.

b. **Technology/Product (to be) developed –** ILLUMINATE- hand-held pathogen screening device for infectious wounds

c. **IP generated/ Potential for IP generation -** Granted Indian IP: 323440 , Filed PCT PCT/IN2018/050161 - CA, EU, USA, SG

d. **Resources Generated -** 14 employees with 1000 SqFt Product development and Assembly unit established. Raised Investment from Menterra Venture Funds. Also supported by Google Launchpad, India for Cloud and AI support

Plans to take innovation further

Commercialisation in India through Channel partners and Distributors. Tie up with major HealthCare companies for marketing and sales in other Geographies EU, UK and USA.

Risks envisaged

New entrant novel product requires concept selling for mass adoption of the product in tier2 and tier 3 settings. Working capital will be an issue during scale up phase

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AINDRA SYSTEMS PVT. LTD.

Title of the Proposal

An Affordable, Point-of-sample-collection screening tool for Cervical Cancer

Brief description

CervAstra, Aindra's computation pathology platform is a unique convergence of Optics, Mechatronics, Deep Learning Artificial Intelligence & Machine Learning and Cloud Technologies that aids in the analysis of biological specimens through the use of AI. This platform or technology can also be utilized in analysing a variety of biological samples that rely on Pathology as a science, like Pap smear test for Cervical Cancer.

Current stage of development

Validation

Innovative Element(s)

There currently does not exist any evidence-based, point-of-care systems that are reliable and aid in the screening of cervical cancer. Compared to the other systems and approaches, CervAstra has faster turn-around-time, accessible anywhere, anytime and affordable. The existing approaches are expensive, centralized or subjective.

Market Potential

With more than 70% out of the 365 million women in India at risk, making screening mandatory at least once in their lifetime and at just about Rs. 150/test the market size is around 5400 Crores.

National/Societal relevance

The High incidence and mortality rates in cervical cancer cases indicate that one woman dies every 7 minutes in India due to Cervical Cancer. Around 80% of healthcare facilities are in urban areas whereas close to 70% of our countries population lives in rural areas. To compound the problem there is an inherent shortage of qualified medical professionals in the country.

Project achievements

a. **Progress vis-a vis objectives -** An end-to-end computational pathology system in place that can be leveraged to screen for Cervical Cancer at the point-of-care.

b. **Technology/Product (to be) developed -** The technology has successfully been converted to a product that is ready to undergo large scale validations in multiple centers.

c. **IP generated/ Potential for IP generation -** Filed for IP in India, Indonesia, Malaysia, Sri Lanka, USA, Europe, and South Africa. The IP has been granted in South Africa. There is potential for filing more patents.

d. **Resources Generated -** Aindra has generated multiple job opportunities for over 10 professionals.

Plans to take innovation further

A combination of institutional, clinical and business partners are available to take the innovations further in terms of technology, domain expertise, and business development. Seeking funding partnerships to scale business.

Risks envisaged

Risks and challenges related to marketing, operational, financial and regulations. Aindra have ensured that these challenges are planned in a manner to mitigate, minimize or eliminate the same so that the organizational goals are met.

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ALTHION TECH INNOVATIONS PVT. LTD.

Title of the Proposal

Indigenous Smart Device to Produce Ultra-pure Type-1 Water for Biotech and Healthcare

Brief description

Biotech/pharma/diagnostic labs and research institutions use type-1 and type-2 water for sensitive and critical R&D work. Type-2 water is used for preparing solutions, buffers and culture media, and type-1 water is used for critical analytical work ICP-MS, HPLC , mammalian cell culture and IVF. Based on a novel platform membrane technology licensed from CSIR-Indian Institute of Chemical Technology, Althion has developed a device that produces ultra-pure type-1 and type-2 water at a faction of the cost of the imported units, which currently dominate the market.

Current stage of development

Validation

Innovative Element(s)

The innovative elements are a) novel RO membrane technology licensed from CSIR-IICT which confer flux and quality advantages b) indigenous Electrodeionisation module which reduces the cost of maintenance and c) custom developed IoT control panel which allows preventive maintenance

Market Potential

The market in India comprises academic and research institutions, biotech/pharma companies, diagnostic labs, IVF labs and semi-conductor manufacturing companies. The market size is estimated to be Rs.500Cr in India, and about 5-6 times the size in other developing countries.

National/Societal relevance

Ultra-pure type-1 and type-2 water units are imported from International market palyers dominated by MNCs which causes a big burden on India's foreign exchange.

Project achievements

a. **Progress vis-a vis objectives -** Integrated the new custom control board with the existing type-2 system to produce type-1 ultra-pure water. Development of Electrodeionisation module and its integration are pending

b. **Technology/Product (to be) developed -** An electrodeionisation module has to be developed and integrated with the existing system to develop an indigenous Ultra-pure type-1 and type-2 water units

c. **IP generated/ Potential for IP generation -** 2 patent applications are being prepared for the type-1 device and the indigenous EDI module

d. **Resources Generated -** 4 jobs have been created. 12 installations of the minimum viable product have been installed in research institutions for feedback. Applied for ONGPSU Startup scheme to mobilize funds for the next stage. Generating revenues from a related ultra-pure water product developed for kidney dialysis centers

Plans to take innovation further

After launch the product in March 2020 plans to seek the assistance of Atal Innovation Mission, CSIR and DBT for initial sales to government customers.

Risks envisaged

MNC products are well entrenched, and have solid sales relationships with all institutions and companies. This may be difficult to overcome

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ATMEN TECHNOVENTION PVT. LTD.

Title of the Proposal

Proof of Concept for A device to Monitor and Detect Obstruction in Endotracheal Tube

Brief description

In intensive care unit most of the patients are intubated, as patient is not able to do respiration at own. it is important to monitor the intubated patient continuously as most of the time when endotracheal tube intubation is performed there is chances that this tube will gets block due to various reasons such as lung secretion. Developed device will effectively detect the Endotracheal tube obstruction from very early level. This device is also able to communicate with other external device so that concern person can monitor this device remotely, so that clinicians will take necessary action after these notifications.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Presently endotracheal tube obstruction is monitored by manual method which requires expert hands. Few devices available are expensive and has issues like inaccuracy in obstruction detection, false alarm, etc. Proposed device is makes the monitoring easy.

Market Potential

In India everyday around 1.5 Lakh endotracheal tube consumes every day. Proposed device will use with endotracheal tube. The global market of endotracheal tube was valued at $1629m in 2016 and it is estimated to reach $2518m by 2023, proposed device will be the part of the endotracheal tube market.

National/Societal relevance: The objective is to develop a low cost, portable device that will easily connect between the endotracheal tube and mechanical Ventilator/Ambu bag, to detect the obstruction occurring in the endotracheal tube from very early stage and send the alert messages/notification to the concern authority. This device can be used in intensive care unit for endotracheal intubated patient.

Project achievements

a. **Progress vis-a vis objectives -** Developed 3 different models of proposed device and are trying to get test manufacturing license from CDSCO to perform clinical investigation. Two hospitals are ready to perform clinical trials.
b. **Technology/Product (to be) developed -** Product is under testing in lab virtual environment and will be launched in February 2020
c. **IP generated/ Potential for IP generation -** 2 patents have been filed and 1 PCT application has been published
d. **Resources Generated -** Employment generated- 4

Plans to take innovation further

Looking for scale up with the help of grants and private investment to commercialize this technology

Risks envisaged:

Setting up a manufacturing unit

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AVINASH DENTAL LABORATORIES & RESEARCH INSTITUTE PVT. LTD.

Title of the Proposal

Design and Development of Silicone based Cartilage like Ear, Nose, Eye, orbital Implants for cranio-facial reconstruction.

Brief description

Loss of facial structure as a consequence of injury or salvaging surgery, demands reconstruction and rehabilitation of lost structures. Lots of surgical options are available to fulfil the requirement but require a surgery to restore the primary defect. Scientific community are in search to regenerate the lost structures by the means of stem cell or biocompatible material. After formulation, preparation and mechanical characterization, it was observed that Si40 was best suitable silicone for bio-composite preparation. The aim was to develop a new biocompatible cartilage like materials to restore anatomical form and function to improve social confidence and quality of life.

Current stage of development

Validation

Innovative Element(s)

Formulation of the product is unique and convincing as far as animal study is concerned. Overcoming the side effects like fibrosis, bacterial invasion to silicone, silicone surface which comes in contact with tissue surface has been modified with easily available bioactive molecules such as HAP, TiO2, TCP. This formulation can be introduced to other silicon based product like Tissue Expander / Breast implant or any other implants.

Market Potential

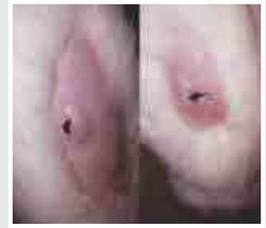
Med pore implants are available, but have shortcomings for use in ear, nose reconstruction. The present material is elastic in nature and is a promising substitute for cartilage. Product is awaiting human trail to meet huge demand from both national and international market.

National/Societal relevance

Indian economy demands Indian products based on cost effective technology so that grater section of population can afford the innovation.

Project achievements

a. **Progress vis-a vis objectives -** Standardization of composite material, Preparation of silicon bio-composites in different concentration, Sterilization and Mechanical characterizations of formed composite and In vivo animal study to prove its safety and efficacy has been completed
b. **Technology/Product (to be) developed -** Technology is ready for further clinical validations
c. **IP generated/ Potential for IP generation -** Not yet applied, preparing for patent filing
d. **Resources Generated -** Manpower employed on temporary basis and Facility created by the company jointly with BIPP contribution. No other sources explored yet



Plans to take innovation further

Plan to find out the Partners/promoters for licensing and marketing the new product. Speaking with different company for the product development and clinical trials

Risks envisaged

Human trails are still pending. Even though all materials are tested separately and shows its safe uses in the human body, silicone alone has some untoward reaction to the human body for long term uses which needs further testing.

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BAGMO PVT. LTD.

Title of the Proposal

To pilot a novel smart blood bag monitoring solution for safe and reliable blood transfusion

Broad Area

Devices and Diagnostics

Brief description

Developing a blood bag monitoring system which will be monitoring the storage conditions of blood bags while it is transported and stored. Currently, blood bags taken out from a blood bank cannot be returned since there is no authenticated end to end data regarding the storage condition. Using this solution it will be able to provide data regarding vein to vein that is from donor to patient. Technology is bringing a process innovation in the blood supply chain in an affordable way which can be easily adapted to the Indian market where resources and money are the main constraints.

Current stage of development

Pre-Commercialization

Innovative Element(s)

Process innovation is brought in the current blood supply chain with the help of IoT technology which will address a large unmet need. Individual blood bag monitoring in an affordable way is the uniqueness of our approach.

Market Potential

It is estimated as INR 200 crore in the Indian market for blood supply chain alone. The technology can be applicable to the high-value perishable products like biological samples or organ transportation etc.

National/Societal relevance

The availability of safe blood can avert majority of the preventable maternal deaths. Reliability on stored blood bags at rural centres need to be established and this can increase the inventory of stored blood in these centres.

Project achievements

a. **Progress vis-a vis objectives -** The project is in the piloting stage and actively looking for early adopters.
b. **Technology/Product (to be) developed -** The product is in the late-stage prototype and ready for deployment in the fields. The product will be designed for mass manufacturing in the coming year. The product is ready to deliver for early adopters in next 18 months
c. **IP generated/ Potential for IP generation -** IP entitled "METHOD AND SYSTEM FOR MONITORING STORAGE OF BIOLOGICAL PRODUCTS IN A COLD CHAIN SYSTEM" Application No.: 201841012703 filed on 03-04-2019
d. **Resources Generated -** Manpower trained and left for other companies as fresher: 9. Manpower employed: 10. The fund received other than BIRAC: INR 9 Lakhs as a purchase order.

Plans to take innovation further

The Company is looking for partnerships to take innovation further in the overseas market is looking for funds to design the product for mass manufacturing.

Risks envisaged

The high cost of marketing and lengthy process in the conversion of interest to purchase order

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BEABLEHEALTH PVT. LTD.

Title of the Proposal

ARM-ABLE: An interactive arm training rehabilitative device. Fun therapy, Better recovery

Brief description

ArmAble is a game based arm rehabilitation device. The immersive games developed exclusively for arm therapy makes the session more engaging and fun-filled. The device motivates the patients to engage in therapy using the immersive games which lead to an increased number of repetition. The high number of repetitions augment the recovery of the arm function. The tele-rehabilitation in ArmAble connects therapists to patients by remotely connecting through a cloud platform. The therapist can monitor and analyze the progress of their patients recovery by looking at the movement data such as patterns, speed, accuracy, etc.

Current stage of development

Validation

Innovative Element(s)

Provides Active bilateral and unilateral training, and passive bilateral training. It enables movement in any trajectory along the X-Y plane and can be inclined to provide motion in multiple planes. It can use the changeable tracks for guided motion. It can use changeable handle grips as per requirement.

Market Potential

Globally, Stroke is the leading cause of disability. Countries, both developed and developing need access to quality rehabilitation. This helps prevent Billions of dollars of economic burden caused by not rehabilitating people

National/Societal relevance

In India, the current incidence of stroke is around 18 Lakh strokes every year, along with this there are 10 Lakh cases of SCI Injuries and TBI. Post medical treatment, patients who do not undergo rehabilitation are denied a chance of recovery and are left disabled. This contributes to the country's economic burden and makes it difficult for people to support their family. Thus the use of arm function contributes a lot to the lives of people and holds significant national and social importance.

Project achievements:

a. **Progress vis-a vis objectives -** Final prototype ready for field testing to gather performance and market data to optimize revenue models
b. **Technology/Product (to be) developed -** A Game-based Arm Rehabilitation Device, aimed towards neuro-rehabilitation of stroke victims and motor rehabilitation of victims with an upper motor deficit due to conditions such as Cerebral Palsy, Multiple Sclerosis, Traumatic Brain Injury, Fracture, Frozen shoulder, etc.
c. **IP generated/ Potential for IP generation -** 1 Patent granted, PCT application also filed.
d. **Resources Generated -** A startup created, 2 Employees trained, 8 Interns trained

Plans to take innovation further

Fundraising to scale-up operations and production. Partnerships for clinical studies and distribution channels.

Risks envisaged

Sale conversion, Clinical Validation data, Logistics of Sale & Service, Manufacturing at Scale

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BIODESIGN INNOVATION LABS

Title of the Proposal

Oxygen Therapy for Children below 5 years to reduce Neonatal & Pediatric Mortality in Developing Countries.

Brief description

Biodesign Innovation Labs is a medical device and healthcare technology company developing indigenous respiratory support device that is based on Bubble CPAP oxygen therapy for reducing infant mortality in low resource healthcare settings as an alternative for low flow and high flow oxygen therapy to treat Pneumonia and related respiratory distress conditions in children under 5 years.

Current stage of development

Validation

Innovative Element(s)

The solution is novel, innovative and indigenous Bubble CPAP oxygen therapy that is affordable, easy to use and suitable for low resource healthcare settings where Pediatricians can easily administer Bubble CPAP oxygen therapy for infants without the need for improvising on the ground with cutting nasal cannula as a jugaad modified Bubble CPAP

Market Potential

The market size for therapeutic respiratory devices in India is worth USD 8.5 Billion and estimated to grow at a CAGR of 11.7% over the period of 2024. Service Available Market USD 5 Billion approximately.

National/Societal relevance

One in six deaths in the pediatric age group are due to illness that end in respiratory failure. The under-5 mortality rate in India is 39.4 per 1000 births. This accounts for 1 million deaths annually.

Project achievements

a. Progress vis-a vis objectives - Product Development for the respiratory support device, designing new components, functional improvements in the respiratory support device, testing the device with test lungs for pressure consistency for a bench study, getting clinical feedback from doctors, getting ethics committee approvals for clinical pilots, submission of MD 22 for regulatory clearance have been completed

b. Technology/Product (to be) developed - Indigenous respiratory support device for infants based on Bubble CPAP oxygen therapy

c. IP generated/ Potential for IP generation - Filed a US Patient, 2 Indian Patents, PCT and Design registration

d. Resources Generated - Biodesign Innovation Labs have received 6.5 Lakhs from Qualcomm India as part of Qualcomm Design in India Challenge and was awarded by Ministry of Meity and DPIIT along with Qualcomm India as top ten startups in India for the QDIC program. The Company has employed four engineers, public health consultant and few doctors are associated with this project.

Plans to take innovation further

Biodesign Innovation Labs is in talks with Phoenix medical systems for distribution of the product under development once the clinical validation is completed and also talks with few investors such as Menterra, Unitus ventures and Pi Ventures etc. for raising the seed round of funding.

Risks envisaged

Regulatory challenges associated with time consuming in approvals

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BIOLMED INNOVATIONS PVT. LTD.

Title of the Proposal

Evaluation and validation studies on BiolMed BGS - a novel osteoconductive bone graft substitute

Brief description

Bone graft substitutes are important for accelerated healing and remodeling of bone voids or defects caused by trauma, infection and some other conditions. Optimal combination of porosity, pore size, mechanical strength and rate of bioresorption along with excellent biocompatibility are essential characteristics of the bone graft substitutes. A unique and patented process to prepare 3D silk fibroin scaffolds has been developed. Uniqueness of this product is in the fact that there is optimal combination of all above properties, unlike other synthetic products available today. In this project, advanced preclinical studies for this silk fibroin based bone graft substitutes were conducted.

Current stage of development

Validation

Innovative Element(s)

Innovation is in the process developed for the processing of silk fibroin into the 3D form that has combination of all the essential and desirable properties

Market Potential

Global bone grafts and substitutes market is valued at USD 2.35 billion in 2014.It is anticipated to grow at CAGR of 4.5 from 2015 to 2023 to reach USD 3.48 billion. Synthetic bone grafts are routinely used in long bone and spinal fusion failures. Indian market share is considered to be 6-8 percent of global market. This translates into approximately INR 650 Cr market.

National/Societal relevance

Currently, surgeons are forced to use autografts. In autografting, the surgeon extracts bone from another part of the patient's body. This is the golden standard in the industry today due to unavailability and unaffordability of synthetic bone graft substitutes in India. BiolMed BGS is based on silk fibroin. India happens to be the second largest producer of silkworm silk. Developing such value added niche applications for an ancient material will strengthen the mature sericulture industry in India.

Project achievements

a. Progress vis-a vis objectives - Completed animal phase and in vitro studies on Serioss and also successfully completed pilot scale up to produce 500 gm/month of serioss

b. Technology/Product (to be) developed - Osteoconductive bone graft substitute based on Silk fibroin

c. IP generated/ Potential for IP generation - Patents licensed from NCL, Pune. Intellectual property : WO2014125505A1, EP & JP granted, WO2016110873A

d. Resources Generated - Employment generated- 2

Plans to take innovation further

In advanced discussions with investors. Intend to raise equity based investment by the end of 2019, and write a BIPP for matching funds, to support clinical trials.

Risks envisaged: To date there is no product in the market that uses silk fibroin as a bone grafting material. Thus, successful completion of preclinical investigations is a challenge for this material.

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BIOLMED INNOVATIONS PVT. LTD.

Title of the Proposal

In vitro and In vivo Evaluation of BioIMed-Serimat, as an alternative to Acellular Dermal Matrices

Brief description

Acellular Dermal Matrices ADM are commonly used in implant based breast reconstruction to form pockets to hold and support implants, and act as a matrix for neo soft tissue regeneration. Use of this technique has advantages and thus is becoming popular. However, there are disadvantages associated with ADMs such as higher risk of infections and seroma. ADMs are prohibitively costly, and unavailable in India. BioIMed has developed a unique composite matrix of regenerated silk fibroin, non-woven mesh and woven sheet of Silk Fibroin having macro, micro and meso level porosity. This matrix is thus a resorbable supporting scaffold with appropriate mechanical properties. The process of synthesis of matrix also results inappropriate surface texture required for cell adhesion, cell proliferation and also angiogenesis.

Current stage of development

Validation

Innovative Element(s)

Process of making the composite matrix using combination of woven and non-woven meshes and sheets is a novel concept. It improves surface texture, gives large surface area for cell adhesion. Porosity will promote cell growth and angiogenesis. Combination of various forms of SF used give optimum balance of required properties

Market Potential

Current numbers of breast cancer patients in India are pegged at 1.5 lac. US also has similar number of patients. Globally the number exceeds 1.7 million per year. Besides its proposed use in breast reconstruction, it also has application in the soft tissue regeneration needs. U.S. soft tissue reinforcement and regeneration market is predicted to reach 3.7 billion in 2021

National/Societal relevance

India has seen rise in number of young breast cancer patients. There is immense improvement in the quality of life of such patients when they opt for IBRS. This product will bring the cost of IBRs within reach for more number of patients. Besides being of help to cancer patients, this product will also strengthen the hands of silk farmers.

Project achievements

a. Progress vis-a vis objectives - Completed in vitro studies, finalized design of custom made machines, and have got permissions for animal studies
b. Technology/Product (to be) developed - BioIMed-Serimat Silk fibroin and Sericin based Dermal mesh for Breast Reconstruction surgery
c. IP generated/ Potential for IP generation - In the process of filing a patent.
d. Resources Generated - Two persons employed

Plans to take innovation further

Raising further funds through investors and new grants

Risks envisaged

The main risk will be associated with market penetration.

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BIOMONETA RESEARCH PVT. LTD.

Title of the Proposal

Field validation of Z-Box: A device to reduce the spread of infection in Healthcare Environments

Brief description

Biomoneta's Z-Box technology aims to prevent the transmission of infection in healthcare spaces and product contamination in biotechnology environments. Our novel, extremely effective air decontamination technology traps and kills bacteria, mold and viruses that contaminate the environment and cause infection and product loss.

Current stage of development

Pre-commercialization

Innovative Element(s)

Biomonet's Z-Box technology very effectively kills microorganisms at the source of contamination. It is safe for continuous use in the presence of humans. It can create local zones of decontamination on the fly without requiring any additional infrastructure.

Market Potential

Z-Box technology finds application in multiple environments requiring low-bioburden. Main customers are hospitals and spaces required for manufacturing and logistics of medical devices, biotechnology products and pharmaceuticals. This extremely effective, energy efficient, air decontamination technology also finds utility in home care, controlled plant growth facilities, aircrafts, automobiles etc.

National/Societal relevance

The World Health Organization states that Healthcare associated infections are the most frequent adverse event in healthcare delivery worldwide. Over 95percent of ICUs in India are multi-patient and are run with no downtime for terminal cleaning. Technology such as Z-box that requires minimal staff intervention or sophisticated infrastructure, and can be deployed continuously in the background of routine hospital functioning

Project achievements

a. Progress vis-a vis objectives - Early data from clinical studies show the device is able to decontaminate hospital pathogens. We are in the process of studying the effect of the device in reducing infection rates.
b. Technology/Product (to be) developed - Z-box air decontamination device
c. IP generated/ Potential for IP generation - Patent applications have been filed in India, US and EU. A second IP filing is being planned
d. Resources Generated- 5 people employed directly by the company and working with additional 10 people outside the company for clincal studies, device design, fabrication etc. Company has raised ~Rs 2 and half crores in funding thus far from grants, investment etc.

Plans to take innovation further

Expect to launch for the biotechnology market in November and to hospitals by mid-2020.

Risks envisaged

Innovative, first-in-class devices have a limited time to impact the market before copycat products are created. It is important to enhance the team with engineering, supply chain and relevant business development experts and to create awareness of the benefits Z-box devices can bring.

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BIONIC HOPE PVT. LTD.

Title of the Proposal

A Low cost, EMG controlled robotic prosthetic Hand with a sense of touch for upper limb amputees

Brief description

The existing prostheses lack any form of Sense of Touch, some technologically advanced devices have tried to incorporate it but need is to use Targeted Muscle Reinnervation surgery or implants into the residual limbs. Applicant has aimed at prostheses keeping in mind affordability and non-invasive methods in mind to create a device that would be simple and quick to learn as well as effective to use while providing feedback to the user.

Current stage of development

Validation

Innovative Element(s)

-Learning Time of 1 single day instead of a few days for other devices.
-Low-cost indigenous MMG Sensors that need no post-processing like EMG sensors
-Provide feedback to the user and improve the Learning time

Market Potential

In India, there are an estimated 8 to 10 Lakhs of hand amputees out of which 70 percent belong to the rural areas due to which prosthesis is inaccessible. There is a rise of 5 to 6 thousand hand amputees every year due to road and rail accidents. Globally there is an estimate of 33 Lakhs of Hand Amputees expected to reach 60 Lakhs by 2050.

National/Societal relevance

-Get rid of the social Stigma related to amputation
- Independence achieved by the users to perform basic day to day functions.
- Resume employment opportunities

Project achievements

a. Progress vis-a vis objectives - Prototype tested for 3 years life cycle. Prototype tested with 9 hand Amputees. -Received NOC from CDSCO. Commercial PCB development started
b. Technology/Product (to be) developed - Applicant Launch a pilot of device in Dec 2019 after they will achieve compliance related to Safety and EMC certifications
c. IP generated/ Potential for IP generation - Filed for a patent related to Active Prosthesis. 2 More patents are under drafting related to under-actuated prosthesis and application of feedback technologies in robotics and automation. 2 Conference papers published related to lifetime determination and the improvement in learning time.
d. Resources Generated - R&D and Low volume manufacturing facility to carry on R&D activities.

Plans to take innovation further

Tie up with a Hospital for IEC and Clinical Validation Pilot Studies. Tie Up with 3 limb fitting centers across the country. Collaborate with a leading NGO or Society like Rotary Club to spread awareness across the country

Risks envisaged

Changing Regulatory Situation for Medical Devices - Entry Barriers due to pricing

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BIOPRAXIS PVT. LTD.

Title of the Proposal

To demonstrate POC for a novel, Nano-conjugate based dialysis cartridge system that reduces blood urea which can be appended to existing dialysis machines resulting in reduction of patient dialysis duration from 4 hours to 1 hour.

Brief description

This project is conceived to develop a pre-cartridge having Composite Multivalent Bio-nano conjugates with high affinity for the toxin molecules of blood. The hydrolysis of urea from blood in 45/60 min instead of four hours of dialysis is the primary goal of this phase. Concurrent removal of urea by the proposed cartridge and other constituents by dialyser is expected to compress total dialysis time

Current stage of development

Proof-of-Concept

Innovative Element(s)

Concurrent removal of urea by the proposed cartridge and other constituents by dialyser is expected to compress total dialysis time

Market Potential

In India, total ESRD patients number will increase to 3.7 million by 2023. In India, Dialysis market is expected grow at 8.1 during 2017 - 2023 . As the number of CKD patients goes up, so has the size of the Indian dialysis market

National/Societal relevance

Society urgently needs to explore cost-effective and scalable solutions over a relatively short time frame

Project achievements:

a. Progress vis-a vis objectives - Prototype optimised for optimum urea removal. Invitro tests
b. Technology/Product (to be) developed - Technology is under development. In twelve months it will to enter the market
c. IP generated/ Potential for IP generation - Patent drafting is in progress
d. Resources Generated - 3 Manpower trained

Plans to take innovation further

Accudx USA, is supporting for the fund raising and clinical trails with Kalbe Farma, Jakarta, Indonesia, and Kalbe international group.

Risks envisaged

Funds for clinical trials and regulatory approvals.

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CARTOSENSE PVT. LTD.

Title of the Proposal

Portable Surgical Navigation System

Brief description

Surgical navigation in neurosurgery is the gold standard-of-care globally, but most patients in India and emerging markets lack access to this high standard-of-care. Cartosense has developed a compact surgical navigation product, along with advanced planning and visualization tools that guides neurosurgeons to accurately target deep-seated structures in the brain through safe and minimal skull openings.

Current stage of development

Validation

Innovative Element(s)

This opens up new clinical application areas and wider market penetration opportunities in India and emerging markets. It also has unique advantages for further integration with advanced visualization and surgical robotics because of its very large working volume and low manufacturing costs.

Market Potential

The global surgical navigation market is valued at $600M and is poised to become a multi-billion-dollar market within the next 5-7 years as the use of surgical navigation becomes increasingly widespread across brain, spine, ortho, ENT and dental surgery, especially in emerging markets.

National/Societal relevance

Majority of patients that undergo brain surgery have post-operative complications, such as functional deficits, seizures and life-threatening hemorrhages. This product will democratize minimally invasive and safe surgery by making it widely accessible to different tiers of hospitals

Project achievements

a. Progress vis-a vis objectives - A complete surgical navigation product for neurosurgery has been. New high-accuracy optical measurement technology has been developed in a breakthrough compact form factor.
b. Technology/Product (to be) developed - Product is currently being manufactured for testing and pilot installations
c. IP generated/ Potential for IP generation - IP filed
d. Resources Generated - 4 personnel employed. Research and development facilities created: high-end calibration lab, hardware and prototyping facilities

Plans to take innovation further

Commercialization in progress

Risks envisaged

Competition from larger players in the international market

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CHIMERA TRANSLATIONAL RESEARCH FRATERNITY PVT. LTD.

Title of the Proposal

Development of solid phase multiplex assay for the identification of antibodies against most frequent and unique Indian HLA antigens.

Brief description

The proposed solution has multi fold uniqueness. It covers genetic makeup of Indian ethnic diversity. Combines automated algorithmic intelligence with the toolkit to perform personalised and cost effective assays.

Current stage of development

Validation

Innovative Element(s)

Representation of HLA alleles covering Indian genetic diversity. Software employing algorithms for smart analyses. Unique toolkit design allowing the user to personalize the test.

Market Potential

Newly emerging transplant centers in the recent past is a positive indicator of growth of transplant industry. Among the hospitals interviewed, about 7 percent of the institutes had established their transplant centers within this year. 67 percent of the lab heads expressed their concerns associated with difference between western and Indian testing technology.

National/Societal relevance

This technology would be a transforming step in Indian transplant industry, significantly improving the transplant outcome of the country. Entry of this exclusive product in the Indian market would also reduce the dependency on imported solutions and increase the reliance on in-house, cost effective diagnostic assays.

Project achievements

a. Progress vis-a vis objectives-
   1. Developing an optimized database of Indian HLA-alleles: done
   2. Proof Of Concept: done
   3. Market Study: in progress
   5.Validation Of Proof Of Concept: in progress
   5.Upscaling Proof Of Concept to develop quality conscious prototype
   6.In-house and on-field prototype validation
b. Technology/Product (to be) developed - Under development. Estimated time to enter the market is 24 months from now.
c. IP generated/ Potential for IP generation - Applied for a final patent application, the reference application number for the same is - E-2/702/2019/DEL
   Primary application number - 201811016151
d. Resources Generated - Developed a strong team of pathologists, biotechnologists, computational biologists and technicians.

Plans to take innovation further

To upscale the prototype and perform a pilot study and seeking funds.

Risks envisaged

Initial capex required for production of monoclonal antibodies and tailor made HLA antigens molecule would require support from the government.

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CHROGENE AAROGYAM BIOTECH PVT. LTD.

Title of the Proposal

Non-invasive Point of care diagnostics for Sickle cell Disease

Brief description

The proposed device is a non-invasive, point-of-care instrument, consisting of a multi-wavelength LED probe with an associated sensor which identifies the sickle-cell disease SCD. The device is a self-contained, portable and battery operated making it suitable for mass screening of rural population without affecting their routine work.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Portable non-invasive point care diagnostics device to identify sickle cell disease . The use of the magnetic ring. No biological and chemical waste involved. an affordable and user friendly device for mass screening of SCD where the disease is highly prevalent

Market Potential

Looking at the market potential, the proposed approach is using a non-invasive device, basically designed for point of care POC in a low resource set up. It could be easily operated with an initial training to the primary health care individuals.

National/Societal relevance

The existing technologies which are available in the market are having some draw backs in terms of logistic issues, cost concerns and tests being carried out in the laboratory settings. Our proposed device would be definitely be a better solution to the existing set up.

Project achievements

a. Progress vis-a vis objectives - Design & prototypes completion. Prototype assembling with final specifications. The above two is planned for 1-6 months after the receipt of the grant
b. Technology/Product (to be) developed - The product under development is a non-invasive device for point of care diagnostics for sickle cell disease SCD.
c. IP generated/ Potential for IP generation - Basic patent application filed and the same has been published. PCT application filed and published. Patent of addition draft ready. To be filed soon
d. Resources Generated - Trained biomedical intern students on the product details

Plans to take innovation further

Attended the final round of ISB D-Labs for investors and mentor connect, fund raising on 11th of October 2019 in Delhi. Final result awaited.

Risks envisaged

Minimal risk

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COMOFI MEDTECH PVT. LTD.

Title of the Proposal

An augmented reality based robotic device to access kidney for PCNL surgery

Brief description

Radiation exposure and challenges in kidney access during kidney stone removal surgery PCNL surgery causes health hazard to or staff and reduced surgical efficiency. The deliverable in the project is building an AI, AR, and cobot powered next generation surgical intervention platform to improve surgery outcome and safety of healthcare practitioners.

Current stage of development

Proof-of-Concept

Innovative Element(s)

As compared to current mechanical gantry systems or free hand technique, technology provides reliable and accurate puncture in the kidney, no radiation exposure to the urologists, and controlled puncture reducing post-surgery complications. For hospitals, it saves critical or time and improves patient relation management

Market Potential:

All urology specialty or multi-specialty hospitals performing more than 12-15% surgeries per month are our potential customers. Market size for PCNL related surgical intervention in India is more than 700 Cr INR.

National/Societal relevance

10-12% population in India is suffering from kidney stone disease. Stone disease has an important effect on the health care system with a prevalence of 10% and an expected recurrence rate of nearly 40-50%. This technology will help commercially establish deep tech healthcare product in India with a huge potential upside both commercially and socially.

Project achievements

a. Progress vis-a vis objectives - Completed feasibility phase and at near completion of optimization phase. First prototype has been tested on inanimate models. Cadaver testing is in progress.
b. Technology/Product (to be) developed - nGuideTM, has two main components- a cobotic device controlled by a controller installed with puncture planning software. It is anticipated to soft launch the product in first quarter of 2021.
c. IP generated/ Potential for IP generation - One patent has been filed and there is potential new IP generation.
d. Resources Generated - 3 people employed, 2 interns trained, basic electro, mechanical fabrication space is created.

Plans to take innovation further

Grantees are applying to raise funds mainly through government grants, CSR funds.

Risks envisaged

Grantee had collaborated with few key hospitals for clinical validation of the robotic platform. Even with established marker need, it will be important to convince surgeons to adopt the device.

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CYONICS CYTO SOLUTIONS PVT. LTD.

Title of the Proposal

Development of point of care instrumentation and kits for epidermal tissue harvesting and dissociation for application in Wound care, Burns and leukoderma / Vitiligo treatment

Brief description

Team has developed a point of care Instrument and Disposable devices for Epidermal tissue harvesting and further dissociation to make single-cell suspension which can be directly applied to the affected area.

Current stage of development

Validation

Innovative Element(s)

Developed a point of care multipurpose instrument used for adipose stem cells and PRP preparation also and disposable devices for skin cell transplantation in 2-3 hrs from skin harvesting to Cell preparation. The Instrument is specialized for several types of tissue dissociation with peltier based temperature controller and mixing controls at optimum temperatures.

Market Potential

The devices will be used for Vitiligo, burns, wound healing and research applications at present which may have a market value of 6-7 crores per annum. The instrument is multipurpose and can be extended to use in other applications of regenerative tissue / cell transplantation.

National/Societal relevance

Regenerative medicine is potential treatment option for several retractable diseases. The tissue and cell transplantation requires special laboratories which may not be possible in several clinical set ups. Point of care technologies saves money and time for several treatment options

Project achievements

a. Progress vis-a vis objectives - The semi-automated instrument Beta version is manufactured and validated in rat models for Blister creation and centrifugation. The tissue Harvesting and dissociation Devices are manufactured tested in Rat models for their functionality.

b. Technology/Product (to be) developed - Another 6 or 8 months for obtaining NOC from CDSCO for clinical use.

c. IP generated/ Potential for IP generation - Patent documentation is under process and the product is Potential to generate Patent

d. Resources Generated - The manufacturing facility is being constructed since the device manufacturing requires medical grade Cleanroom facility. However further funding is required to make the facility as per ISO 13485 norms.

Plans to take innovation further

Seeking funds for establishing a manufacturing facility and transforming the system to an automated processing machine to use for multiple applications.

Risks envisaged

Seeking funds for establishing a manufacturing facility and transforming the system to an automated processing machine to use for multiple applications. Expecting reliable, risk-bearing partners for marketing the product.

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DF3D CREATIONS PVT. LTD

Title of the Proposal

Cloud based platform for creation of 3d printed surgical guides online.

Brief description

The Osteo3d Cloud based platform enables the surgeon to design and fabricate patient specific 3d printed guides online.

Current stage of development

Commercialized

Innovative Element(s)

The Online platform is a one of a kind solution that increases accuracy and reduces the duration of the surgery by means of enabling the creation of patient specific surgical guides for mandibular reconstruction by grafting the fibula from the patient's body. This is an effective approach for patient suffering from cancer.

Market Potential

With the large incidence of cancer of the head & neck area, there is a large patient base within India and abroad that need cost effective, high quality patient specific surgical guide for mandibular reconstruction.

National/Societal relevance

It provides cost effective, high quality patient specific solutions complying to ISO 13485:2016 standards for patients for mandibular reconstruction -especially for cancer patients

Project achievements

a. Progress vis-a vis objectives- Project Completed

b. Technology/Product (to be) developed - Osteo3D cloud based platform

c. IP generated/ Potential for IP generation - Design Registrations.

d. Resources Generated - 6 Manpower trained

Plans to take innovation further

Collaboration with international surgical equipment companies.

Risks envisaged

Major risk seen is non-payment for product/service by Hospital Management.

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DIAGNORITE INNOVATIVE HEALTHCARE PVT. LTD.

Title of the Proposal

Development of a Prototype Blood Test Kit for Earliest Diagnosis of Acute Myocardial Infarction at any Healthcare Setup

Brief description

Grantee is developing a new blood test that detects superior and earliest cardiac marker H-FABP from blood stream. H-FABP appears in the blood stream only in the case of emergency conditions, majority being acute myocardial infarction or heart attack. India still do not have this test in the market for routine use

Current stage of development

Validation

Innovative Element(s)

The H-FABP tests available elsewhere in the world are antibody-reagent based. These reagents involve animals, are difficult to raise and difficult to manufacture in large scale. Indian work and climatic conditions make antibody-based reagent manufacturing extremely difficult. Our novel reagents are recombinant: easy and cost-effective manufacturing suitable for India.

Market Potential

Estimatedprevalence of Cardiovascular disease or CVD in India is 54.5 million as CVD is the leading cause of death in India. Â Heart attack diagnostics Global Market is estimated at 15.4Billion USD by 2024.

National/Societal relevance

Chest pains are taken seriously as it may mean heart attack. But as only 10% of the chest pain cases have real heart attack and it is difficult to identify real emergency cases through symptoms and ECG, many lives can not be saved and many heart-burn cases receive heart attack treatment.

Project achievements

a. Progress vis-a vis objectives - Grantee has developed reagents for detection of H-FABP from human serum. Currently optimization of these reagents in a lateral flow assay format that shall be validated with clinical samples.
b. Technology/Product (to be) developed - Blood tests that detect H-FABP in ELISA and Lateral Flow Assay formats. We need approximately 2 years to enter market provided enough fund is raised.
c. IP generated/ Potential for IP generation - None
d. Resources Generated – Manpower trained

Plans to take innovation further

Looking for funds from government and non-government sources. IISER-Kolkata is keen on supporting us for pilot manufacturing and beyond. They have identified a few potential partners for manufacturing and marketing as well

Risks envisaged

Fund raising in the era of recession is extremely difficult especially in the pre-revenue stages.

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DIPTI GUPTA

Title of the Proposal

Low cost, Disposable, and skin like electrodes for Electroencephalography EEG

Brief description

In the project fabricated EEG electrodes that are ultrathin, stretchable and easily mounted on the skin like a patch. Such skin like electrodes make conformal contact with the skin due to which they are able to maximize the signal-to-noise ratio SNR of sensors, exclude movement artifacts and provides high temporal and spatial resolution without requiring conductive gel, tape, skin-penetrating pins.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Looking at several limitations of the conventional electrodes, the development of ultrathin, flexible and compliant materials based electrode systems is highly relevant, which will be the core innovation in this project. Skin-like EEG electrodes that are ultrathin, flexible and stretchable enables conformal contact of electrodes to the skin via van der Waals forces alone and thus the device is able to provide low impedance even without gels, and offers comfortable, non-invasive recording of important physiological data.

Market Potential

This work may have huge market potential as it as a very low cost wearable technology for continous EEG monitoring and for other related applications, such as in Dyslexia Screening, neuro-disorders etc. Some invasive and implantable applications are in Epilepsy diagnosis and monitoring.

National/Societal relevance

Developed EEG electrodes will be of grade interest for developing medical devices

Project achievements

a. Progress vis-a vis objectives - Completed
b. Technology/Product (to be) developed - Conformal and wearable dry EEG electrodes, however, their long term capabilities such as testing signal quality over long durations, biocompatibility tests still need to be performed to enable them for clinical trials and to enter into commercial world.
c. IP generated/ Potential for IP generation - Indian Patent Application No. 201921022239
d. Resources Generated - 4 Manpowers were trained

Plans to take innovation further

Talks are already on with several healthcare and educational companies to explore the possibility of developing products using flexible EEG electrodes as these electrodes are going to be suitable for long term uses

Risks envisaged

Long term testing and acquiring high quality signals, interfacing electronics and integrating with standard EEG machines

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DZEAL PVT. LTD.

Title of the Proposal

Rotary endodontic file in basket form

Brief description

BIG RC file is a rotary endodontic file used during bio mechanical preparation of root canal of tooth. It is simple to use, conservative, less chances of separation in canal and easy to retrieve design.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Innovation lies in the design of the file and the change it will bring of doing root canal treatment. This design is an attempt to merge the efficient way of mechanical debridement with chemical cleaning.

Market Potential

International market of rotary file is 182 Million USD. A 10% penetration will give market of 18 M USD. INR 127 Cr.

National/Societal relevance

Reduce incidence of file separation will help in providing the optimum root canal services to patients. This improved success rate will boost the efficacy perception of this treatment among masses. This will encourage more patient to opt for this treatment and thus save the tooth that would have been extracted otherwise .As more teeth would be saved with this treatment, it will help to decrease the morbidity and poor quality of life due to missing teeth

Project achievements

a. Progress vis-a vis objectives - Development of prototype: Completed. Mechanical tests as per ISO: Completed. Ex vivo comparative study: Completed. POC Result: BIG RC file is statistically equivalent to market available rotary file
b. Technology/Product (to be) developed - BIG RC file: A rotary endodontic file.
c. IP generated/ Potential for IP generation - Indian Patent issued.
d. Resources Generated - Team: 4 Consultants: 3

Plans to take innovation further

Fund raising for clinical validation study, manufacturing unit set up and Llicensing out to an international company

Risks envisaged

Funds to set up a manufacturing unit and marketing.

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DZEAL PVT. LTD.

Title of the Proposal

Clinical validation of BIG file

Brief Description

BIG RC file is a rotary endodontic file used during bio mechanical preparation of root canal of tooth. It is simple to use, conservative, less chances of separation in canal and easy to retrieve design.

Current Stage of Development

Validation

Innovative Element

Innovation lies in the design of the file and the change it will bring of doing root canal treatment. This design is an attempt to merge the efficient way of mechanical debridement with chemical cleaning, where we want minimal damage to tooth with complete removal of infection.

Market Potential

International market of rotary file is 182 Million USD. A 10 percent penetration will give a market of INR 127 Cr.

National/Societal Relevance

Reduced incidence of file separation will help in providing the optimum root canal services to patients. This improved success rate will boost the efficacy perception of this treatment among masses. This will encourage more patient to opt for this treatment and thus save the tooth that would have been extracted otherwise. Reduced incidence of file separation and complete removal of broken file will boost the confidence of dentist. Development of an indigenous technology will bring more foreign research funding and add value to exports

Project Achievements

a) Progress vis-a vis objectives - Manufacturing process finalized and preparation for validation is in progress.
b) Technology/Product developed - BIG RC file: A rotary endodontic file.
c) IP generated/ Potential for IP generation - Indian Patent issued.
d) Resources Generated - 5 team members, 3 Consultants and a facility for processing Nitinol including shape setting, acid pickiling.

Plans to take innovation further

Fund raising for manufacturing unit set up and licensing out to an international company.

Risks Envisaged

Funds to set up a manufacturing unit and marketing.

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EKISTICS SOLUTIONS PVT. LTD.

Title of the Proposal

Autologous Reconstruction of Aortic valve AuRA

Brief description

AuRA is a cloud-based technology innovation for recreating the native aortic valve by using a patient'S own tissue. AuRA intends to provide an easily reproducible, economical and customizable solution to address inherent shortcomings of prevalent prosthetic solutions. AuRA addresses inherent issues associated with prosthetic valves like high cost, need for lifelong anti-coagulants, risk of patient prosthetic mismatch and structural failures of mechanical valves.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Aims to perfect and promote a technique that replaces an expensive prosthetic valve replacement with a customised valve recreation using the patient's own tissues. The accuracy and the pervasiveness of this approach with leverage advanced technology to make the valve repair less risky and more affordable.

Market Potential

The market potential for AuRA is huge as it looks at disrupting a ~10 BUSD valve replacement market. In India itself, there are more than 30,000 valvular replacement surgeries being performed each year where the impact of such a solution can be game changing

National/Societal relevance

AuRA aims to provide an affordable and customized surgical solution to a high impact problem. This solution will be a game changer in the Indian market where the power lies in the Government adopting it and making it accessible to our large population in the far flung areas.

Project achievements

a. Progress vis-a vis objectives - Development of design software and the processing of 3d printing an accurate replica of the mould for the replacement of a diseased valve.
b. Technology/Product (to be) developed - AuRA is currently being developed as a technology and process innovation that encompasses medical technology, advanced cloud computing, machine learning, computer aided design and 3D printing.
c. IP generated/ Potential for IP generation - To be filed
d. Resources Generated - NA

Plans to take innovation further

To take this innovation to the next level with the help of collaborations from the right partners like research institutes, hospitals, medical technology device manufacturers, funding partners, Franchisee partners, etc.

Risks envisaged

Displacement of established players like the valve manufacturers. Adoption risk - New technology and process adoption hurdles. Funding risk - having enough capital to take it to next level.

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FASTSENSE DIAGNOSTICS PVT. LTD.

Title of the Proposal

Electrochemical Point of care Portable Detection Kit for Liver cancer

Brief description

Cancer is the most fatal disease with more than 10 million death each year and the number of new cancer cases may reach close to 25 million a year in the next 2 decades. The major cause of death and expenses related to cancer is the late diagnosis. Even in developed countries, most cases are diagnosed at an advanced stage when no treatment is possible.

Current stage of development

Validation

Innovative Element(s)

Development of on-chip affordable easy to use sensing platform with mobile interface for easy data display, transfer, and storage in the cloud server. The whole concept is novel lives can be saved after early detection.

Market Potential

The global market on in-vitro diagnosis devices IVD would be $94 Billion in 2025. While in India would expect to reach $1.5-1.7 billion by 2020 5-year CAGR 15-20

National/Societal relevance

Cancer is leading cause of death worldwide and global cancer burden is estimated to 18.1 million new cases and 9.6 million deaths in 2018. While as per ICMR, India had 14 lakh cancer patients in 2016 and this number is expected to increase. Cancer is the second most common disease in India responsible for maximum mortality with about 0.3 million deaths per year.

Project achievements

a. Progress vis-a vis objectives - First objective is to develop the point of care, rapid, accurate device for HCC detection. To get it validated with standard tests would be our last milestone for BIG and obtain necessary approvals is critical step before commercialization.
b. Technology/Product (to be) developed - Sens is the product for point of care, rapid accurate and early detection of HCC. Currently we are validating our device with standard tests to establish its efficiency.
c. IP generated/ potential for IP generation - One patent provisional filing is done and another parallel project under NIDHI, another patent is also under process.
d. Resources Generated - In-house facilities for on-chip electrodes fabrication and universal platform technology that can be extended for other sensing need as well.

Plans to take innovation further

Planning to have a complementary partner for jGTM to avail the existing sales and distribution network, while focus is on product enhancement and extension based on feedback loop from market.

Risks envisaged

The risks are generic that are associated with any technology-related initiatives

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FLEXMOTIV TECHNOLOGIES PVT. LTD

Title of the Proposal

Flexcrutch: Flexure and Kinetic Shape based Crutches for enhanced mobility and reduced energy consumption

Brief description

All Terrain, Self Standing Crutches Axillary and Elbow which can be used on wet and uneven surfaces such as mud and snow without slipping. It is energy efficient and will not make the user tired even after walking long distance.

Current stage of development

Commercialization

Innovative Element(s)

Polymer tip of traditional crutch is replaced by flexure a flexible metal sheet in a foot like design that works like a leaf spring absorbing the impact when the person tries to put his weight forward and later while the person tries to lift the crutch for the next gait motion, the stored energy is released leading to easier lifting of crutches.

Market Potential

Around 50 Lakh people in India with reduced mobility elderly, disabled, paraplegic require crutches every year but most of them use wheelchairs due to the problem of improper medical advice and slippage issues with traditional crutches in Indian terrain conditions.

National/Societal relevance

Developing countries especially India has 5 times more people with mobility disability. These people suffer from poor Quality of life as the basic crutches does not properly solve the problem of walking and they get tired by walking small distance with it and their productivity is low.

Project achievements

a. Progress vis-a vis objectives - Clinical Trials on Normal crutches to understand gait and generate product specification. User study on existing users to understand their difficulties. Design, Prototype and test new design on the users. Conduct comparative clinical gait analysis for our design and competitive crutches. Manufacture crutches and distribute to NGO for Validation. Fatigue testing for ensuring reliability

b. Technology/Product (to be) developed - Product commercialized and is undergoing Final manufacturing process stabilization

c. IP generated/ Potential for IP generation - Utility Patent filed in India and PCT Design Patent Granted in India. Trademark for Flexmo has been approved and Pending grant in Dec 2019

d. Resources Generated - 6 Manpower Employed, 50Lakhs fund raised as convertible debt, work orders etc, 230 Life improved as part of our product

Plans to take innovation further

Fund raising, Scaling up Manufacturing and Marketing

Risks envisaged

Mentality of customers End user and NGO to purchase cheap Chinese product as opposed to value oriented products

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GENOMIX MOLECULAR DIAGNOSTICS PVT. LTD.

Collaborator: National Research Centre On Equines-ICAR,HISAR

Title of the Proposal

Scheduling Equines from Fatal Zoonotic disease- Glanders and Equine Infectious Anemia EIA in India using Point of Care Diagnostics POCD

Brief description

Genomix Glanders and EIA Rapid and ELISA Antibody Detection Test Kits are a Lateral Flow and Indirect Ab ELISA based point of care Assays for the qualitative determination of Glanders and EIA Specific antibodies in whole blood/Serum samples of Equines samples at point of care areas. The RDT kits are designed to detect the primary antibodies against the Glanders/EIA through a Gold conjugated Protein G captured by the specific antigen HCP1, TssA, TssaB for Glanders, RP26 for EIA.

Current stage of development

Pre- commercialization

Innovative Element(s)

Till date no precise standardised diagnostic methodologies are available to detect Glanders and EIA in equines. The technology utilised in the development of diagnostic kits is well versed and established. In addition, these kits can be utilised at point of care settings to get quicker results.

Market Potential

Military Services, Horse breeders and veterinary clinicians being the prospective buyers in India, Gulf countries, US and Europe. These RDT and ELISA kits are cheaper than that are available in the market and at par with the quality, can be a better alternative to the kits imported

National/Societal relevance

Both these diseases are of economic importance to horse breeders, armed forces, police as they cause mortality among equines.

Project achievements

a. Progress vis-a vis objectives - Scaling up of recombinant protein production Development of ELISA and point of care test In-house and third party validation of kit

b. Technology/Product (to be) developed - ELISA and Lateral flow rapid diagnostic kits for Glanders ELISA and Lateral flow rapid diagnostic kits for Equine Infectious Anaemia

c. IP generated/ Potential for IP generation - 2 Indian Patents are filed by NRCE-ICAR Recombinant TssA protein for detection of antibodies against Burkholderia mallei and uses thereof 3610/DEL/2015 Recombinant Hcp1 protein for detection of antibodies against Burkholderia mallei and uses thereof 4120/DEL/2015

d. Resources Generated - 1 manpower

Plans to take innovation further

Applied for manufacture licence through CDSCO, New Delhi

Risks envisaged

None

Project coordinator:
Rathnagiri Polavarapu

Team Members:
Hari Shankar Singha &
G. Vinay Chand Vidyasagar

Contact:
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Kukatpally Hyderabad
ANDHRA PRADESH
India-500072

GENRICH MEMBRANES PVT. LTD.

Title of the Proposal

Oxygen Enrichment unit (OEU) for increasing life expectancy of aging patients suffering from COPD and Asthma

Brief description

Oxygen therapy is as essential as medicines for patients suffering with chronic respiratory diseases including COPD, Asthma, ILD. Unlike the current methods, our oxygen concentrator is portable, plug-and-play, easily can be taken to the door step of the patients instaed patients coming to big city for treatment. With our oxygen concentrator, we aim to elevate life-style and life-expectancy of these patients

Current stage of development

Validation

Innovative Element(s)

Though oxygen separation using membrane technology is practiced in developed countries on industrial scale, miniaturization for individual patient is done by Genrich. This constitutes novelty.

Market Potential

In India, there are 55 million COPD and 34 million Asthma patients. There are 75 million and 400 million COPD patients globally. By considering the average cost per patients, the total addressable Indian market is 975 million USD.

National/Societal relevance

In India, currently Oxygen Therapy is mainly available in big cities and big hospitals. Due to imported technology and/or hardware, high maintenance the current methods are costly and are out-of-reach for majority of the patient population particularly BoP population.

Project achievements

a. Progress vis-a vis objectives- All technical objectives achieved, validation and design change achieved.
b. Technology/Product (to be) developed - Another 8-10 months are required to reach the market after funds availability
c. IP generated/ Potential for IP generation - Patent is filled
d. Resources Generated - employment for 6 people. Trained 10 interns.

Plans to take innovation further

By Fund raising

Risks envisaged

Market acceptancy.

Project coordinator:
Ulhas Kharul

Team Members:
Rajendra Kharul,
Sharayu Pithore,
Nitesh Gangade &
Arati Rathod

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Pashan Pune
MAHARASHTRA India-411008

HAPPY RELIABLE SURGERIES PVT. LTD.

Title of the Proposal

Image Guided Surgical Navigation System for Spine

Broad Area

Healthcare-Devices and Diagnostics

Brief description

easyNav navigation system is an image guidance system. It helps the surgeon in precise pedicle screw placement by 3D tracking of the surgical tools with the help of stereotactic camera and computer.

Current stage of development

Pre-Commercialization

Innovative Element(s)

It uses unique pattern recognition technology makes it one and only consumable-less navigation system available in the Indian market. Its automatic C Arm registration with zero profile tracker reduces the number of X ray shots drastically

Market Potential

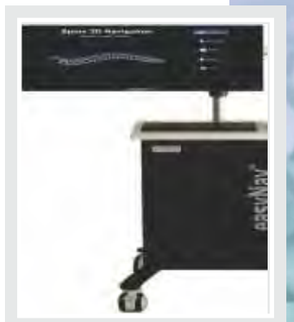
Market potential is $200 million dollars

National/Societal relevance

Currently available navigation systems in Indian market are imported. The cost of these systems is very high and they also need costly consumables. The developed unique pattern recognition technology is totally consumable-less. Its compact size, ease of use and cost makes it more affordable for hospitals even in tier 2 and tier 3 cities

Project achievements

a. Progress vis-a vis objectives - Completed spine 3D CT Based navigation & completed spine 2D C Arm navigation
b. Technology/Product (to be) developed - Implementation of 3D C Arm navigation with automatic registration CT and C Arm image fusion & Market release of Fluoro Navigation C-Arm based in next 6 months
c. IP generated/ Potential for IP generation - Under process
d. Resources Generated – 5 Manpower hired



Plans to take innovation further

By fund raising, partnership

Risks envisaged

None

Project coordinator:
Arpit Paliwal

Team Members:
Kshitij Palkar,
Pruthvesh Pipaliya &
Shweta Paliwal

Contact:
834, 13 Cross, Near Sharma
Music School Mahalakshmi
Layout Bangalore
KARNATAKA India-560086

HTIC, IIT MADRAS

Collaborator: Mitra Medical Services, Delhi

Title of the Proposal

SmartEye-Technology platform for endoscopy.

Brief description

A state of art 4K/UHD, 60 fps, flexible video endoscope system, with smart flexible video scopes and intelligent image enhancement features for improved usability and clinical utility. The key technology innovations that we are planning are smart-scopes with embedded intelligence and wireless capabilities, true-multi-spectral imaging scopes, deep learning-based image processing and computing.

Current stage of development

Proof of Concept

Innovative Element(s)

Wireless technology for video transfer,Multi spectral imaging, deep learning based intelligent image processing & analytics modules for enhanced diagnosis & clinical decision support

Market Potential

The commercial impact of the technology and products is estimated at Rs. 1000 Crores over 8 years after the project completion.

National/Societal relevance

Nearly 15 Million endoscopes are performed in India every year. There is a clear clinical need and market requirement for affordable endoscopy devices, which can be addressed only by an Indian company with indigenous technology development capabilities.

Project achievements

a. Progress vis-a vis objectives - Development of CMOS endoscopic image sensors and multispectral imaging is underway.
b. Technology/Product (to be) developed - 4K/UHD, 60fps, flexible video endoscopy system with smart probes and intelligent image enhancement features within 3 years Next generation, 4K+,60fps flexible video endoscopy system with advanced multispectral imaging, multimodal tissue visualization and intelligent computing for decision support in 4 years
c. IP generated/ Potential for IP generation - Potential IPs for multispectral imaging in endoscopic image diagnosis
d. Resources Generated - 8 member team experienced in embedded hardware, software, firmware, mechanical, image processing

Plans to take innovation further

Initiation of collaboration with CMC and AIIMS for clinical validation. Collaboration with Mitra Medical Services for manufacturing and commercialization

Risks envisaged

Availability of latest image sensor chips, Ensuring EMI/EMC compliance of smart scopes, Integration of SIBs with active, temperature sensitive electronics into the plastic scope handles

Project coordinator:
Mohanasankar Sivaprakasam

Team Members:
K. Yesurathnam, Rahul G.S., Keerthi Ram, Maharaj Singh, Rajendar Raina & Preejith S.P.

Contact:
5th floor, 'C' Block, Phase 2, IIT-Madras Research Park, Kanagam Rd, Tharamani, Chennai, Tamil Nadu 600113

HUWEL LIFE SCIENCES PVT. LTD.

Title of the Proposal

Development and manufacturing of end to end room temperature stable molecular diagnostic reagents.

Brief description

manufacturing of IVD reagents and kits which can be transported and stored at Room temperature. Once suggested sample transport media is established entire system can be offered as package making molecular diagnostic testing independent of low temperature requirements. Reference and evidence for inhibitior resistant taq already exists in the literature. Availability of reverse transcriptase which can work in crude samples will be a step ahead in the direction of extraction free detection. It will also boost development of better microdevices.

Current stage of development

Validation

Innovative Element(s)

End to end room temperature stable solution is not completely innovative step considering market solutions but extremely important to set up in Indian scenario. Whereas development of inhibitor resistant reverse transcriptase is an innovative and useful idea. It can lead to a good IP and help country to make a mark in this field.

Market Potential

A conservative estimate of indian market is approx 150 cr with a CAGR of 25% A part from existing classical molecular market the proposed products can expand to tier 2 and tier 3 cities and low resource areas

National/Societal relevance

Confirmatory diagnostics should reach en masse in vast country like India to avoid spurious and discontinuous use of drug. These practices lead to drug resistance as reported in case of TB and other infections leading to high rate of mortality. Hence ease of operation and availability of high quality stable reagents across the country is highly desirable.

Project achievements

a. Progress vis-a vis objectives - LAB scale lyophilization of amplification mixes is done
b. Technology/Product (to be) developed - Lyophilized complete amplification mix. with in two years
c. IP generated/ Potential for IP generation - Lyophilised composition and mutant has great potential for patenting.
d. Resources Generated - Technical and nontechnical Manpower is employed and trained

Plans to take innovation further

Partnering with strong parteners who can help to take product to the national and international market.

Risks envisaged

Partnering with strong partners who can help to take product to the national and international market.

Project coordinator:
Rachana Tripathi

Team Members:
M Shesheer Kumar, V.S.K Chakrawarty, Ch. Ravi Kumar, B. Ravi, Pranay Katkar & V.S.S Pavan kumar. M

Contact:
Narsingi, Hyderabad, Telangana 500075

IATOME ELECTRIC INDIA PVT. LTD.

Title of the Proposal

Commercialisation and Development of Compact High Frequency X-Ray Machines

Brief description

The project is to develop key technologies and to use this for the development of a series of commercial diagnostic x-ray equipment. Specifically, a hand-held dental x-ray, portable general x-ray and a fluoroscopy generator is developed. The models or variants of products possible is however, much wider

Current stage of development

Pre-Commercialization

Innovative Element(s)

Composite HV insulations, New Electronics and Software Design, Innovative packaging, High Frequency Operation, High Dose efficiency.

Market Potential

Hand-Held dental x-ray is imported and this is an import alternate. Similarly, the High Frequency generators used for making local units are imported. There is good potential for import substitutions.

National/Societal relevance

The technology enables new type of x-ray equipment which are mostly available as imports. The safety and performance of these systems are superior and hence the diagnosis is more efficient.

Project achievements

a. Progress vis-a vis objectives - Dental X-Ray & portable general X-ray has been commercilizized. Fluoroscopy generator is under development
b. Technology/Product (to be) developed - Composite HV insulations, New Electronics and Software Design, Innovative packaging, High Frequency Operation, High Dose efficiency.
c. IP generated/ Potential for IP generation - None
d. Resources Generated - Manufacturing facility, production staff, SAP ERP, Marketing Team, Sales Team, Working Capital from Bank

Plans to take innovation further

Need to raise working capital from private funds.

Risks envisaged

Brand name, Service and Sales Network

Project coordinator:
Biju S Nathan

Team Members:
Uthamachandran,
Lavanya U, Indrajeeth &
Sathyamoorthy

Contact:
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New Dhamu Nagar
PN Palayam Coimbatore
TAMIL NADU India-641037

IIT-BOMBAY

Title of the Proposal

Determining and Development of Digital Device for Screening and Diagnosis of Dyslexia among Hindi Speaking Children

Brief description

To investigate and ascertain causal factors and exact symptoms of developmental dyslexia among Hindi speaking children and then develop a digital tool for Screening and Diagnosis of developmental dyslexia

Current stage of development

Proof-of-Concept

Innovative Element(s)

This will be the first of its kind effort in India to make digital platform for the screening and diagnosis of Hindi speaking dyslexics especially by incorporating phonological processing, word recognition, decoding, spelling, automaticity etc.

Market Potential

The proposed digital tools is going to address to about 30 million potential dyslexic children. Since solution is being developed in the digital form, economy of scale will be in the favor of this product leading to successful commercialization of this digital assessment tool at a very reasonable investment.

National/Societal relevance

Dyslexia screening tools which are used currently like Woodcock Johnson test, IQ Tests and DAT in India are not standardized as per Indian languages. In this project we will incorporate latest findings and and valid the tools with EEG based Biomarkers for Dyslexia.

Project achievements

a. Progress vis-a vis objectives - Conceptualization of module and recording of the data. Analysis of the data Conceptualization of the module
b. Technology/Product (to be) developed - Digital tool for screening and diagnosis of dyslexia is underway. Within six months,we expect to develop the product.
c. IP generated/ Potential for IP generation - Potential for new IP generation
d. Resources Generated - Trained two interns and one RA

Plans to take innovation further

After developing digital tool, we will approach to industry for scaling up.

Risks envisaged

None

Project coordinator:
Azizuddin Khan

Team Members:
Manish Kumar,
Aiswarya Rai & Ayyub Khan

Contact:
Bombay Powai Thane
CTARA Office,
Old CSE building,
IIT Bombay Mumbai
MAHARASHTRA
India-400076

IIT- DELHI

Collaborator: AIIMS, Delhi

Title of the Proposal

Continuous Noninvasive Blood Pressure Waveform Measuring Device for Cardiovascular Health

Brief description

To devise an affordable and accurate, cuff-less, non-invasive, table-top, simple to operate BP device along with its software and data integration platform for highly reliable monitoring of hypertension for personalized as well as large scale community monitoring. For personal health monitoring, the device will be closely integrated with mobile application to get personalized data for hypertension monitoring.

Current stage of development

Proof-of-Concept

Innovative Element(s)

The traditional blood pressure measuring device gives only systole and diastole pressure information which are incomplete for full analysis. The blood pressure waveform can provide a lot more information about cardiovascular health. T device can give complete BP waveform, from where feature extraction can be done to relate to numerious other cardivascular health parameters.

Market Potential

Currently, there is no device existing that can give waveform based BP measurement based on direct tonometry based pressure measurement in the affordable segment, under 1000 INR.

National/Societal relevance

The software platform can be used for integration of anonymized data for open sharing and data visualization as needed for access by the community, government, researchers, and health organizations

Project achievements

a. Progress vis-a vis objectives- Developed the mechanical form factor in wearable and pentype form factors, its associated processing electronics and algorithm.
b. Technology/Product (to be) developed – proof of concept is ready, validation will be perform
c. IP generated/ Potential for IP generation – An patent is filed on "A NOVEL DEVICE FOR MEASURING PRESSURE PULSES BASED ON APPLANATION TONOMETRY"
d. Resources Generated - A start up registration is under process. Trained BTechs, MTech as well as PhD scholars in cardiovascular bioengineering through this project.

Plans to take innovation further

Out licensing

Risks envisaged

None

Project coordinator:
Sitikantha Roy

Team Members:
Dinu S Chandra

Contact:
Kusuma school of biological sciences
IIT-Delhi Hauz Khas
New Delhi DELHI
India-110016

IIT - MADRAS

Collaborator: Imov Motiontech Pvt. Ltd.

Title of the Proposal

A foot-drop rehabilitation device offering customized treatment and monitoring

Brief description

The primary goal of this project is the development of a customizable Functional Electrical Stimulator FES with a key differentiator of being able to provide highly personalized treatment to patients. A FES is used to provide treatment for patients suffering from movement disorders

Current stage of development

Validation

Innovative Element(s)

The customizability aspects of the system where a doctor can easily add multiple channels of stimulation, and advanced machine learning techniques will easily learn the optimal muscle activation sequence automatically. The second main innovation is that the software will provide real time feedback updates on how to walk optimally in order to conserve energy a critical indicator of optimal gait

Market Potential

In Hospitals and Rehabilitation, Clinics Geriatric rehabilitation centers

National/Societal relevance

Worldwide, the WHO states that about 15 million people suffer stroke every single year across the world . These strokes could result in the inability of the survivor to perform basic movement tasks, severely impairing the quality of life.

Project achievements

a. Progress vis-a vis objectives - Proof of concept first developed and tested Design and Fabrication of custom wireless sensor and Base Station modules Discrete event algorithm for foot-drop Specification and Performance Documentation Sensor Data Acquisition 50 Datasets Hardware Prototype ready Medical Grade Software being developed
b. Technology/Product (to be) developed – Automatic Stimulator Control, Gait Module for Gait Analytics, Integrated Stimulation with Gait module
c. IP generated/ Potential for IP generation - Patent filed
d. Resources Generated - 3 Employees have been employed in this project. Electronic Assests developed

Plans to take innovation further

Partnered with SIM, Chennai and Manipal Bangalore to validate and take the product into commercialization. Looking for a Series A funding from investors to get into the world market

Risks envisaged

Adaptability of these devices to frequent changes in hardware and communication technologies.

Project coordinator:
Ramkrishna Pasumarthy

Team Members:
Vinay Sridhar,
Viswanath Talasila,
Arjun Nanda &
Geethanjali R

Contact:
Dept of Biotechnology
IIT Madras Chennai
TAMIL NADU India-600036

INDIUS MEDICAL TECHNOLOGIES PVT. LTD.

Title of the Proposal

Development of a Novel Self Actuating Hydraulics based Growing Rod Technology for Growth Induced Correction in Paediatric Scoliosis

Brief description

Early Onset Scoliosis EOS affects children below the age of 10, who are not yet skeletally mature. If left untreated, the growth of the deformed spine results in severely compromised pulmonary and cardiac function and even an early death. The growing rod currently under development is hydraulic based and focuses on mitigating the complications involved in current procedures for scoliosis correction in paediatric patients.

Current stage of development

Validation

Innovative Element(s)

Systems focus on deformity correction followed by predictive increase in spinal height at regular time intervals through distraction forces on the implants

Market Potential

A conservative estimate of 1000 procedures/year gives a market potential of INR 30 Crores at a price between INR 1 to 5 Lakhs. In USA, a price of USD 15,000 to 30,000, gives a market potential of USD 30 Million.

National/Societal relevance

The hydraulic rod will help reduce complications related to repeat surgery lengthening procedures, wear debris, sub - cutaneous rod placement and numerous anchoring points and will reduces overall costs

Project achievements

a. Progress vis-a vis objectives - Design finalized based on surgeon feedback and manufacturing constraints. Initial sample manufacturing initiated.
b. Technology/Product (to be) developed - Hydraulic based Growing Rod for Early Onset Scoliosis
c. IP generated/ Potential for IP generation - India Patent granted for Self-Actuating Hydraulic Growing rods One application Pending. Application filed in USA, Japan and the European Union
d. Resources Generated - One Product Development Engineer recruited. Computer System and necessary support software purchased.

Plans to take innovation further

Post design finalization, validation testing, animal testing and regulatory approvals, funds will be raised to set up the full commercial manufacturing facility with necessary / additional resources.

Risks envisaged

Changes in Medical Device rules and Regulatory environment

Project coordinator:
Aditya Ingalhalikar

Team Members:
Sagar Sathaye,
Manali Kunte &
Meet Pandya

Contact:
100, NCL Innovation
Park Dr. Homi Bhabha Road
Pune MAHARASHTRA
India-411008

INDIAN INSTITUTE OF TOXICOLOGY RESEARCH-CSIR

Title of the Proposal

Development and clinical validation of markers for a point of care diagnostic kit for diabetic nephropathy

Brief description

Project is aimed at identification of clinically validated multi-marker panel for early detection if diabetic nephropathy. Diabetic patients will be screened for stage of diabetes and kidney diseases using established methods. The stage and grade will then be correlated using our early diagnostic markers for their sensitivity and specificity.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Multimarker assay which can predict region specific renal damage. Specific for diabetic nephropathy which has unique pathological features. Precise association between stages of diabetes and diabetic nephropathy

Market Potential

Indian diabetic market growing at more than 25 per cent and pegged at Rs 7,638 crore. Renal Function Test Market Excepted to be Worth US$ 900 MN by 2026. 30-50 of diabetics will proceed to renal failure at later stage according to studies and early detection kit may be helpful for them.

National/Societal relevance

Approx 30-50 of more than 60 million diabetic patients in India will develop kidney diseases. Only 10-20 of Indian kidney failure population has access/can afford the costly dialysis/renal transplant at present. Diabetic patients with kidney diseases: cost is 4 time more per hospitalization â‚¹ 12,664 vs. 3,214 .

Project achievements

a. Progress vis-a vis objectives - Project in initial stage. Collection of patient samples and their grading in progress.
b. Technology/Product (to be) developed - This is proof of concept proposal for testing newer diagnostic markers for diabetic nephropathy in Indian population. If successful, can lead to development of new highly sensitive multimarker assay for early detection of diabetic nephropathy.
c. IP generated/ Potential for IP generation - A potential patent for a multimarker assay for early detection of diabetic nephropathy would be generated.
d. Resources Generated - 2 research associates are being trained in markers assessment and development

Plans to take innovation further

Following successful validation, grantee will be looking for an industry partner to develop a microfluidics/strip based or similar assay platform.

Risks envisaged

Patient to patient variability. Multifactorial disease etiology may give false signals. Cost of scaling up the proposed future multimarker assay.

Project coordinator:
Vikas Srivastava

Team Members:
Vineeta Sharma

Contact:
80, Mahatma Gandhi Marg
31 Vishvigyan Bhawan
31, M.G. Marg Lucknow
UTTAR PRADESH
India-226001

INNAUMATION MEDICAL DEVICES PVT. LTD.

Title of the Proposal

AUM voice prosthesis

Brief description

A voice prosthesis device, which is implanted in patients undergoing laryngectomy enabling the patient to speak after surgery.

Current stage of development

Pre- Commercialization

Innovative Element(s)

Unique inserter that facilitates easy insertion of the device. & technique for Esophageal ring during primary insertion

Market Potential

More than 1 million patients globally

National/Societal relevance

Patients with throat cancer coming in stage 4 end up losing their voice box because by then the voice box is completely destroyed by the cancer.

Project achievements

a. **Progress vis-a vis objectives -** Currently in the process of complying with regulations CDSCO
b. **Technology/Product (to be) developed -** The device, Aum Voice Prosthesis is ready to hit the market.
c. **IP generated/ Potential for IP generation -** IP's are filled
d. **Resources Generated -** Clean Room Works have been partially completed, factory floor is setup for production, device has obtained bio-compatibility clearances

Plans to take innovation further

Plan to reach out to Regional Cancer Centers, Government and Private cancer hospitals. Trying to add the device as part of the ADIP Scheme.

Risks envisaged

Generate funds for operations being a social enterprise with the focus on keeping the prices as low as possible.

Project coordinator:
Vishal U S Rao

Team Members:
Shashank Mahesh,
VIshwas Uchila Shishir,
Madhukar S M, Amit Karnik,
Prasanna Hegde &
Asif Ahmed

Contact:
B26, 2nd Main Road Peenya
2nd stage Peenya
Industrial Area
Bengaluru 560058

INOCHI CARE PVT. LTD.

Title of the Proposal

Combined Negative Pressure and Oxygenation Therapy for Accelerated Healing of Chronic Wounds

Brief description

Innovative multi therapeutic wound healing technology consists of an electronic medical device along with a specially designed dressing to deliver multiple therapies at the wound site to facilitate faster healing. This technology targets various biological phenomena to simultaneously stimulate the biochemical and biophysical interactions leading to accelerated wound healing.

Current stage of development

Validation

Innovative Element(s)

Combined delivery of multiple therapies which makes the device usable for treatment of more than one type of wound

Market Potential

Chronic wound segment is projected to grow at the highest CAGR of 3.7% in 2018-2025 due to increase in incidence of chronic diseases.

National/Societal relevance

A majority of 700 million people live in rural areas where the condition of medical facilities is deplorable. Nearly 86 of all the medical visit in India are made by rural people with majority still travelling more than 100 km to avail health care facility of which 70-80 is born out of pocket landing them in poverty. The qualitative and quantitative availability of basic health care facilities is far less than the defined norms by the World Health Organization WHO

Project achievements

a. **Progress vis-a vis objectives -** Clinical partnership with AIIMS for testing efficacy and safety.
b. **Technology/Product (to be) developed -** Currently undergoing clinical studies
c. **IP generated/ Potential for IP generation -** Indian and International application filed through PCT route
d. **Resources Generated -** Total Funds raised: 1.3 Crores,Manpower: 5, Facility: inhouse prototyping capacity

Plans to take innovation further

The regulatory certifications like ISO 13485 and BIS and start with the pilot production and finalizing the contracts for manufacturing facilities.

Risks envisaged

Changing landscape of regulating medical devices and funding

Project coordinator:
Neelarnab Dutta

Team Members:
Shivani Gupta &
Suteerth Tripathi

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Near Namghar Jorhat
ASSAM India-785001

HEALTHCARE - DEVICES AND DIAGNOSTICS

PACE-AIR

INSTITUTE OF CHEMICAL TECHNOLOGY, MUMBAI

Collaborator : Tvasta Bio-Science Pvt. Ltd.

Title of the Proposal

Bioprinting of 3D skin in a microfluidic device for pre-clinical investigations.

Brief description

The project will focus on building Proof of Concept models. A prototype Bio-printer will be developed during the course of this project. This prototype printer will be used for printing skin tissues using skin-on-a-chip technology. The end result of the project will be PoC versions of the technologies – a software-controlled extrusion Bioprinter and a skin-on-a-chip tissue for preclinical research that will be prototyped and scaled up in further efforts.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Microfluidic based skin-on-a-chip technology is a next-generation perfusive 3D culture approach for in-vitro skin development. Additionally, in order to alleviate problems with reproducibility and human error, the present project aims to introduce 3D bioprinting technology along with a novel bioink for expediting the process of culture development using Skin-on-a-chip.

Market Potential

The Bioprinter being developed can be sold to research labs. The skin tissue can be sold to cosmetic and pharmaceutical companies to test their products, replacing long and expensive animal trials. The organ-on-a-chip technique can also open avenues to other tissues that can be commercialised in the future.

National/ Societal relevance

The prudent approach of its development and relative lucrativeness as compared to international counterparts/ companies will enhance its practical utility at national and international levels. It also supports the 3 Rs – Reduce, Refine and Replace – of animal testing by encouraging the development of alternative-to-animal models of drug & cosmetic testing.

Project achievements

a. **Progress vis-a vis objectives -** Development of computer-controlled extrusion-based 3D bioprinter platform: Designing and manufacturing are complete. Testing is in progress. The software control system has been designed and completed.

b. **Technology/ Product (to be) developed -** (i). Development and validation of the on-printer temperature control system. (ii) Development and characterization of PoC 3D Microfluidic co-culture of Mammalian Skin using 3D Bioprinter system

c. **IP generated/ Potential for IP generation -** (i) Indian Design No. 279195, 2016. Granted. (ii) Indian Design No. 307139, 2018. Granted (iii) Indian Patent Application No. 201621000456, 2016. (iv) International PCT Patent Application, PCT/IN2017/000071.

d. **Resources Generated -** 3 Manpower employed and trained, 1 Bioprinting facility developed

Plans to take innovation further

ICT Mumbai will licence out technology to interested organisations and will engage in consultancy with industry partners. Tvasta will commercialise the bioprinter in US and EU markets for general research.

Risks envisaged

Precise temperature control is necessary in order to prevent needle clogs during printing and is challenging to achieve.

Project coordinator:
Prajakta Dandekar Jain

Team Members:
Advait Bhagwat, Adithya VS, Parivartan Reddy, Yuvraj Sri

Contact:
Nathalal Parekh Marg, Matunga, Mumbai, Maharashtra - 400019

HEALTHCARE - DEVICES AND DIAGNOSTICS

IIPME

JANITRI INNOVATIONS PVT. LTD.

Title of the Proposal

Affordable, easy to use and portable uterine contraction monitoring device for low resources healthcare settings

Brief description

KEYAR is an affordable, easy to use and wearable fetal heart rate, uterine contraction and maternal heart rate monitoring device for the intrapartum period which also communicates with DAKSH which is an intelligent labor monitoring mobile application.

Current stage of development

Commercialization

Innovative Element(s)

Single patch which monitors fetal heart rate, uterine contraction & maternal heart rate, super easy to use by the staff nurses, generates automated WHO Partograph, Standard A4 paper printing, automated reminder to staff nurses based on the standard intrapartum protocol, automated filled case sheet printing and patient mobility during intrapartum period

Market Potential

More than 27 million deliveries takes place in India every year in more than 75,000 healthcare settings. The global market size of fetal monitor is about 3 billion dollar.

National/Societal relevance

Maternal/Newborn mortality/morbidity is a big challenge in India. Every year, 250,000 mothers and 2 million newborn die globally during the labor period and more than 99% of these deaths occur in developing countries. JANITRIs product helps staff nurses during the labor period for better monitoring and decision making which can prevent the maternal/newborn mortality/morbidity.

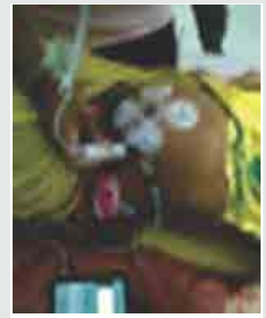
Project achievements

a. **Progress vis-a vis objectives -** Development of a patch based fetal heart rate and uterine contraction monitoring device and feasibility and validation study in comparison to the gold standard device completed

b. **Technology/Product (to be) developed -** Affordable, easy to use and wearable fetal heart rate, uterine contraction and maternal heart rate monitoring device

c. **IP generated/ Potential for IP generation -** 2 patents filed

d. **Resources Generated -** 15 people employed



Plans to take innovation further

Partnership with healthcare foundations and fund raising from a strategic venture

Risks envisaged

Regulatory, Localization of the product and Brand value

Project coordinator:
Arun Agarwal

Team Members:
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JC ORTHOHEAL PVT. LTD.

Title of the Proposal

POC to market of FlexiOH: Breathable, Washable and light weight cast immobilization for fractured bone/ joint injuries.

Brief description

FlexiOH is next generation Orthopedic Immobilization Technology being used for various orthopedic treatment such as bone fractures, sprains, soft tissue injury, post-surgery.

Current stage of development

Commercialization

Innovative Element(s)

Absolute washable, breathable and light-weight Orthopedic cast which is capable of preventing serious side effects such as skin/ wound infection, compartment syndrome. FlexiOH is quite easy and faster compared to conventional casting system, that makes it more suitable for rural/ emergency system. i.e. field support in defence.

Market Potential

24 people out of 1000 people suffers from bone fractures, and even more from soft tissue injuries. FlexiOH is 6th Generation Immobilization technology which is considered as most advanced in its segment.

National/ Societal relevance

So far OrthoHeal has generated 20 Direct and 50 indirect employment since 2015. FlexiOH is one of the few technologies which has been well recognized and appreciated even in developed countries like USA and UK. Currently OrthoHeal has its direct or indirect presence in 14 + countries and expanding.

Project achievements

a. **Progress vis-a vis objectives -** We have achieved significant (~60%) cost reduction in the polymers we were using. and we are trying to take it further down by synthesizing core materials in house.

b. **Technology/Product (to be) developed -** FlexiOH: The Next Generation Orthopedic Immobilization Technology

c. **IP generated/ Potential for IP generation -** IP has been generated and Owned by Department of BioTechnology - GoI and exlusively licensed to OrthoHeal Private Limited.

d. **Resources Generated -** 7 Employment generated, Two manufacturing facility set-up, 50M INR invested in the project.

Plans to take innovation further

Actively looking for distribution partners for further business development.

Risks envisaged

Increasing distribution network to reach across the country.

Project coordinator:
Pankajkumar Chhatrala

Team Members:
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Chintan Sapovadiya,
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JEEVTRONICS PVT. LTD.

Title of the Proposal

Development of advanced prototype of a very affordable Bi-Phasic Defibrillator with a built-in power generator for low resource settings.

Brief description

Jeevtronics has developed the world's first hand cranked defibrillator, which works even in rural, remote areas without electricity. It is battery-less and maintenance free. It is designed and engineered to international standards like IEC60601-2-4 etc and for ambulance vibrations, resistance to high temperatures, shock etc to EN1789/ AIS125. It is 4-15 times less expensive than comparable devices.

Current stage of development

Commercialization

Innovative Element(s)

Works even in areas without electricity. Never needs a battery change in its life time, thereby saving cost and eliminates battery trash.

Market Potential

Indian market for manual external defibrillator is about 70,000 units or Rs 700 crores per year. Out of this, only 10,000 units sold are new. Rest are refurbished. Jeevtronics SanMitra 1000 HCT is uniquely positioned to displace these units with its high quality and low cost. Worldwide market for defibrillators is about USD 12 Billion.

National/ Societal relevance

Sudden cardiac arrest kills 6-7 lakh people annually in India alone. This rate is 3-4x higher compared to the developed countries. Reasons: Lack of stable grid electricity and affordability. Similar is the situation in Africa, SE Asia, S America. This defibrillator is very cost effective, has built in power source and will work in rural remote villages too. This will be a boon for primary health centers, community health centers, sub-centers and even ambulances which do not have inverters + batteries (99% of Indian ambulances). If this defibrillator is deployed across the country, the death rate due to sudden cardiac arrest should come down.

Project achievements

a. **Progress vis-a vis objectives -** Project complete.

b. **Technology/Product (to be) developed -** Worlds first dual powered hand cranked + grid defibrillator.

c. **IP generated/ Potential for IP generation -** US patent US6597949 B1 granted. Indian Design Patent 289404 granted. 2 Patents pending.

d. **Resources Generated –** 7 Manpower employed. Debt raised from Bank for getting production ready.

Plans to take innovation further

Trying to raise funds. Open to partnerships.

Risks envisaged

Scaling up distribution presence in India, Africa, SE Asia, S America.

Project coordinator:
Aniruddha Atre

Team Members:
Ashish Gawade

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Pashan, Pune,
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KORNERSTONE DEVICES PVT. LTD.

Title of the Proposal

CT Guided Needle Navigation Device.

Brief description

Computed Tomography (CT) has developed into a well-accepted and widely used guiding tool for a broad range of percutaneous interventions. However, there are many pitfalls in accurately inserting needles into the patient, which results in errors, repeated insertions, pain/ discomfort to patients, additional radiation, extended procedure time and complications. The High Noon device addresses all these problems effectively by accurately navigating CT guided needles without coming in contact with the patient, the needle or the CT machine, considerably reducing pain/ discomfort, repeated insertions, radiation and complications. It is also cost effective and simple to use.

Current stage of development

Validation

Innovative Element(s)

The High Noon device uses a positioning system consisting of 4 LED light sources to generate shadows, 2 laser sources and camera to visually assist the clinician to accurately insert the needle with precision into the patient. The idea is simple, easy to adopt and does not hinder the regular workflow.

Market Potential

There are about 6,000 CT machines in India and totally about 100,000 CTs globally. We expect to attach the High Noon device to about 10,000 units in the coming 5 years.

National/ Societal relevance

Current methods to perform biopsy limits the size of lesion over 10 mm diameter, while most centers target lesions above 30 mm. This device can help in accurately inserting the needle into a point of interest even as small as 2 mm.

Project achievements

a. **Progress vis-a vis objectives -** Project goals have been achieved - the initial prototype has been refined to reduce size and cost. Feedback was taken from 25+ users & implemented. Five prototypes were developed with the new specifications.
b. **Technology/ Product (to be) developed -** The device will be tested for regulatory standards Indian as well as CE. Additional validations are planned. Product would be ready to take to market in about 6-8 months.
c. **IP generated/ Potential for IP generation -** Indian patent granted in Jan 2019. Also applied - US patent, Europe Patent China Patent.
d. **Resources Generated -** Three trained engineers who manage the installation, demonstration, training, clinical validation etc. All other professional assistance is through consultants.

Plans to take innovation further

We are in the process of identifying and approving distributors. Initial discussion for licensing the product for manufacturing, marketing and sales.

Risks envisaged

Adoption of the device would be key to successful sales of the device. Though care has been taken to ensure that the device does not add steps in the process, radiologists may be reluctant to take risks with smaller lesions which have risky access.

Project coordinator:
Roy Santosham

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KRIYANEURO TECHNOLOGIES PVT. LTD.

Title of the Proposal

Development of wearable wireless limb band for home-based monitoring of Parkinson's Disease patients.

Brief description

We are developing a wearable device to monitor progress of pathology in Parkinson's disease.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

Continuous tracking of movement and regulation of dosage of medication.

Market Potential

One million customers in India.

National/ Societal relevance

The problem helps improve the quality of life of patients with Parkinson's Disease.

Project achievements

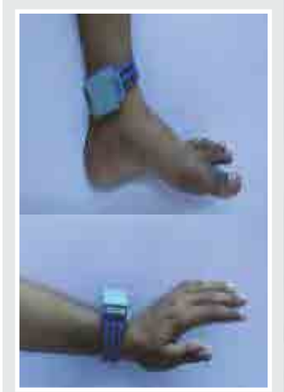
a. **Progress vis-a vis objectives -** Development of Limb Band and Limb Module – Completed
b. **Technology/ Product (to be) developed -** Wearable wireless limb band for home-based monitoring of Parkinson's disease patients.
c. **IP generated/ Potential for IP generation -** Tracking all four limbs, collecting data, developing a tool for limiting the degeneration in PD is done very little and scope of IP generation is enormous.
d. **Resources Generated -** Trained two individuals.

Plans to take innovation further

Currently, we are planning to do field trials in hospitals where we have tie up. We will update our design based on that before entering the market.

Risks envisaged

Possibility that the market is not receptive to this product since it does not cure the disease. Possibility of entering a market segment that is not receptive.



Project coordinator:
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KUMUDHA HEALTH TECH PVT. LTD.

Title of the Proposal

3D diagnostic and treatment planning tool for the spinal disorders.

Brief description

SPINAK is a 3D diagnostic tool for quantifying spinal deformities using stereo-radiographic reconstruction from biplanar X-rays, thereby enabling specialists to track the disease like scoliosis and provide better treatment. The registered users like doctors, surgeons, clinicians, biomechanics experts, have to upload two orthogonal X-ray frontal and lateral images to the cloud. The stereo-radiographic reconstruction and deformity quantification algorithms serves as Software as a service on cloud to support the users. The algorithm computes the 3D spine model and the deformity quantification report contains spinal indices like spinal curvature and axial vertebral rotation that quantifies the spinal deformities. The 3D models can be printed for the treatment planning such as surgical planning and guidance, designing the braces, developing new spinal fixation methods.

Current stage of development

Validation.

Innovative Element(s)

3D reconstruction from only two X-ray images, low-cost diagnostic tool 10-times economical, used for surgery simulation.

Market Potential

In the hospital where this tool is validated, 200 patients visit/ year. Identified 5000 hospitals across India.

National/ Societal relevance

Before the surgery, the patient need not undergo CT/ MRI scan. SPINAK can give equally good 3D model which can be used as a diagnostic tool. It can also be used for surgery simulation. It will save surgery time and also the patient recovery time. It will also reduce the overall cost of the surgery.

Project achievements

a. **Progress vis-a vis objectives -** Project is complete.
b. **Technology/ Product (to be) developed -** A 3D diagnostic tool for quantifying spinal deformities using stereo-radiographic reconstruction from biplanar X-rays.
c. **IP generated/ Potential for IP generation -** Filed an Indian patent.
d. **Resources Generated -** 6 people trained and 5 are employed.

Plans to take innovation further

Recently received a grant from Dept. of IT-BT, Govt. of Karnataka.

Risks envisaged

At present, doctors are using D-rays for the diagnosis. It is difficult to convince the doctor to use our advanced tool.

Project coordinator:
Sampath Kumar

Team Members:
Hareesha KS,
Soujanya Shetty, Ankita Ghosh,
Shilpa Rao, Rashmi KB

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Assoc. Professor Dept. of ECE,
Manipal Institute of Technology,
Manipal 576104

LATTICE INNOVATIONS PVT. LTD.

Title of the Proposal

Use of virtual reality (VR) goggles to aid in exercising vestibular disorders in elderly patients.

Brief description

The project is aimed at rehabilitating patients with vestibular disorders - commonly, balance disorders such as vertigo. Such conditions are estimated to affect 1 in 10 of the elderly, and contribute to falls and consequent morbidity. The approach is novel - we use virtual reality to simulate both real-world and laboratory conditions in the form of games. As patients move through various levels of the game, their progress is tracked and improvement measured. Virtual reality rehabilitation helps patients develop compensating mechanisms - such as visual feedback - that restore their sense of balance.

Current stage of development

Validation

Innovative Element(s)

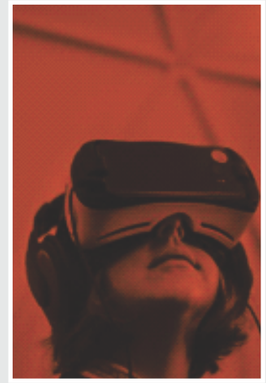
Our approach is novel in applying virtual reality tools developed for gaming to serve an unmet clinical need. VR enables rehabilitation to be done from an armchair - eliminating the need for customized, space-consuming, physical rehabilitation equipment that can only be installed in large clinics.

Market Potential

This product is optimized for use by ENT specialists, who see the majority of Balance Disorders. It can support a new service/ therapy that can be offered in doctor's offices, and hence lends itself to a viable business model.

National/ Societal relevance

This product will help alleviate the risk of falls and consequent injuries - a major source of morbidity in the elderly. Furthermore, improved balance will reduce challenges currently posed in everyday tasks such as walking, shopping and travelling - allowing patients to lead their lives with greater autonomy and freedom.



Project achievements

a. **Progress vis-a vis objectives -** Completed project on-time and below budget. Demonstrated working product at two trade shows, with an audience of over 500 ENT specialists. Completed pilot evaluation comparing VR with conventional rehabilitation.
b. **Technology/Product (to be) developed -** While the current product is market-ready, further investment is required to expand the technology platforms on which this system is available and expand the reach of the product.
c. **IP generated/ Potential for IP generation -** None so far.
d. **Resources Generated -** 6 full-time employees were engaged in the course of the project. Since licensing discussions are underway, additional resources have yet to be allocated to this product.

Plans to take innovation further

Licensing discussions with a firm that had developed a vestibular disorder diagnostic system are in progress. Successful completion of these negotiations will result in the device being offered to over 200 clinics in South-east Asia and the Middle East.

Risks envisaged

The primary risk is the acceptance of a new modality of therapy by the ENT community. This will require investment in clinical research, education efforts and evidence-driven marketing.

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Sahil Mehta

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Bikashkali Jana,
Soura Bhattacharyya.

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DELHI -110020

LORA MISHRA

Title of the Proposal

Development of Novel Endodontic File Viewing Box.

Brief description

During the root canal procedure, many files are used to clean the content of the infected root canal. Many procedural accidents can happen while performing root canal procedure. Separation of file within the root canal system is one of the most common procedural accidents that can hamper the patient and ruin the reputation of dentist. This device identifies the defects of chair-side and restricts its further use in the canal and therefore preventing separation of file.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

The scanning electron microscope and dental operating microscope are expensive, occupy huge space and used for research purpose. Therefore, there is a need of this device which will aid the dentist in identifying the defects in the file and prevents its further usage.

Market Potential

According to competitive intelligence report this device is ranked 1 in market potential in its segment. Based on searches. it appears that the present invention seems to possess industrially utility and will find wide application amongst dentists.

National/ Societal relevance

In India, the average cost of root canal treatment is Rs 2500 which is very cheap compared to what it's charged in European and US countries. The file which is used to perform root canal treatment are made from nickel titanium which are very expensive and cost approximately Rs. 2500 for 4 files. The same files are repeatedly used and abused in number of patients and break in the canal without warning. The separated files in canals cause foreign body reaction, pain swelling and ultimately extraction of otherwise health tooth is last resort. This device will aid the dentist in identifying the defects on file and discard it prior to use in the patient.

Project achievements

a. **Progress vis-a vis objectives -** The prototype is in progress and both software and hardware inputs are being utilized to enhance the accuracy of the device.
b. **Technology/ Product (to be) developed -** The sensitivity and specificity of the device needs to be validated. The entire device will have inbuilt calibrated data of all the files available in the market. This technology with the most commonly used files calibrated data will be available in the market in 1 year time.
c. **IP generated/ Potential for IP generation -** 201831030316: Application under examination
d. **Resources Generated -** Employment of research scholar, IPR Expert, Central tool training institute funds to make the prototype.

Plans to take innovation further

To own company which exclusively makes this product and market it with other innovative products.

Risks envisaged

Branding of product and distribution can be one the challenges.

Project coordinator:
Lora Mishra

Team Members:
Naomi Ranjan Singh,
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Aseem Mishra.

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LUMISOFT TECHNOLOGIES PVT. LTD.

Title of the Proposal

Affordable portable digital slit lamp.

Brief description

It is a portable, affordable, technician-friendly eye examination equipment, a slit lamp, that provides a near real experience to the remote observer. With an additional lens, it captures image of the fundus, aiding recognition of nearly 80 of causes of blindness.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

It provides a virtual 3D experience to the observer, integrates a slit lamp to a fundus camera, an app with a subscription for return on investment and a novel portable stand.

Market Potential

Total available market in India for slit lamps is about 60,000. Total market revenue potential for slit lamps and fundus cameras in India: 38,544 lakhs. Total available market worldwide: 4,00,000. Total market revenue potential worldwide for slit lamp and fundus camera: 26,000 lakhs. Gives return on equipment with just 4 phaco surgeries. Gives an opportunity to eye care professionals to expand their business to remote areas and yet be in the towns and cities. It helps governments in India and abroad to provide eye care in underserved geographies and communities. Helps in reducing burden of blindness with reliable opinion. App can be used for other specialities and sectors.

National/ Societal relevance

Prevalence of blindness in India is about 3 times the world average. This is higher burden of blindness in the rural areas as compared to urban areas, patients in remote areas lack adequate access to eye care facilities and there is a general shortage of ophthalmologists in India. This innovation addresses lack of reach of eye care services to the needy. It helps the patients to view themselves the condition of their eye. This helps in acceptance of cataract surgery as 55% population refuse cataract surgery due to their attitude. Nearly 60% of blindness is due to cataract. It also helps in counselling treatment for diabetic retinopathy or glaucoma.

Project achievements

a. **Progress vis-a vis objectives -** Proof of concept is available. Prototype that can be deployed in the field will be available in a month or two.
b. **Technology/ Product (to be) developed -** Portable slit lamp. Time to market: 1 year.
c. **IP generated/ Potential for IP generation -** Provisional patent filed. 3D slit lamp is a novelty. Additional potentials: Design patent of the product, copyright for the software and product patent for the table.
d. **Resources Generated -** 3 manpower employed. Facility for 3D printing. Funds mobilized from KBITS.

Plans to take innovation further

Licensing after clinical validation

Risks envisaged

Portable slit lamps do exist in market.

Project coordinator:
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MACHPHY SOLUTIONS PVT. LTD.

Title of the Proposal

Cry-cool box for end-point biotech cold chain.

Brief description

CryoCool Box is a subzero environment system for preserving biologics that require negative temperatures. It is an active device that provides favourable temperatures with charge & go facility.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

Solid state - PCM hybrid cooling technology, innovative I/P and O./P design for sample interactions.

Market Potential

The system will play a big role in connecting the gaps in last mile cold chain, particularly in the fields of diagnostics, healthcare, point of care treatments, etc. that need controlled environment.

National/ Societal relevance

For a country like India, the product, if implemented properly, can help in penetrating the major healthcare services to rural & remote households. Thus, a greater number of people will have access to better health care, particularly infants & women. Infant deaths & malnourishment issues can be prevented at mass scales.

Project achievements

a. **Progress vis-a vis objectives -** PoC is being validated
b. **Technology/ Product (to be) developed -** CryoCool Box is under development. It needs 6-8 months to enter the market.
c. **IP generated/ Potential for IP generation -** 2 patents will be filed in next 2 months
d. **Resources Generated -** 4 employment opportunities created.

Plans to take innovation further

Innovation will be taken further through licensing & angel investors will be approached.

Risks envisaged

Competition, Economies of scale & IPR issues.

Project coordinator:
Pradeep Rout

Team Members:
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MANIPAL ACADEMY OF HIGHER EDUCATION, MANIPAL UNIVERSITY

Title of the Proposal

Translation of CpG-Methylation Biosignatures of Genes for Rapid and Sensitive Diagnostic and Prognostic Applications during Cervical Cancer Progression.

Brief description

The novelty of the project is twofold. First, it is propose to validate specific DNA methylation changes in 11 genes discovered previously by us in a panel of normal, squamous intraepithelial lesion (SIL) and squamous cell carcinoma (SCC) of the cervix to test the clinical utility of specific CpG sites for early diagnosis and prognosis using non-invasive exfoliative cytology specimens. Secondly, it is propose to develop a non-invasive visual photometry-based method for the detection of gene-specific CpG methylation signatures directly from clinical specimens.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

Sensitive and specific molecular markers for early detection. Screening and prognosis of cervical cancer still needs to be established. It is propose to test previously identified DNA methylation markers which require testing in large number of samples with simple, low cost, rapid, sensitive and visual-based system in low resource settings such as in developing countries. The gold nanoparticle-based quantitative assay will be made amenable for direct detection of DNA methylation from the clinical specimen.

Market Potential

Low and middle income countries account for 86% of the cervical cancer deaths. In India, it accounts approximately for 122,844 new cases and 67,477 deaths annually. Many of the IVD and other kits used are based on testing of HPV or methylation markers which are expensive and may lack sufficient sensitivity and specificity.
Hence has a significant market potential.

National/ Societal relevance

Cervical cancer is an important public health problem in India and other developing countries. In India, it accounts approximately for 122,844 new cases and 67,477 deaths annually with highest age standardized incidence ratio in South East Asia of 22 when compared with 19.2 in Bangladesh, 13 in Sri Lanka, and 2.8 in Iran. Infection with HPV is amongst the most important risk factor for cervical cancer.

Project achievements

a. **Progress vis-a vis objectives -** Established CpG methylation fingerprints and gene expression of proposed DNA methylation signatures. Developed nanoparticle based visual and photometric method.
b. **Technology/ Product (to be) developed -** Development of nanotechnology-based DNA methylation by visual and photometric method. Validation of clinical samples.
c. **IP generated/ Potential for IP generation -** Submitted for IP.
d. **Resources Generated -** Three manpower trained. Nanoparticle technology developed.

Plans to take innovation further

They indent to partner with diagnostic industries, companies to license the product.

Risks envisaged

Entry into the market, Change in acceptance pattern, Regulatory approval.

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MEDIASHA TECHNOLOGIES PVT. LTD.

Title of the Proposal

Instasplint-The first-aid kit which we can use to immobilize the affected limb instantly.

Brief description

FractoAid for Early and Instant Immobilization of fractured limb. It is an integrated pack of hybrid composite materials with built-in hook-loop fastener straps for better securement. FractoAid is a ready-to-use product and requires only water. The 3-step application process DIP-SQUEEZE-WRAP makes it user-friendly. It conforms to the shape and contours of injured limb. It is lightweight and portable. FractoAid stabilizes and restricts the motion of injured limb, reduces muscle pain and muscle spasm, accommodates the muscle swelling, prevents the chances of a closed fracture becoming open.

Current stage of development

Commercialization.

Innovative Element(s)

FractoAid is an integrated pack of hybrid composite materials with built-in hook-loop fastener straps for better securement. FractoAid is a ready-to-use product and only requires water. The 3-step application process DIP-SQUEEZE-WRAP makes it user-friendly. It conforms to the shape and contours of injured limb. It is lightweight and portable.

Market Potential

The estimated global cast and splint market for year 2024 is INR 22,097 crore whereas, estimated Asia-Pacific market is INR 6,330 crore. The target audience for FractoAid is Educational Institutes (15,73,880), Ambulances (24,000), Healthcare centres (1,99,873), Registered Vehicles (21,00,23,289). The expected market for FractoAid is INR 762 Crore.

National/ Societal relevance

Globally every year, 200 Million people suffer from fractures. The population of India is 135.51 crore where every single minute 1 person gets injured in a road accident. According to a recent study of WHO, India has the highest number of road accidents with 14 deaths per hour. Dislocation, fractures, sprain are the most common injuries linked with road accidents.

Project achievements

a. **Progress vis-a vis objectives-** Pre-clinical evaluation by surgeons and functional prototype fabrication, Pre-clinical testing and benchmarking, Functional prototype fabrication
b. **Technology/ Product (to be) developed –** FractoAid - Early and Instant Immobilization of fractured limb. It restricts the motion of injured limb.
c. **IP generated/ Potential for IP generation -** Patent filed with title 'Orthopaedic hybrid plaster splint'. Full specifications are 08/04/2016 1464/MUM/2015. Technology is licensed to us. MediAsha and FractoAid Trademark filed.
d. **Resources Generated –** 3 employment generated, ISO 13485:2016 Certified facility.

Plans to take innovation further

Distributor partnership with dealers from Mumbai, Pune and Kerala. Direct sales to hospitals, educational institutes and ambulances in and around Pune.

Risks envisaged

Competition from foreign MNCs who have the advantage of established brand image. The target audience includes educational institutes, sports academies, defence training centers, hospitals, ambulances, which is wide. Reaching to each and every patient is challenging.

Project coordinator:
Mayur Sanas.

Team Members:
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MICROGO LLP

Title of the Proposal

On the GO, Powerless, Steamless Surgical Sterilizer for Resource Limited Settings.

Brief description

GOsteri is a no power/ no steam requiring sterilizer for surgical instruments. It is based on MicroGO's patented platform that releases surgical sterilant used for sterilization. It is portable, easy to use and can perform sterilization on the go in any resource limited settings.

Current stage of development

Validation

Innovative Element(s)

The most unique feature is in the delivery of surgical sterilant for sterilization of surgical instruments in a portable manner and operation of the device without the need of water and continuous use of power.

Market Potential

India and other developing nations which may suffer from power shortages that interrupt sterilization of surgical equipment have a huge potential for use of our device. It can also be applied in a resource-poor setting such as rural areas or in mobile hospitals and clinics.

National/ Societal relevance

Global healthcare need access to safe surgical sterilization, lack of which drives up the healthcare infection rates. Inadequate sterilization also contributes to the spread of HIV and other diseases that spread via contact through bodily fluids. At present we do not have any technology that is portable and can sterilize surgical instruments in resource limited settings.

Project achievements

a. **Progress vis-a vis objectives -** Validation is completed and regulatory requirements are being fulfilled.
b. **Technology/ Product (to be) developed -** Product will be launched in the year 2021.
c. **IP generated/ Potential for IP generation -** An Indian Patent is granted on the platform on which GOsteri is developed.
d. **Resources Generated -** A follow up funding from BIRAC under SBIRI scheme is received.

Plans to take innovation further

In the next stage, we plan to develop GOsteri for sterilization and disinfection of scopes.

Risks envisaged

Acceptability for regular use against conventional steam-based equipment.

Project coordinator:
Rachna Dave

Team Members:
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Sujitha Balu

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MIMYK MEDICAL SIMULATIONS PVT. LTD.

Title of the Proposal

An Immersive Endoscopy Simulation Platform

Brief description

The proposed endoscopy simulator named EndoMimyk enables the trainee to train for complex maneuvers and hand-eye co-ordination in a safe virtual world. It offers realistic visual, haptic feedback and auditory guidance for immersive learning in a safe virtual environment. It also provides assessment, tracking, and training in advanced GI diagnostic and therapeutic procedures.

Current stage of development

Validation

Innovative Element(s)

Haptics, Physics-based simulation, and product design are the key distinguishing features of EndoMimyk. As a result of these key technologies, the simulation platform is more immersive and imparts best practices in endoscopy training

Market Potential

Medical simulation and Bloomberg projects the medical simulation market to be more than $5 Billion in the year 2025. PI is looking at the opportunity to train over 200,000 medical professions every year. India forms the big chunk of this market with the opportunity of training 50,000 medical professionals every year.

National/Societal relevance

The proposed simulator is an indigenous technology. It is technologically superior and provides complete immersion for the training in endoscopy procedures. From a societal point-of-view, among Indias population, 30 percent suffer from gastro-related ailments, while only 15 percent are affected by diabetes. For more than 1.3 billion population, India just has about 2000 qualified Gastroenterologists in the country.

Project achievements

a. **Progress vis-a vis objectives -** built an advanced prototype of the EndoMimyk
b. **Technology/Product (to be) developed-** Haptics and Real-time simulation are the key technologies being developed for endoscopy simulator.
c. **IP generated/ Potential for IP generation -** filed for a US patent
d. **Resources Generated -** built a multidisciplinary team of about 10-12 engineers, designers, and artists

Plans to take innovation further

Plan to raise seed funding to take the innovation forward

Risks envisaged

The complexity in selling to institutions and training centers is the other challenge. Scaling from a start-up to a large production facility, while maintaining high-quality control of the finished product .

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Team Members:
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MIRAQULES MEDSOLUTIONS PVT. LTD.

Title of the Proposal

Development of a commercially viable and easily applicable first acting haemostatic agent – A First Aid Essential.

Brief description

Severe bleeding could lead to death within a minute, be it for civilians or army personnel. Miraqules, has developed StopBleed, a powder that clots blood within 30 seconds of application. StopBleed is 5 times faster than existing solutions and allows injured people to reach treatment without losing fatal amounts of blood, it cost 20% compared to competitors and, is easily affordable for use in hospitals, battlefields and first aid kits. It requires no expertise and anyone can use it without any training.

Current stage of development

Validation.

Innovative Element(s)

The powder can mimic the fibrin threads facilitating the clotting before fibrin formation takes place. It has a very high absorption capability to absorbs the watery part of the blood. The surface of the fibres was made to acquire a net charge because of which it attracts the blood cells and entraps them into its fibrous mesh, facilitating a mechanically strong clot formation.

Market Potential

The worldwide market is of Rs 42000 Cr. In India, there is an annual requirement of 400 million packets, which creates a total available market of Rs 20000 Cr with a price of Rs 500/packet.

National/ Societal relevance

There are several hemostatic agents available in the market but we have seen none of them much in use, especially in hospitals. Although there is a critical need, the existing solutions were unable to dominate the market because of their ineffectiveness and higher price.

Project achievements

a. **Progress vis-a vis objectives -** Team has completed our Pre-clinical small animal studies in accordance with ISO 10993 in a GMP lab. We are currently in the process of building our small scale production facility in order to procure our manufacturing license to launch the product in the Veterinary Market and complete the clinical trials.
b. **Technology/ Product (to be) developed -** Completed product development and waiting for the regulatory approvals to start selling in the Veterinary market, following which clinical trials will start to launch it in the Human market by Jan21.
c. **IP generated/ Potential for IP generation -** Filed 2 patents to date and those are in the PCT state.
d. **Resources Generated** - Two full-time members. In the process of building up our small scale ISO 13485 facility. Won the 1st prize in DRDO Dare to Dream contest in the Hemostatic Category with an equity-free cash prize of INR 10L.

Plans to take innovation further

They will enter the Veterinary Market entry & initiating Clinical trials for humans in 2020. By 2021, we plan to enter the Human market. Currently raising: Rs 2 Cr

Risks envisaged

According to the risk-based classification of CDSCO and FDA, StopBleed is considered as class C and Class 2 medical device for respective regulatory bodies.

Project coordinator:
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MODULE INNOVATIONS PVT. LTD.

Title of the Proposal

To Validate USenseTM: Platform based Low cost, Rapid and POC diagnosis of specific Uropathogens causing UTI, helping reduce AMR

Brief description

USense detects the presence of bacteria causing Urinary Tract Infections UTI . USense is a portable, point of care and affordable test that is aimed to direct clinicians towards a more accurate and targeted antibiotic therapy. USense gives the result in 15 minutes with colorimetric readouts that do not need a lab, instrument or a trained person for interpretation.

Current stage of development

Validation

Innovative Element(s)

Detect UTI either detect the bacterial by products or take upto 2 days to identify the organism. USense detects the presence of bacteria in Urine reducing false positives and does that in a rapid time of upto 15 minutes.

Market Potential

There are an estimated 150 million cases of UTI occurring every year globally. The total diagnostic market is estimated at 47 Billion US$ with the asian diagnostic market growing rapidly at 17% CAGR.

National/Societal relevance

The need of products that give accurate UTI diagnosis in a short span of time. This will also benefit the patient who will be treated faster with appropriate antibiotics and also leading to financials savings

Project achievements

a. **Progress vis-a vis objectives -** The project has been completed with 250 clinical validations done as against 200 which were committed as part of the project.
b. **Technology/Product (to be) developed -** 6-9 months
c. **IP generated/ Potential for IP generation -** IP generated on the developed technology
d. **Resources Generated -** 3 new employees hired & funding raised

Plans to take innovation further

Looking for funds to market the device. Also looking for manufacturing partners

Risks envisaged

Marketing is a challenge.

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MONITRA HEALTHCARE PVT. LTD.

Title of the Proposal

Compliance of the Smart MCT platform with IEC safety & radio-frequency standards.

Brief description

Adhesive Sensor without any wires that automatically senses multiple bio-parameters, digitizes, encrypts, compresses and transmits data wirelessly. Cutting-edge special breathable materials on wearable improve patient compliance by making the device extremely comfortable for 7-day use and providing freedom of mobility to perform daily activities.

Current stage of development

Pre – Commercialization

Innovative Element(s)

Enables higher diagnostic yield by allowing extended duration of cardiac monitoring and also allows seamless capture of patient

Market Potential

About 8 million arrhythmia patients are estimated in India and 30 million worldwide. Global cardiovascular monitoring and diagnostic devices market was valued at USD 3.7 billion in 2012 and is expected to reach USD 7.0 billion in 2019.

National/Societal relevance

This technology enables early diagnosis of cardiac ailments, which allows diseases to be cured at initial stages before progression to chronic stage. The Smart MCT helps prevent morbidity, mortality and disability with rapid diagnosis and treatment of heart patients

Project achievements

a. **Progress vis-a vis objectives-** The first two milestones are completed. The industrial design is undergoing revision and the third milestone will be completed thereafter.
b. **Technology/Product (to be) developed –** Currently limited release underway. Full market release within one year.
c. **IP generated/ Potential for IP generation -** One granted patent in India and patents filed in other markets.
d. **Resources Generated -** Funds raised from Indian Angel Network

Plans to take innovation further

Distribution through channel partners

Risks envisaged

Ability to raise funds prior to full market release

Project coordinator:
Ravi Bhogu

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MUNNA LAL YADAV

Title of the Proposal

Development of Pregnancy Associated Glycoprotein 7- (PAG-7) based proof of concept (POC) for early detection of pregnancy in bovine using blood/ serum as a source.

Brief description

PI has developed polyclonal and monoclonal antibodies against PAG-7 and checked its suitability as a diagnostic marker of early pregnancy. They have developed proof of concept for early diagnosis of pregnancy in bovine. LFA strip based cheaper diagnostic kit can be used for screening of pregnant and non-pregnant animals.

Current stage of development

Validation.

Innovative Element(s)

Dairy farmer has to wait for 45 to 50 days for pregnancy diagnosis by trained veterinarian using per-rectal palpation method. This method is not advisable because of chances of the abortion of the fetus. Farmers are very much in need to have a door-step diagnostic kit for early detection of pregnancy. Their FA strip-based cheaper diagnostic kit will help the Indian farmers in early detection of pregnancy which will result in financial viability in terms of milk production by cattle and buffalo

Market Potential

The total number of cattle and buffalo world wide- 1200 million and total number of cattle and buffalo in India- 300 million. Till date ELISA kits are available and the cost is prohibitive and lab based ~Rs. 1000/ sample. PAG-7 based diagnostic kit has a large market size in India as well as worldwide.

National/ Societal relevance

Development of low-cost, field applicable diagnostic kit for early and accurate detection of pregnancy in dairy animals. PAG-7 based cheaper pregnancy diagnostic kits will help the Indian farmers for early detection of pregnancy in cattle and buffaloes.

Project achievements

a. **Progress vis-a vis objectives -** Successfully developed a proof of concept for early diagnosis of pregnancy in bovine. Screening of large number of animals and validation of the diagnostic device is under process.
b. **Technology/ Product (to be) developed -** LFA-based diagnosis of pregnancy in bovine.
c. **IP generated/ Potential for IP generation -** Two patent application is in process.
d. **Resources Generated -** Developed lab infrastructure with suitable equipment and company formation is in process

Plans to take innovation further:

Planning for company formation before November 2019. Looking for funds/ grants from BIRAC/ investors. The technology will be either transferred to a company or will be commercialized through our own venture.

Risks envisaged

The sensitivity and specificity of the developed kit may vary between cattle and buffalo. However, the kit will help to assess the pregnancy status during early phase before 25th day of pregnancy.

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Munna Lal Yadav,

Team Members:
Ashok K Mohanty

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MORPHLE TECHNOLOGIES PVT. LTD.

Title of the Proposal

Scalable Tele-Pathalogy platform with affordable hardware and low data footprint

Brief description

Morphle has invented inexpensive supreme whole slide scanning technology and enables digital AI enabled workflows for clinical microscopy.

Current stage of development

Commercialization

Innovative Element(s)

Highest robustness to pre-analytical defects coupled with 5X more affordability improves adaptability by factor of 10X

Market Potential

10000 installation within India in next 5 years amounting to INR 1000Cr+ worth of market cap. Market cap for international is roughly 10X that of Indian Market.

National/Societal relevance

Morphle products solves reach of sub-speciality pathology expertise to the periphery via tele-reporting workflows.

Project achievements

a. **Progress vis-a vis objectives -** All Objectives are acheived
b. **Technology/Product (to be) developed -** Low throughput version is already commercialised, currently in process of launching a high throughput variant
c. **IP generated/ Potential for IP generation -** 2 Patent applications are filled
d. **Resources Generated -** Bangalore headquarters has the manufacturing facility & R&D center. Delhi has one sales office.

Plans to take innovation further

looking for international distribution partnerships & strategic fundraising opportunities within & outside INDIA.

Risks envisaged:

None

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MOCXA HEALTH PVT. LTD.

Title of the Proposal

An accurate, automated, accessible and affordable solution for seizure diagnosis

Brief description

Mocxa is an innovation-driven startup developing solutions for the diagnosis of seizures, epilepsy, sleep disorders, and movement disorders. The technology uses programmable cameras, video and image processing, computer vision, and robotics to create superior diagnostic products. There are two products 1) Automated Privacy Enhancement Technology for video-basedmedical diagnostic procedures and 2) Robotic Video-Electroencephalography solution to automatically track, monitor and record patients continuously for prolonged periods of time in the hospital or at home.

Current stage of development

Validation

Innovative Element(s)

Worlds first Smartphone-based Robotic Video-EEG system. It is patent pending in India and the US.

Market Potential

The market for this in India is more than 500 crores. The US market is around $30 billion

National/Societal relevance

India has one of the highest incidences of persons suffering from Seizures and Epilepsy. The treatment gap is more than 90% in rural areas. The cost of the gold standard diagnostic procedure, Video-EEG is prohibitive and difficult for many to access. Mocxa's solution will make diagnosis much more accessible while reducing the costs by as much as 80%

Project achievements

a. **Progress vis-a vis objectives -** Completed the validation of the first prototype at a major hospital in South India
b. **Technology/Product (to be) developed -** 1. Robotic VEEG system 2. Machine Learning-based patient privacy enhancement technology
c. **IP generated/ Potential for IP generation -** IP filed
d. **Resources Generated -** In the process of raising seed capital from strategic partners in India

Plans to take innovation further

Plan is to finish the clinical validation for the product in 2020 and release it to wider market.
Also planning to partner with a major EEG manufacturer to license the solution for overseas markets.

Risks envisaged

Evaluating the new medical device rules from CDSCO as to how it impacts the regulation for this medical device

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NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY

Title of the Proposal

Development of point-of-care diagnostics for detection of venom proteins of Naja naja Cobra and Bungarus caeruleus Krait in envenomed animals.

Brief description

They have developed a monoclonal antibody against recombinant venom protein of Elapid group of snakes viz. cobra and krait that has the ability to discriminate between the venom of Elapid and Viparidae group: Russels viper and Saw scaled viper. The antibody has shown promising result in the ELISA format and we are in the process of optimization of a lateral flow-based assay for point-of-care diagnosis of the presence of venom in the envenomed individual.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

They have generated a monoclonal antibody against a recombinant venom protein. So far, there is no such antibody available that can discriminate between Elapid and Viperidae group of snake bite.

Market Potential

The assay to detect specific venom of cobra and krait will have wide applicability in India. For applicability abroad, validation is needed using cobra and krait venom from other geographical locations.

National/ Societal relevance

Of all the snake bite deaths in the world, India accounts the half of the deaths due to snake bite. World Health Organization has also listed snake bite as neglected tropical disease. So, this product will be unique in providing confirmatory diagnosis about the types of poisonous snake has bitten the individual. This way, the person can get specific anti-venom therapy to overcome the side effects associated with poly-valent antivenom therapies

Project achievements

a. **Progress vis-a vis objectives -** They have generated the monoclonal antibody that detects the cobra and krait venom. In addition, they are in the process of development of aptamers that can differentiate the snake venom.
b. **Technology/ Product (to be) developed -** They have developed an ELISA-based assay for venom detection and we are in the process of optimization of lateral flow based assay.
c. **IP generated/ Potential for IP generation -** The research work has potential to generate IP for the production of venom specific monoclonal antibody.
d. **Resources Generated -** Established the monoclonal antibody production laboratory. In addition, we have trained 5 Junior research fellows.

Plans to take innovation further

Looking forward for industrial partnership for taking this innovation into the market.

Risks envisaged

Sensitivity of detection in the biological fluid has to be accessed before entering into the market.

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NATIONAL INSTITUTE OF ANIMAL BIOTECHNOLOGY

Title of the Proposal

Development of lateral flow based chromatographic immunoassay using recombinant chimera antigens for point-of-care testing of Toxoplasma gondii infection.

Brief description

For Toxoplasma gondii detection, a new approach of using recombinant chimeric antigen derived from immunodominant regions of key parasite proteins. The proposed novel chimeric formulation potentially represents the antigen diversity offered by Toxoplasma lysate over individual recombinant proteins, at much lower costs and time of preparation. This simple, inexpensive test can be easily adapted and extended for human use.

Current stage of development

Proof-of-Concept.

Innovative Element(s)

Use of novel combination of immunodominant proteins in chimeric antigen, chimeric antigen containing more than three candidates has not been previously tested, antigens representative of all lifecycle stages with ability to detect both acute and chronic infection, adaptation of the recombinant chimeric antigen in LFA format

Market Potential

The test is targeted to be used for mass screening of livestock but can be potentially used for meat processing industry for ruling out Toxoplasma infection and maintaining food safety standards, gestational screening of toxoplasmosis promptly diagnosing foetal infection and screening of risk groups- abattoir workers, veterinarians, medical doctors.

National/ Societal relevance

There is a large target group: animals and humans. Current diagnosis largely relies on testing in sophisticated reference laboratories and are expensive. Point-of-care testing using LFA is the method of choice for diagnosis owing to its extraordinary features and versatile detection formats.

Project achievements

a. **Progress vis-a vis objectives -** Designed the chimeric combination of Toxoplasma gondii antigens and optimized its expression in bacterial system. Currently, we are investigating the immunoreactivity of this chimeric antigen using goat and sheep serum samples.

b. **Technology/ Product (to be) developed -** Lateral flow-based antibody detection kit for Toxoplasma gondii infection in animals.

c. **IP generated/ Potential for IP generation -** No IP generated for the proposed concept.

d. **Resources Generated -** Manpower employed – JRF and Project Assistant have been recruited under this project

Plans to take innovation further

The project is in preliminary stage. However, the proposed diagnostic assay has a marketing potential. Accordingly, in future would definitely like to take innovation further for private partnership.

Risks envisaged

The only foreseeable risk factor is with respect to the standardization of purification of high-quality chimeric antigen which may require considerable time.

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NEMOCARE WELLNESS PVT. LTD.

Title of the Proposal

Nemocare Raksha: An IoT enabled smart Wearable along with an intelligent decision support system to augment non-invasive clinical hemodynamic monitoring to predict and identify early markers for late onset of sepsis and periodic shock in neonates.

Brief description

Nemocare aims to build the perfect diagnostic tool to augment clinical examination for early identification and treatment of Late-onset neonatal sepsis LONS in NICU babies and periodic neonatal shock.

Current stage of development

Proof-of-Concept

Innovative Element(s)

By pushing the data processing and storage onto the cloud/hub and optimizing the hardware, PI will bring down the size, energy consumption and cost of the continuous monitoring device significantly, allowing it to be used as a wearable for the new born. The wearable solves the need of continuous monitoring as recommended by WHO.

Market Potential

1,20,000 Hospitals private nursing homes, public health centres and corporate hospitals and 3.5 million premature babies to be monitored with a total addressable market size of USD 1.2 billion just in India. Primary commercial customer segments are rural health facilities and urban hospitals.

National/Societal relevance

The economic burden due to prematurity in a country like the United States is close to $26.2bn each year. Drawing parallels to this due to lack of data on India-we extrapolated the economic burden of prematurity in India is also of the same order, drastically impacting the economic development of the country.

Project achievements

a. **Progress vis-a vis objectives -** Wearable device has been developed and is validated for safety,efficacy and performance in clinical studies after approval from Ethics Committees and clarification from CDSCO.The Dashboards have been tested in field using heuristic evaluations and usability tests.

b. **Technology/Product (to be) developed -** The solution has 3 parts to it-1 an IoT enabled wearable device which is being clinically validated. The AI platform will be launched in FY 2021

c. **IP generated/ Potential for IP generation -** filed for a complete specifications patent: patent numbered 201741025396

d. **Resources Generated -** 2 Engineering graduates and 1 undergraduate have been trained and employed 1 resource trained as ISO 13485 internal auditors.

Plans to take innovation further

Manufacturing a small batch prototypes to conduct a clinical validation study with our partner hospitals and data collection, early 2018- late 2019 : Data Collation, Application development.

Risks envisaged

Challenge : Data interoperability, proposed Mitigation Strategies Open APIs ensure straight-forward integration into the hospitals information system Challenge :Slow behavioral change towards monitoring and using ML based Diagnostic tools.

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NESA MEDTECH PVT. LTD.

Title of the Proposal

Affordable and Minimally invasive therapy for women with Symptomatic Uterine Fibroids.

Brief description

Uterine fibroids are tumors that develop in the muscular wall of the uterus. Globally prevalence is 1 in every 4 women suffer from it. Symptoms are excessive & prolonged menstrual bleeding, severe acute pain and infertility. Medications are the first line of treatment unfortunately only a small percentage i.e. 25 percentage of them get relived from symptoms. There remains a huge clinical need for a minimally-invasive alternative to traditional surgical approaches with the promise of less morbidity, short recovery time, faster procedure time, and lower cost.

Current stage of development

Validation

Innovative Element(s)

Solution is accessible, minimally invasive, in-office procedure to treat symptomatic uterine fibroids. This can be achieved by necrosis of fibroids using a thermal energy inserted through uterine cavity using a proprietary access system and guiding system.

Market Potential

Target End Users - Government Hospitals Private Hospitals / Clinics . Solution is designed to be operated by a gynaecologist even at a limited resource setting. In India, Target Available Market â€“ 4 Million . Serviceable Addressable Market - 1 Million. It is projected to be 4 Billion USD opportunity globally.

National/Societal relevance

This innovation is uniquely suited to address the market in India for at least the following reasons: It will be an outpatient procedure, safe, effective and affordable which addresses the prime concerns of women, both in rural and urban India.

Project achievements

a. **Progress vis-a vis objectives -** Concept Generation, Selection & validation with clinicians IP Landscape Analysis Pre-Clinical research & Prototype development Pre-clinical verification Activities Re-iterate design & development, Verification Activities Design Freeze POC Established Pre-Submission Meeting with Indian FDA CDSCO Execution of critical clinical & safety tests Re-design & validate for efficacy & safety functionalities and IP Application & PCT Filed
b. **Technology/Product (to be) developed -** by 2021 product will come into market
c. **IP generated/ Potential for IP generation -** IP application has been filled - 201841028351.
d. **Resources Generated -** Employees - 6 Company Incorporated Funds Raised - 200 K USD Grants & Bootstrapped

Plans to take innovation further

Raising a 400K USD seed round - Q1 2020 ISO 3485 approval - Q1 2020 Clinical Approval Studies - Q3 2020 and Manufacturing License - Q1 2021

Risks envisaged

Learning curve for the clinicians is significantly lesser will enable to be used by larger number of clinicians

Project coordinator:
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NEWNDRA INNOVATIONS PVT. LTD.

Title of the Proposal

IndoKnee: A device for knee Support

Brief description

IndoKneeTM is an efficient, unpowered, configurable knee supporting device that supports the knee and lower foot during the range of mobility tasks including walking, climbing the stairs and flexion-extension movements of the knee.

Current stage of development:

Validation

Innovative Element(s)

Unique rack and pinion mechanism to address deformities. Spring assistance during standing-up. Single Point Configurable support/load adjustment. Autoblock of the assistance when not needed. Universal size and ergonomic design.

Market Potential

Current size of the Indian orthopedic devices market is around USD 375 M Rs. 2,400 crores and it will grow at around 20 every year for the next decade to reach USD 2.5Bn. As per WHO, one in six people and one in three families suffer from arthritis in India. The global orthopedic devices market is expected to reach $41.2 billion by 2019.

National/Societal relevance

India has the second-largest population of Knee Osteoarthritis sufferers in the world which is getting further severe as the population ages. India having the highest young population today, going to be highest elderly population. 901 Million Indian people aged above 60 years and that accounts for 12 percent of the total global population

Project achievements

a. **Progress vis-a vis objectives -** Milestone 1: Product Design based on concepts and User Requirements and Computer simulation, Milestone 2: Design, Simulation and Prototyping. Milestone 3: Testing and Design modifications
b. **Technology/Product (to be) developed -** Within this project, Team has designed and developed the knee assistive devices: IndoKnee. They have developed bilateral, universal size IndoKnee having adjustable assistance mechanism, flexion and extension adjustment. We have incorporated a novel auto-locking mechanism, efficient valgus and varus deformity correction using a geared jack mechanism.
c. **IP generated/ Potential for IP generation -** IndoKnee is based on their Indian Granted Patent No. 268302 and newly filed patent 201711003199. The PCT No. PCT/IB2015/059722, ISR is published and is fully positive.
d. **Resources Generated -** 1. Product designed and developed with 2 novel mechanisms. 5 Employees 4 Interns employed, 1 Clinical Trials Research Paper 2 Patents ,1 Trails Facility

Plans to take innovation further

To make the product market-ready. Team is planning to carry out filed trails and do the pilot. After this, they will get the product part manufactured outside and will do the assembly at our facility and then in market.

Risks envisaged

There may be some competitors who may work around or attempt to modify/infringe the IndoKnee. Users may take some time to accept and adapt the new technology.

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NEXTGEN IN-VITRO DIAGNOSTICS PVT. LTD.

Title of the Proposal

Research trial for developing a rapid biomarker-based non-sputum-based test for detecting TB

Brief description

RU-1 is a joint effort of NGI and Appgenex, a University of California Davis UCD spinoff, in the discovery of a panel of eight plasma antibodies against Mycobacterium tuberculosis antigens in active TB patients called as RU-1. Panel of 11 M. tuberculosis antigens, detecting corresponding antibodies were identified for diagnostic applications. They are manufactured in a multiplexing format using bead based array for simultaneous detection in a single reaction.

Current stage of development

Validation

Innovative Element(s)

The approach of diagnosis of Mycobacterium tuberculosis is simple blood based test with multiple antibodies to MTB. This test is highly sensitive and specific and provides improvement in diagnostic algorithms.

Market Potential

India has 23 percent of the total TB patients across the world. WHO in its High-priority target product profiles has recommended need of non-sputum based point of care diagnosis of Tuberculosis. The RU-1 test would be recommended for people with persistent cough and fever. RU-1 can be implemented in future for identifying paediatric and extra pulmonary TB. NextGen is planning to market 800,000 tests in 2016, followed by 2,500,000 tests in subsequent years with approx. about 20 percent increase in number of tests per year.

National/Societal relevance

There are major gaps in the existing diagnostic tools: lack of simple and accurate point of care test for TB. In India, procedures primarily used for the detection of TB is based on 2 sequential sputum smears microscopy, X-ray and if available, M. tb. culture. However, these procedures have either low sensitivity, accuracy or are inefficient, slow and cumbersome.

Project achievements

a. **Progress vis-a vis objectives -** Manufacturing under valid test licence is done. The establishment of cut-off is under progress

b. **Technology/Product (to be) developed -** Non-sputum based point of care diagnosis test for TB. The technology would be ready for commercialization by December, 2020.

c. **IP generated/ Potential for IP generation -** Patent has already been filed 201641006487 dated 24/02/16: System and Method for Active tuberculosis detection by multiplexing serology using mycobacterium tuberculosis antigens combinations

d. **Resources Generated -** 5 People trained and employed, Multiplexing facility for new disease diagnosis created, USISTEF grant received.

Plans to take innovation further

NGIVD along with Becton Dickenson BD will translate the product globally

Risks envisaged

The high expenditure in clinical trials can cause the product to be expensive than the target price. Other risks associated are low sensitivity and specificity of the test in larger population compared to culture, which is currently the gold standard for tuberculosis diagnosis.

Project coordinator:
Vivek Chandra

Team Members:
Puneet Kumar Gupta,
Surendra Parashar,
Sandeep Sharma, Lovnish
Thakur and Rupinder Singh

Contact:
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Development Area,
New Delhi India-110016

NISHANT KATHPAL

Title of the Proposal

Portable Diabetic Foot Screening Device

Brief description

The smart diabetic foot screening device integrates all three stimuli - touch, vibration and temperature in a single unit and automates the process, thereby making it easy to use by general practitioners and paramedics. It quantifies three major parameters namely tissue stiffness, vibration & temperature perception threshold. A nerve conduction belt enables sensing perception of patients without actually asking them, thereby eliminating the subjectivity involved. An optional pressure pad detects high points on foot sole where the stimuli need to be applied, further improving the accuracy of predicting diabetic foot neuropathy. The device enables rapid, non-subjective and accurate screening of neuropathic patients.

Current stage of development

Validation

Innovative Element(s)

The novel element is the single probe which is capable of providing multiple stimuli i.e. Pressure, Vibration & Temperature. Second, novel element is the Nerve Conduction Belt which objectively capture the patients response against the applied stimulus.

Market Potential

With more than 70 Million diabetic patients, India is the second-largest country after China. Thus, the market is very large. The early targets will be diabetologists and podiatrists, followed by hospitals and clinics. More than 400 Million diabetic patients present around the globe, the product is also having a good scope in abroad.

National/Societal relevance

Every 30 seconds, there is one patient who is losing his limb because of diabetes. Diabetes leads to neuropathy which is the major cause of foot ulcers. 85 percent of the foot amputations can be avoided if diabetic patients are screened for neuropathy at an early stage. Thus, there is a need of device which not only assist the clinicians but also bridge the gap between number of clinicians to the number of diabetic patients in India.

Project achievements

a. **Progress vis-a vis objectives -** The problem is validated with more than 20 doctors. The inputs are being incorporated in the final design.

b. **Technology/Product (to be) developed -** Smart diabetic foot screening device is being developed. The comprehensive prototype is in development and is expected to be completed by February 2020.

c. **IP generated/ Potential for IP generation -** Two Indian Patents and one PCT is filed.

d. **Resources Generated** - 2 Employee and 1 intern

Plans to take innovation further

The Company is open for partnerships and will be raising around 2 Cr. INR for further development of the product and its scaling up.

Risks envisaged

Market awareness.

Project coordinator:
Nishant Kathpal

Team Members:
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Rajesh Jat,
Shumeel Momin and
Aadarsh Lodhi

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NEUKELP INNOVATION TECHNOLOGY PVT. LTD.

Title of the Proposal

Neukelp Posture

Brief description

Device under development is a body posture monitoring device to keep humans free from Back and Neck Pain naturally. Moreover, an extension of this product would also help in curing Back Pain in the body. This device would help user to build a good habit of maintaining right body posture and keep themselves away from excruciating pain and a lot of other health issues. We know that bad body posture is responsible for Back, Shoulder and Neck Pain.

Current stage of development

Proof-of-Concept

Innovative Element(s)

There are a lot of ways to identify neutral body posture, one of them being analysis of lumbopelvic rhythm and monitoring pelvis and spine orientation. This device would use this principle to identify good body posture of an individual.

Market Potential

Huge market potential

National/Societal relevance

Every 7-8 out of 10 people are having Back Pain and this number is growing very rapidly even in youths. India is having more than 65% of the population under the age of 25. When these people grow and they suffer from problem like Back Pain, the country's efficiency goes down drastically. This results in financial, emotional and societal imbalance of an individual. So innovative ideas and solution to solve this problem is an urgent requirement.

Project achievements:

a. **Progress vis-a vis objectives -** Proof of concept is ready
b. **Technology/Product (to be) developed -** Very small, Lightweight and Easily Operable Body posture monitoring device is developed along with Mobile App to control it. This would go to market for pilot in next 3-4 months.
c. **IP generated/ Potential for IP generation -** Draft patent ready to go for filing
d. **Resources Generated -** 4 employees are currently working including 2 co-founders

Plans to take innovation further

Planning to do CE certification. Also contacting fitness centres, Physio clinics to prescribe this device to people suffering from Back Pain due to bad posture.

Risks envisaged

Major challenges is market acceptance of this new kind of device in Indian market. Moreover, the device needs to be in touch with back of the body to give very accurate result. Using skin friendly hypoallergenic double-sided adhesive tapes to attach it with the body, the risk of skin irritation is mitigated.

Project coordinator:
Saurabh Agrawal

Team Members:
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Vighnesh Ramanathan,
Nitin Kumar Agrawal

Contact:
Bibhuti Bhusan Jena
Brahmanbad,
Damodarpur
Cuttack - 754130

ON MY OWN TECHNOLOGY PVT. LTD.

Title of the Proposal

Proposed in-shoe sensor integrated wearable device measures & analyses Spatio-Temporal gait data which can be used by physiotherapist, orthopedics, rehabilitation centers, neurologists & hospitals to monitor & track line of treatment.

Brief description

The present invention generally relates to a gait analysis and more particularly, to a wearable, portable, affordable and accessible device for gait analysis.

Current stage of development

Validation

Innovative Element(s)

The wearable device is portable, affordable, accessible for screening gait and analysis of lower limb joint kinematics and kinetics including ankle, calf, thigh, hip, pelvic, foot plantar pressure, clearance parameters and all spatial temporal parameters.

Market Potential

INR 900 crores India market size. Globally the market size could be close to a $1 billion.

National/Societal relevance

Osteoarthritis is the 2nd most common Rheumatologic problem in India. 15 million adults apart from other lower limb disability caused due to Diabetes, Blood Pressure, Stroke, Parkinson - which though not life threatening in all cases are not given adequate treatment due to high medical costs.

Project achievements

a. **Progress vis-a vis objectives -** Prototype with placement, integration & calibration of sensors completed. Consistency and reliability testing completed.
b. **Technology/Product (to be) developed -** Integration of Kinematics, Pelvis, Knee under development along with Integration of reports
c. **IP generated/ Potential for IP generation -** IP has already been filed for product & design. Trademark for name and logo received.
d. **Resources Generated -** 10 jobs created, partnerships with 2 Hospitals, 1 Physiologist, 1 BioMechanist established. Innovation lab created.

Plans to take innovation further

Product Development & Testing with Hospitals or Orthopaedics, Fund Raising for Clinical Testing, Extension of product to other use cases

Risks envisaged

Product Positioning to Orthopaedics and Licensing at the right costs

Project coordinator:
Lokap Sahu

Team Members:
Reetu S Jain, Charmie Vora,
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Amey Chavan and Jeffin Joy

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ORTHOCRAFTS INNOVATIONS PVT. LTD.

Title of the Proposal

Bioabsorbable implants based on polylactic acid

Brief description

Orthocrafts has developed indigenous know-how for synthesizing biomedical grade polylactic acid in accordance with ASTM standards. Polylactic acid PLA has proven track record biocompatibility & mechanical performance in medical device industry for temporary support applications. Orthocrafts uses this competency to develop bioabsorbable implants for various applications. As a part of this project Orthocrafts is developing products such as interference screw for ACL reconstruction surgery, Suture anchor for rotator cuff repair of shoulder and tacks for attaching hernia mesh to soft body wall.

Current stage of development

Validation

Innovative Element(s)

Orthocrafts has done a process innovation to synthesize medical grade PLA and implants at affordable costs.

Market Potential

Orthocrafts two products viz Orthoscrew and Osteoanchor represents soft tissue repair market which is expected to reach over USD 9 billion by 2024. The third product in the portfolio is bioasborbable tacks - Primatack, intended for attaching hernia mesh to soft body wall. This product segment is pegged at USD 4.75 billion.

National/Societal relevance

There is no Indian manufacturer of biomedical grade PLA. Raw materials are available at premium cost in India. By creating safe to use, tailored biomedical grade PLA,

Project achievements

a. **Progress vis-a vis objectives -** Orthocrafts has initiated process for obtaining ISO 13485 certification. The implants are under performance testing.

b. **Technology/Product (to be) developed -** Orthocrafts has demonstrated proof of concept for interference screw. Test license has been obtained from CDSCO for Orthoscrew. Two more products under development are Suture anchor –Osteoanchor and Primatack.

c. **IP generated/ Potential for IP generation -** Orthocrafts has generated indigenous know-how for PLA synthesis. They have also secured trademarks for our various products such as Lactomeros, Orthoscrew, Osteonachor and Primatack.

d. **Resources Generated -** Orthocrafts has engaged people and created a network of advisors with relevant experience in material science, commercialization and regulatory aspects of medical devices.

Plans to take innovation further

Orthocrafts will seek partnerships with existing players to bring this innovation to market.
They will be collaborations with people having excellent market understanding and distributor networks. We will be raising strategic funds to develop the entire solution for deployment of planned implants and commercialise them.

Risks envisaged

Early stage technology adoption is a risk. Indian medical device regulations are evolving rapidly and navigating through it appears a risk.

Project coordinator:
Piyush V Joshi

Team Members:
Ashish Lele, V Premnath,
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Maharashtra, 411008

ORTHOCRAFTS INNOVATIONS PVT. LTD.

Title of the Proposal

Manufacture and commercialisation of polylactic acid based indigenous bio-absorbable implants

Brief description

Orthocrafts has developed indigenous know-how for synthesizing biomedical grade polylactic acid in accordance with ASTM standards. Polylactic acid (PLA) has proven track record biocompatibility & mechanical performance in medical device industry for temporary support applications.

Current stage of development

Validation

Innovative Element(s)

There is no Indian manufacturer of bioabsorbable materials and implants despite the clear need. These materials and implants are made available in India at a premium price. In this context Orthocrafts has done a process innovation for making biomedical grade PLA at affordable costs.

Market Potential

PLA, its copolymers and blends are the major bioabsorbable polymers used in making bioresorbable implants. Latest market report indicates that global bioresorbable implant market was valued at ~ USD 5500 million in 2017 and expected to exhibit a CAGR of 7% till 2026.

National/Societal relevance

No Indian manufacturer of biomedical grade PLA despite clear need. It is one of the crucial areas of technology and product development for upliftment of Indian medical device manufacturing sector. Raw materials are available at premium cost in India. By creating safe to use, tailored biomedical grade PLA, Orthocrafts has created and option for Indian surgeons and medical device designers to develop India specific designs. This will create an access to platform technology to Indian device developers for advanced medical device solutions.

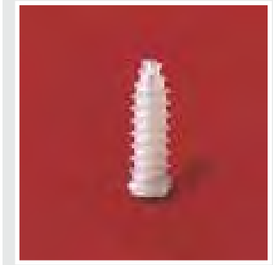
Project achievements

a. **Progress vis-a vis objectives -** Orthocrafts has designed, developed and manufactured reactor for scaled-up synthesis of medical grade PLA. Have identified and engaged space to establish the facility to manufacture PLA in clean environment

b. **Technology/Product (to be) developed-** Orthocrafts is developing platform technology for synthesis of biomedical grade PLA and further plan to use this technology to manufacture bioabsorbable implants for sports medicine applications.

c. **IP generated/ Potential for IP generation -** Trademark Lactomeros has been secured for biomedical grade PLA produced by Orthocrafts.

d. **Resources Generated -** Orthocrafts has identified and engaged space for creating a clean environment facility to synthesis medical grade PLA.



Plans to take innovation further

Seeking partnerships with existing players to bring this innovation to market and forming collaborations with people having excellent market understanding and distributor networks. Othocrafts is raising strategic funds to develop the entire solution for deployment of planned implants and commercialise them.

Risks envisaged

Early stage technology adoption as a risk. Indian medical device regulations are evolving rapidly and navigating through it appears a risk.

Project coordinator:
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Team Members:
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OSIND MEDI TECH PVT. LTD.

Title of the Proposal

A Hand in Need - A Self Driven Rehabilitation Device for Stroke and Neuro-Muscular Deficit Patients.

Brief description

A Self-Driven Hand Rehabilitation device for patients with neuromuscular deficit of the hand which consists of two gloves. The patient can use his / her healthy hand wearing a Sensor glove to mirror similar movement on the affected hand wearing a Motorized glove. This allows the patient to do functional exercises with independent movement of each finger and the gloves provide good visual feedback. The device can also support Passive Mobilization Therapy.

Current stage of development

Proof-of-Concept

Innovative Element(s)

It is self-driven, allowing smooth, realistic movements and real-time mirroring for better visual feedback than currently used passive mobilization therapy. It is automatic, highly portable, customizable, compact & wearable all in one unit. It uses wireless transmission and is powered by a Power Bank.

Market Potential

India has more than 100,000 new patients per year who suffer from neuromuscular deficit. The device also has a huge potential abroad to offer cost-effective rehabilitation for patients.

National/Societal relevance

More than 2.5 Million people suffer from neuromuscular deficit in India. These patients need long term rehabilitation which is expensive and time consuming. Frequent visits to the hospital are a financial and social burden on the family. This device will overcome these challenges by providing a self-driven, cost-effective, highly portable device available for therapy at home.

Project achievements

a. **Progress vis-a vis objectives -** All objectives are achieved.
b. **Technology/Product (to be) developed -** A Self Driven Rehabilitation Device currently under Extensive validation.
c. **IP generated/ Potential for IP generation -** Indian Patent application is filed.
d. **Resources Generated -** Team of 5 including 1 Biomedical Engineer, 1 Biotechnical Engineer, 1 Fashion Designer, 1 Mechanical Engineer has been employed full time and 1 Intern part time. Also provided jobs for local Tailors for development of gloves

Plans to take innovation further

Raised funds for Extensive validation under BIRAC - SBIRI Scheme.

Risks envisaged

Implementation of the new Therapy device in current clinical practice will need training and time.

Project coordinator:
Mohammad Samheel

Team Members:
Anil K Bhat,
Satyam Chaturvedi,
Amartya Gupta,
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OSIND MEDI TECH PVT LTD

Title of the Proposal

A Hand in Need - A Self Driven Rehabilitation Device For Stroke And Neuromuscular Deficit Patients - Extensive Validation

Brief description

HAND IN MOTION - This product offers a unique solution to the usually cumbersome activity of rehabilitation in a hospital by making portable rehabilitation possible at home. It utilizes wireless technology and an array of sensors to make active rehabilitation possible via real time mirroring of a patient's normal hand activity onto the affected hand and also has the provision for continuous passive mobilization.

Current stage of development

Validation

Innovative Element(s)

It is a self-driven machine with smooth and realistic movements. It provides real time mirroring of the normal hand onto the affected hand. It can be customized to individual patients. It is portable compact and wearable. Remote monitoring to assess the patient's progress and usage of the device.

Market Potential

There is an estimated market potential of Rs. 100 crore in India.

National/Societal relevance

There are more than 2.5 million neuro-muscular deficit patients in India who need long term rehabilitation involving frequent visits to the hospital. Given that a majority of these patients are from rural backgrounds the factors of cost and logistics play an important factor in patient recovery. As a result the therapy is discontinued leading to joint stiffness and reduced surgical options. The device will help overcome these challenges and allow therapy at home.

Project achievements

a. **Progress vis-a vis objectives -** 30 Devices have been developed. Ethics Committee approval has been obtained. Clinical Testing and feedback is ongoing.
b. **Technology/Product (to be) developed -** The final validation and trials are being conducted to show the feasibility of the device and regulatory approvals for electrical safety are being conducted. Similarly the remote monitoring application is tested in the trials. The expected time to enter the market is 6 Months.
c. **IP generated/ Potential for IP generation -** Indian Patent application is filed.
d. **Resources Generated -** A team of 5 including 2 Biomedical Engineer, 1 Fashion Designer, and 3 Mechanical Engineers has been employed full time and 2 Intern part time. Also provided jobs to local tailors for development of gloves.

Plans to take innovation further

Exploring collaborations to commercialize the device after full validation with hospitals and miniaturization of the device. Raising funds to develop the rehabilitation ecosystem to provide therapy at home, hospital and rehabilitation clinics.

Risks envisaged

Implementation of the new therapy device in current clinical practice will need training and time.

Project coordinator:
Mohammad Samheel

Team Members:
Anil K Bhat, V S Venkatesan,
Mohammad Tameem Ahmed,
Neha Sheikh &
Satyam Chaturvedi

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MANIPAL, Udupi,
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PANACEA MEDICAL TECHNOLOGIES PVT. LTD.

Applicant Name

Panacea Medical Technologies Pvt. Ltd.

Title of the Proposal

Development & Manufacturing of Slip ring, useful for Diagnostic CT and Ring gantry based Radiotherapy equipment

Brief description

CT Slip ring is a electro-mechanical technology that enables the CT and other radiology machines with continuous rotation of gantry while transmitting power and data to the system to get a complete volumetric image data in a required time.

Current stage of development

Proof of Concept

Innovative Element(s)

Use of Contactless Data transfer system and high data transfer rates

Market Potential

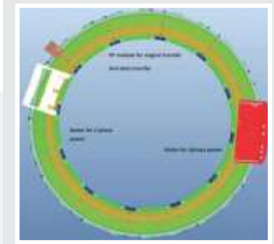
Competitors are mainly in Europe and North America. There is an annual market of 2000+ sliprings. They hope to serve the inhouse consumption and national and international market upto about 500 units per year.

National/Societal relevance

There are no national manufacturers of slip rings. Slip rings are made by few companies from Europe, China for large bore applications and hence are very expensive.

Project achievements

a. **Progress vis-a vis objectives-** Proof-of-concept
b. **Technology/Product (to be) developed -** The project is to develop a Slip ring, to transmit power between a rotating ring and a stationary part. The slip ring would be made customizable to suit various needs of three phase/ multi-phase power and configurable data transmission and customizable diameters in the range of 900mm to 1800mm.
c. **IP generated/ Potential for IP generation -** None
d. **Resources Generated -** Employment opportunity and import substitution for current medical equipment



Plans to take innovation further

Panacea is trying to build complete sub system of CT machines technology in-house and make the slipring available for healthcare at an affordable cost.

Risks envisaged

Novel technology development and market penetration

Project coordinator:
G.V. Subrahmanyam

Team Members:
In-house R&D team

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PERSISTENT SYSTEMS LTD.

Collaborator : Maharashtra Institute of Medical Education and Research, Pune

Title of the Proposal

I-Doctor: An intelligent diagnosis and drug dispensing platform

Brief description

i-Doctor platform is an intelligent disease diagnosing and automated drug dispensing kiosk. It effectively blends advances in artificial intelligence, medical sciences, biomedical sciences, mobile technology and cloud computing. i-Doctor kiosk is integrated with non-invasive devices such as thermometer, SPO2, BP apparatus, ECG, weighing machine, camera, etc. working in sync with disease diagnosing algorithm powered by an intelligent engine. i-Doctor is assisted by trained health worker for improved user interactions. It is also equipped with biometric security for patient identification and retrieval of clinical history.

Current stage of development

Validation

Innovative Element(s)

Intelligent algorithm to diagnose clinical condition and decide on prescription accordingly, data capture using multiple point-of-care devices and analyse symptoms to dispense drugs, in case of an emergency the SOS system will communicate with medical experts, nearby hospitals and ambulance, bio-metric based authentication will help ascertain patient identity to avoid drugs abuse and dissemination of data analytics to healthcare professionals, doctors and policy makers.

Market Potential

Currently 24*7 healthcare is offered only at limited tertiary healthcare centers or large private hospitals. i-Doctor has the potential to capture large section of OTC market considering better service delivery.

National/Societal relevance

In India, cost of visiting a doctor/healthcare centre/hospital is increasing and creating huge financial burden on people and 24*7 basic healthcare for all is still a distant dream. In addition, India has 1 doctor per 1681 people as per the data from our Health Ministry. A large section of Indian population visits local Pharmacies and relies on OCT drugs for getting relief from commonly occurring illnesses like vomiting, diarrhoea, stomach ache which is a dangerous practise. i-Doctor would provide 24*7 basic healthcare services at very affordable cost to Indian citizens and has potential to revolutionize the healthcare sector.

Project achievements

a. **Progress vis-a vis objectives -** Development and alpha testing completed, Beta testing with beneficiaries is in progress
b. **Technology/Product (to be) developed -** i-Doctor Platform which is an intelligent disease diagnosing and automated drug dispensing kiosk.
c. **IP generated/ Potential for IP generation -** Patent filing process is in progress, the prior-art search to evaluate similar frameworks is going on.
d. **Resources Generated -** Manpower and infrastructure

Plans to take innovation further

The team is exploring licensing process and funding options to scale up the production

Risks envisaged

Regulatory approvals and market acceptance

Project coordinator:
R Venkateswaran, Sushma Sharma

Team Members:
Arun Jamkar, Vivek Kulkarni, Bharadwaj, Narendra avadekar, Pratap Sanap, Sanket Lolage and Anuradha Potey

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PISCIUM HEALTH SCIENCES PVT. LTD.

Title of the Proposal

Nano-engineered dental burs with better durability, efficiency, heat conduction, and reduced vibrations

Brief description

Piscium synthetically grows nano-sized SP3 diamond onto the helically bladed metal burs and thus gets the best of both- hardness and cutting abilities of diamond and the classical raking mechanism of a bladed tool.These burs have delivered 7 times smoother cavities than sintered burs and have maintained the cavo-surface integrity.

Current stage of development

Validation

Innovative Element(s)

A thin film of nano sized diamond is synthetically grown and semi embedded into metal bur heads. This film stays adherant and performs well at 250,000 rpm, typical of modern day handpieces for repeat use in over 7 teeth.

Market Potential

The retail market alone, excluding institutional sales, is estimated at Rs 1500 cr per annum. The Global Dental consumables market is USD 28 billion per annum.

National/Societal relevance

According to National oral health survey, 80 percent of Indians suffer from a dental ailment and less than 45 percent have ever visited a dentist. Driven by a huge diabetic population and increasing rural incomes, apathy towards dental health is changing fast and for better. India by 2023, will be the biggest dental market in the world. Yet almost 100 percent of dental materials are imported.

Project achievements

a. **Progress vis-a vis objectives -** All objectives of BIG completed. Follow-on funding under BIPP. Machinery in place, technical staff hired, training in progress, ISO 13485 process commenced.
b. **Technology/Product (to be) developed -** Nano Engineered Diamond burs.
c. **IP generated/ Potential for IP generation -** Complete patent specifications filed by Piscium- June 2018 no 201721036636.
d. **Resources Generated -** 4 technical staff, Set up that converts unground carbide rods into nano diamond burs established, vendor ecosystem developed, early investors/friends, seed funds, grants , founder contribution raised to the tune of INR 4.9 cr

Plans to take innovation further

Manufacture and sell to distributors and dental e-commerce platforms

Risks envisaged

The manufacturing process has yet to establish its scalability from current pilot plant to industrial scale

Project coordinator:
Malay Dikshit

Team Members:
Trupta Dikshit

Contact:
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Sector 19A Nerul East Navi
Mumbai 400706

PRANTAE SOLUTIONS PVT. LTD.

Title of the Proposal

Development of novel and ultra-sensitive method for amplification less measurement of miRNA to enable early diagnosis of Pregnancy disorder- Preeclampsia at affordable cost.

Brief description

The translation of well-established biomarkers, especially microRNA into diagnostics is limited by its very low expression amount as well as complex and expensive detection procedure. A novel ultra-sensitive Localized Surface Plasmon Resonance scattering platform device has been developed under the BIG grant which has the potential to detect Femtomolar concentration of microRNA and other bioanalytes which ensures true/natural representation of the biomarker in the sample as it does not include artificial amplification step as in PCR/RT-PCR or selective enrichment. Furthermore, the device operates at the infrared region for its sensing and detection where most of the biological materials do not show optical property and hence extensive sample processing is not required.

Current stage of development

Validation

Innovative Element(s)

Plasmonic Nanoparticle based smart probe and ultra-sensitive Localized Surface Plasmon Resonance Reading Device which gives the unique advantage of detection of bio-markers at extremely low concentration. The platform operates at near infrared optical range where most of the biological elements do not interfere resulting in low noise and simple sample preparation.

Market Potential

microRNA globally has well accepted diagnostic and prognostic relevance along with being subject of intense biomarker discovery. However, its translation into clinical practice has been limited due to the huge cost associated with its assay. The proposed platform uses Localized Surface Plasmon Resonance technology. Portable SPR systems offer strong potential for point-of-care testing for various industries.

National/Societal relevance

The platform device has been developed to address the gap of no reliable early diagnosis of pregnancy disorder preeclampsia. The disorder is one of major cause of maternal mortality and pre-term delivery, which can be tackled only with early diagnosis and timely management.

Project achievements

a. **Progress vis-a vis objectives -** All objectives achieved.
b. **Technology/Product (to be) developed -** SPR reading device developed
c. **IP generated/ Potential for IP generation -** Patent Filled: Application No. 201731026349, Design registration No. 316101-001
d. **Resources Generated -** A team of 12 members, fully equipped dedicated lab and manufacturing facility.

Plans to take innovation further

Currently looking for funding options for scale-up.

Risks envisaged

Adoption of this technology

Project coordinator:
Sumona Karjee Mishra

Team Members:
Aseem Mishra, Neel Ratan Guria,
Gaurab Bhattacharya.
Sukanya Pati, Balabhadra Kar,
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PURPLAS IT SERVICES PVT. LTD.

Title of the Proposal

Real-Time object recognition in ultrasound video for detection and censoring of foetal genitals

Brief description

SecureSound is an affordable portable handheld ultrasound machine for accessibility to universal point-of-care diagnostics services in Rural and Urban India. These machines embedded with proprietary image processing technology, censors foetal physiologies which can be used for pre-natal sex determination. Being incapable of use for sex determination, these fall outside regulatory restrictions on sale and use of ultrasound machines through PC-PNDT Act.

Current stage of development

Validation

Innovative Element(s)

Real-time Deep-Learning software for censoring foetal-genitalia and other required physiologies on live ultrasound video. The solution is powered by Purple`s Traversing CNN architecture capable of recognising a portion of an image and can be trained using significantly lesser data as against industry benchmarks.

Market Potential

The potential customers are the 11 Laks doctors present in India, 40 percent of which are in professions where ultrasound is a necessary tool. The machines are priced at 1,50,000 for universal accessibility. Taking a conservative estimate of only 40 percent adoption, USD 625 million can be generated across a period of 4 years.

National/Societal relevance

SecureSound is an affordable handheld portable point of care non-obstetric ultrasound device. SecureSound being a non-obstetric USG machine is incapable of use for sex determination, and does not fall with-in the regulatory restrictions on ultrasound machines due to PC-PNDT Act.

Project achievements

a. **Progress vis-a vis objectives -** Prototype development is complete. Validation process is being executed by Medical Partner. Regulatory compliance for manufacture and sales are being undertaken. Opportunities with Potential Ultrasound OEM partners are being explored.

b. **Technology/Product (to be) developed -** Handheld portable point-of-care ultrasound machine, embedded with SecureSound technology, incapable of use for pre-natal sex determination. Expected to be sold in un-restricted Indian market outside PC-PNDT Regulations within a year.

c. **IP generated/ Potential for IP generation -** 2 patent applications filed in 2016 & 2017.

d. **Resources Generated -** 6 people have been employed, 3 interns have been trained. A Lab with Technology development, Meeting space and Product Development facilities has been created.

Plans to take innovation further

Funding options for scale-up are being explored. Technology licensing with manufacturers is being explored for introducing multiple Non-Obstetric Variants.

Risks envisaged

Market penetration, Regulatory approvals and market penetration.

Project coordinator:
Abhishek Biswas

Team Members:
Shubham Gupta,
Kaustav Banerjee,
Saurabh Jain and
Sharad Gupta

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KOLKATA 700102

RCUPE LIFESCIENCES PVT. LTD.

Title of the Proposal

To establish Manufacturing and regulatory compliance for clinical validation of Ozyn-D a novel, indigenously developed Intraosseous device for emergency vascular access in resource constrained settings.

Brief description

Ozyn-D is a novel Intraosseous Access Device which gains access to circulation in medical emergencies such as Cardiac Arrest, Trauma, Dehydration, Pediatric and Obstetric emergencies in less than 10 seconds.

Current stage of development

Validation

Innovative Element(s)

Novel Ozyn-D intraosseous access device is pre-packed, single use, pre-sterile device for gaining access to circulation in medical emergencies. The device gains access in less than 10sec and usable in resource-poor settings.

Market Potential

Globally 250 million patients need an alternative to failed IV access. Estimated 1.3 million patients annually are deprived for IO access due to lack solution for adults usage in India alone. In USA, 6 million patients need IO access. There is huge requirement in defense segment.

National/Societal relevance

Establishing access to circulatory system is critical to resuscitate the patients in clinical emergencies. Even though peripheral intravenous I/V access is the preferred mode of vascular access, many a time it is difficult to access these veins. This can happen in patients with cardiac arrest, trauma, dehydration or obstetric emergencies. In such patients, low blood volume and pressure lead to vein collapse. Precious time is lost in trying to gain peripheral IV access during the emergency. This leads to considerable morbidity and mortality.

Project achievements

a. **Progress vis-a vis objectives -** Design frozen and manufacturing drawings released. A small batch of the devices with rapid prototype parts has been built and design verification completed. Test license applied with CDSCO.

b. **Technology/Product (to be) developed -** Intraosseous Access Device: Ozyn-D. Product is expected to be in market by 2021.

c. **IP generated/ Potential for IP generation -** Indian design registration 291027 granted, US Patent 10,238,420 granted, European Patent 3145416 granted, Israel Patent 248908 granted, Chinese Patent 201480080673.0 granted

d. **Resources Generated -** RCupe has established its innovation lab in Bangalore with state-of-the art facility for medical device innovations. They have been able to attract angel and seed funding. The Company has highly skilled set of manpower in the domain of medical device design, development, regulatory and marketing.

Plans to take innovation further

The Company is seeking to raise next round of funding. They have already partnered with established device manufacturers for scaled up manufacturing.

Risks envisaged

Regulatory Compliance and Funding

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HEALTHCARE - DEVICES AND DIAGNOSTICS

NBM

RENALYX HEALTHSYSTEMS PVT. LTD.

Title of the Proposal

Indigenous Renal care solutions – A critical technology development from pumps to dialysis machines

Brief description

Development of pumps Peristaltic pump, Gear pump, Piston Pump which are used in Dialysis machines, There is no supplier base for these pumps in India.

Current stage of development

Proof of concept

Innovative Element(s)

Prototype models for the pumps are being developed indigenously with help of local suppliers. These will be validated in dialysis machine that is also developed indigenously. This will help in creating local supplier base for the critical technology.

Market Potential

The pumps can be used in dialysis machines, pharma industry machines, cold storage industries and others

National/Societal relevance

This development activity will help in reducing the cost of dialysis session for end user thus making it affordable.

Project achievements

a. **Progress vis-a vis objectives -** The specifications of the pump have been finalized. Prototypes for Peristaltic Pump Head, gear pump head.
b. **Technology/Product (to be) developed -** Development of pumps Peristaltic pump, Gear pump, Piston Pump.
c. **IP generated/ Potential for IP generation -** IP may be generated on Integration of pressure sensor to detect tube blocking and dislodgment of needle while dialysis operation, Integration of blood detector in pump head assembly and achieve wider range of flow rate in Gear Pump.
d. **Resources Generated -** Currently five people are working on this project

Plans to take innovation further

Design and technology will be shared with the fabrication partner, Searock Precession Pvt. Ltd.

Risks envisaged

Fabrication of critical parts like Ceramic piston and cylinder, Magnetic coupling for Gear Pump

Project coordinator:
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HEALTHCARE - DEVICES AND DIAGNOSTICS

BIG

SALCIT TECHNOLOGIES PVT. LTD.

Title of the Proposal

Digital Health Advisory System for Chronic Respiratory Diseases

Brief description:

ReWell-MD, a device for screening respiratory problems. It analyses and quantifies the risk associated with respiratory sounds Cough, Wheeze and Crackle. ReSA-MD, a device for objective clinical assessment and continuous monitoring using audio metric evaluation based on respiratory sounds.

Current stage of development

Validation

Innovative Element(s)

A machine learning respiratory sounds can bring in a whole new world of opportunities from screening, disease management, predicting exacerbations and early identification of adverse conditions. The Company has a composite model with cough, wheeze and crackle in assessing risk condition, providing audio metric data for objective assessment and continuous monitoring.

Market Potential

Based on market segments Private Clinics, Private Hospitals and Diagnostic centers, the TAM in India is 14,219 Core rupees which is ~2 Billion USD. The immediate target market is 461crore rupees, focusing in AP & Telangana in first 2 years, PAN India from 3rd year.

National/Societal relevance

The total population in India suffering with chronic respiratory diseases is in the range of 100 million. The proposed solution is transplanted modified urban health-service extended to rural patients remotely and is expected to help physicians to early diagnose, analyse, monitor patient`s cough, wheeze and crackle sounds along with other respiratory diseases related symptoms via a mobile, to provide better patient care. Ptient Screening/Monitoring can be facilitated at Public Health Centers and Community Health Centers as well using this tool.

Project achievements

a. **Progress vis-a vis objectives -** PoC models of ReWell-MD & ReSA-MD devices completed. Product testing in progress.
b. **Technology/Product (to be) developed -** Initiated product testing for ReWell-MD with retail & enterprise customers initiated; ReSA-MD product testing and market launch is planned by Aug 2020.
c. **IP generated/ Potential for IP generation -** Indian Patent Granted: A System for Analyzing Risk Associated with Cough Sounds. No. 308156; PCT/IN2018/050745 and Design A Jacket To Monitor Sounds In A Human Body. Application No: 316913-001.
d. **Resources Generated -** 6 Full time employees, Total 56 Lakh generated from two grants from BIRAC SoCH & BIG.

Plans to take innovation further

Initiated fund raising exercise through external investors Angles & VC.

Risks envisaged

Quality Annotated Data collection and Building a strong technology & marketing team

Project coordinator:
Narayana Rao Sripada

Team Members:
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SENSIVISION HEALTH TECHNOLOGIES PVT. LTD.

Title of the Proposal

Effective, Accessible and Affordable Device to Diagnose, Treat and Prognosticate HIE in Neonates

Brief description

In India, birth asphyxia accounts for more than 3 lakhs deaths per year. Hypoxic Ischemic Encephalopathy (HIE), a common complication of birth asphyxia is due to reduction in blood supply and oxygen to the brain during traumatic birth. Effective treatment within 6 hours of birth has been shown to drastically reduce morbidity and mortality associated with HIE. The solution developed by Sensivision Technologies achieves this through a fully automated, sensor controlled system that not only ensures effective treatment but also creates a simple workflow for nurses and physicians. The device is portable enabling its use while neonates are transported to a tertiary care center.

Current stage of development

Validation

Innovative Element(s)

The device is servo-controlled for maximum effectiveness with temperature control at least within +/- 0.5 degree Celsius; Fully Automated for precise treatment while reducing the need for constant clinical attention and monitoring; equipped with Cerebral Function Monitoring for early Diagnosis of the condition and continuous monitoring of the Treatment; portable device; Battery backup which enables use in low resource setting or during power interruptions and Whole Body Cooling made possible by finely fabricated body wrap providing effective heat extraction.

Market Potential

The market is anticipated to be across the world. It will be particularly high in developing nations like Asia, Africa, Middle East, Americas etc. Export will therefore be a major focus.

National/Societal relevance

India accounts for the most neonatal deaths in the world and birth asphyxia is one of the top three causes of neonatal death.

Project achievements

a. **Progress vis-a vis objectives-** Device is ready for Clinical Trials. Awaiting CDSCO approval for the trial.
b. **Technology/Product (to be) developed -** Uniquely designed and fabricated Body wrap made of medical grade polymer with proprietary designed channel structure to enable effective coolant flow for maximum heat extraction from the body of the New born. Device is portable (ambulatory), sensor controlled and has battery back up.
c. **IP generated/ Potential for IP generation -** 294921 Indian patent granted, Worldwide in process.
d. **Resources Generated -** Manpower - 5 Engineers, Besides Grants from BIRAC, Ministry of Electronics, Karnataka Government, PATH-Social Alpha, the Company also secured investment from Venture Centre & CCAMP

Plans to take innovation further:

Planning to take to market through hybrid approach using their own Sales/Distribution team as well as partnerships with existing Distributors in Neonatal domain.

Risks envisaged:

Regulatory approvals and finding the right manufacturing partners

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SOLBOTS

Title of the Proposal

Self learning prosthetic hand based on voice commands

Brief description

The product provides an ideal alternative to myoelectric and mechanical prosthetic arms. The arm makes use of a user's voice to perform user-definable actions. While this system allows ease of use to perform routine actions, the secondary wearable system, Ring, can be used to operate the arm in any environment as well as to train the arm.

Current stage of development

Proof of concept

Innovative Element(s)

The product uses a person's voice commands captured using a throat microphone which even detects low amplitude commands. An accuracy of over 92 percent has been achieved. The secondary wearable control system increases the range of actions a user can perform which requires almost little to no training.

Market Potential

The Indian market is highly lucrative for this product as it provides a high functionality arm at a relatively low price combined with the sheer number of amputees. Though, for international markets where prosthetics are subsidised by the government, more innovative control options can be offered.

National/Societal relevance

The major drawback for prosthetics in India is the lack of government support. Moreover, a majority of prosthesis are imported from countries like China and Germany. This calls for the need of indigenous prosthetics which is both affordable as well as functional. The current product address these.

Project achievements

a. **Progress vis-a vis objectives -** As per sanctioned objectives
b. **Technology/Product (to be) developed -** Voice control system development has been completed and the Company is currently working on the development of the Ring, wearable device, as well as building and testing new technologies for the arm. The development is expected to end by February, 2020.
c. **IP generated/ Potential for IP generation -** exploring possibilities with patent advocates
d. **Resources Generated -** An industrial designer and a few interns.

Plans to take innovation further

Immediate plan is partnering with Kamineni Prosthetics, Moulali, Hyd., for the field tests as well as primary distributors.

Risks envisaged

The greatest challenge is to shift the users attitude from existing prosthetics.

Project coordinator:
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Team Members:
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SVASTHYAADHAR PVT. LTD.

Title of the Proposal

Affordable Portable Medical Kit for Road Traffic Emergencies and Traumas

Brief description

Problem/Need: Easier and faster way of stabilizing and transporting Road Traffic Accident RTA victims with grievous musculoskeletal head and spine injuries to health care facility avoiding delay during golden hour.

Opportunity

Every 10 seconds there is a near fatal RTA in the country. Delay in arrival of ambulance to the site and/or inappropriate handling of victims by good Samaritans would lead to worsening of victims plight. More so in mass casualties.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Multiple features in portable kit are,

Portable spine guard for spine immobility and restrict neck movement

Splints help immobilization of fractured limbs

Straight connectors with splints can be used as extraction device for drivers from motor vehicles.

Market Potential

Huge market

National/Societal relevance Customized to Indian road traffic accidents Can be used by unskilled and non/minimally trained individual Enable the Ambulances and Sarmatians

Project achievements

a. **Progress vis-a vis objectives -** Two versions of Prototype of the Makeshift Spine Board With Aluminium and Stainless Steel are ready for further testing
b. **Technology/Product (to be) developed -** Need 12 months to make the market ready product
c. **IP generated/ Potential for IP generation –** An Indian Ip is filed on "œA Foldable Back Support Structure for A User and A Medical Kit Thereo"
d. **Resources Generated –** Company Form

Plans to take innovation further

Awareness video to help collaborate for field trials Collaborations with road safety and transportation department stakeholders for field trials.

Risks envisaged

Educating the general public about the need.

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SWAGATIKA PANDA

Title of the Proposal

Aerosolized Toluidine Blue Sprayer for Early Diagnosis of Oral Potentially Malignant and Malignant Disorders

Brief description

This innovative device will deliver the pharmaceutical grade proprietary vital stain locally on the oral mucosa to aid in early diagnosis as well as selection of appropriate biopsy site in malignant ulcer. The cost effective, sensitive and easy to handle innovative product will encourage clinician performing early screening for every patient with white lesions and ulcerations of oral mucosa with an objective to diagnose oral cancer at a very early stage.

Current stage of development

Proof of Concept

Innovative Element(s)

First ever pharmaceutical grade vital stain in India, Proprietary additives and aerosolization enhance absorption increasing sensitivity of the test, One device delivering vital stain in three steps excluding cumbersome laboratory preparation, Applicator free delivery controls infection and keeps the working area clean, Cost effective and less time consuming technique.

Market Potential

Target customers are dental surgeons, oncosurgeons and ENT surgeons. Number of target customers in India are approximately 2,50,000. Assuming 70 percent penetration rate, market volume is estimated to be 1,75,000.

National/Societal relevance

Mortality due to oral cancer is highest in Southeast Asian countries like India. Early diagnosis through screening is the best way to reduce mortality and morbidity due to oral cancer. In India, patients may not afford existing expensive light based screening aids for oral cancer. In fact compared to all existing technologies, vital staining has higher sensitivity and specificity. However, the low acceptance among clinicians is attributed to the unavailability of chair-side, ready to use delivery methods of pharmaceutical grade vital stain.

Project achievements

a. **Progress vis-a vis objectives -** Synthesis of pharmaceutical grade of toluidine blue has been completed and Optimization of device with proposed design and both aerosolized canisters attached to their respective nozzles is in process
b. **Technology/Product (to be) developed -** An innovative device to spray aerosolized proprietary vital stain is being developed and the time needed to enter the market is expected to be 15 months
c. **IP generated/ Potential for IP generation -** Patent filed
d. **Resources Generated -** One consultant and one research associate MDS, Oral Pathology and Microbiology are employed.

Plans to take innovation further

Possibilities of establishing manufacturing unit and technology transfer or licencing may be considered. Business angels, venture capitalist or multiple Government funding opportunities may also be approached.

Risks envisaged

Market penetration and establishment of manufacturing units to meet the market demand.

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SWAPNIL SINHA

Title of the Proposal

An inexpensive DNA based diagnostic kit for early detection of Urinary Tract Infections

Brief description

Urinary Tract Infection is among most common infections and is very challenging to diagnose. Most reliable diagnosis is urine culture which takes 3-5 days. The PI has evolved DNA-Aptamers by Cell-SELEX specifically identifying and binding four bacterial species E. coli, E. faecalis, S. aureus and K. pneumonia which are most commonly present during UTIs. DNA-Aptamer based Aptasensors are being developed that will specifically identify target bacteria. DNA Aptamers are adsorbed on gold-nanoparticle and detection is accomplished by target bacteria-induced aggregation of aptasensor leading to color change.

Current stage of development

Proof of Concept

Innovative Element(s)

Simultaneous detection of four major UTI bacteria using the novel DNA-Aptasensors is proposed. The kit is proposed to be cost-effective, requires no infrastructure which is very instrumental for use in rural setting.

Market Potential

UTI has global annual-incidence of 150 million cases. About 40 percent of women and 12 percent of men experience at least one symptomatic-UTI during their lifetime. Due to lack of testing facility in villages, UTI remains mostly undetected. The product has huge global-market covering population of every stratum urban and large rural market.

National/Societal relevance

According to a report on Global Burden of Disease study published in Lancet, India ranks 154 out of 195 countries as far as access to healthcare and quality are concerned. UTIs are fairly common in India and is prevalent in women residing in rural setting mostly because of poor hygiene. Most of the time UTIs in women living in rural areas remain undetected because of the non-availability of testing facility at primary health centers in villages. The portability of the proposed kit and ease of detection will be very convenient to detect UTIs in any small pathology laboratory especially in peripheral health centers in villages.

Project achievements

a. **Progress vis-a vis objectives -** Prototype has been developed and is undergoing in-house validation.
b. **Technology/Product (to be) developed -** Simultaneous detection of four major bacteria during UTIs using novel DNA-Aptamers developed as Gold-Nanoparticle based Aptasensors.
c. **IP generated/ Potential for IP generation -** To be done
d. **Resources Generated -** A team of four personals is working on various aspects of product development. A start-up has been incorporated in September, 2018. A training program for students, "Nurture Youth" has been started to generate revenue.

Plans to take innovation further:

An MoU has been signed with IIT-Guwahati for the development of Aptasensors using Gold-Nanoparticles. Funding options are being explored.

Risks envisaged:

Regulatory approvals and Clinical validation

Project coordinator:
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SYNTHERA BIOMEDICAL PVT. LTD.

Title of the Proposal

Pre-Clinical validation of dental alloplasts from bioactive phosphate glasses

Brief description

PoroSyn® is patented bone graft substitute product line of SynThera Biomedical. It is intended for repair and regeneration of bony defects in dental and maxillofacial procedures. With its proprietary formulation and manufacturing technique, PoroSyn® represents the state-of-the-art in biomimetic bone graft product design and offers resorption, porosity and compositional features that closely mimic that of native human bone tissue with complete predictability of performance. As a versatile class of materials designed to suit the characteristics of the defect and overall patient profile, PoroSyn® offers tremendous possibilities for transforming personalized regenerative medicine paradigms in bone and tooth repair.

Current stage of development

Validation

Innovative Element(s)

From a technological perspective, PoroSyn® offers a combination of bone-mimicking characteristics, 100 percent absence of infection transmission risks and opportunities for graft personalization through changes in material characteristics such as composition, porosity, size and shape.

Market Potential

The global dental bone graft market is worth approx. USD 500 million with CAGR of close to 10. India is among the fastest growing markets with a total approachable market size in the range of INR 500-600 crore and CAGR of close to 15-20 percent.

National/Societal relevance

Through PoroSyn®, SynThera aims to indigenously develop innovative bone augmentation products at affordable costs to all the sections of society.

Project achievements

a. **Progress vis-a vis objectives -** Preclinical safety studies as well as implantation efficacy studies in rabbit femur and beagle dog mandible models has been completed.
b. **Technology/Product (to be) developed -** The product is expected to be launched in the Indian market in FY 2020-21.
c. **IP generated/ Potential for IP generation -** PoroSyn® is already patented and trademarked in India. Patents have also been filed in the US, China, Europe and South Korea.
d. **Resources Generated -** 8 people have been employed and trained, a 200 sq. ft. R&D facility has been set-up and expanded into 900 sq. ft. facility. Grant and equity funding from BIRAC and a syndicate of 20+ angel investors has been rasied.

Plans to take innovation further

Funds will be raised via grant and equity for pilot and pivotal clinical trials. For the Indian market, partnerships with regional and/or nationwide distributors will be established. For the overseas markets, licencing arrangements with MNCs are planned.

Risks envisaged

Regulatory approvals.

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SYNERSENSE PVT. LTD.

Title of the Proposal

Wearable and portable gait monitoring device i-Sens for clinical assessment of movement disorders for people with locomotion disability

Brief description

Wearable gait analysis with a Data analytics platform for gait analysis of Orthopedic and Neurology for treatment management.

Current stage of development

Validation

Innovative Element(s)

Smart wearable and portable devices for clinical assessment for movement disorders to study and make clinical decisions faster and accurate to provide effective treatment and Machine learning data analytics platform to predict the minimizing risk of injuries for patients

Market Potential

Hospitals, Physiotherapy centers, Clinics and diagnostics centers, National/Societal relevance In India, 80+ million people with orthopedic and neurological disorders. 4 million people becoming disabled annually. 30 lakhs per annum by 2027 - total knee and Hip replacements. 15-20 Childrens with Cerebral Palsy, 15 with road accidents and sports injury, 6-8 Aging people with Parkinsons disorder and posture and walking movements.

Project achievements

a. **Progress vis-a vis objectives -** Development of MVP and Validation of early stage of Technology incorporated in commercial product design
b. **Technology/Product (to be) developed -** Clinical trials, Pre-market early customer acquisitions, Regulatory and ISO 13485
c. **IP generated/ Potential for IP generation -** IP is filed
d. **Resources Generated -** Employment: 10 people, Facility of Data analysis center for Gait Analysis, Fund Raised from Grants and Public investors CSR Fund

Plans to take innovation further:

By Fund Raising

Risks envisaged

Awareness of instrumental gait analysis in India. Potential barriers in Govt. Settings

Project coordinator:
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TEJOMIR DIAGNOSTICS LLP

Title of the Proposal

Development of a novel medical device for early detection of Liver disease

Brief description

A major liver disease, Non-alcoholic fatty liver disease NAFLD caused by lifestyle changes, affects 10-32 percent of the Indian population and 20 percent of the world population. Currently, the disease is only detected by chance or in the late severe stages, leading to costly medical care and loss of working days. Tejomir is building a device for early and accurate detection of NAFLD with the focus being on delivering an easy-to-use, inexpensive technology for the consumers- doctors, nurses and patients.

Current stage of development

Proof-of-Concept

Innovative Element(s)

The technology utilises sensitive and accurate DNA based probes for the detection of novel endogenous biomarkers in blood for diagnosis of the disease at early stages. The device would be portable and easy-to-use by untrained personnel.

Market Potential

Approximately 20 of the world and 40 crores of Indian population is affected by NAFLD, highlighting the commercial viability and market potential of the product. In India, the affected population in tier one cities is 16 lakh patients per year. The device can also monitor follow-up progression or reversal of disease.

National/Societal relevance

Late diagnosis of NAFLD results in severe end-stage liver disease, which needs costly medical care to prevent complications. The proposed technology and early diagnosis would be disruptive in such an environment and become a social community service provider. The risk factors are increasing globally, highlighting the necessity of the product giving patients agency to reverse the disease.

Project achievements

a. **Progress vis-a vis objectives -** Laboratory operating conditions for methodology of detection of biomarkers have been optimized and version 1 of device has been built. Further design optimization and optimization is ongoing.
b. **Technology/Product (to be) developed -** A device for early and accurate detection of NAFLD is being developed. The entry into the market after regulatory approval is estimated to be in approximately 3-5 years from now.
c. **IP generated/ Potential for IP generation -** 2/3 patents both in India and abroad are expected to be filed including device development, process methodology and use of novel technologies etc.
d. **Resources Generated -** The project trained and employed 2 part-time employees and gave employment to 5 more via outsourcing for device development.

Plans to take innovation further:

The Company is planning to raise funds soon and are looking for partnerships to enter the market.

Risks envisaged:

Market entry and adoption of the product may be challenging.

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Venkat Manohar Mentor and Mansi Garg

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THE UNIVERSITY OF BURDWAN

Title of the Proposal

Development of field based rapid hemoglobinopathy - Thalassemia carrier screening kit.

Brief description

The applicant has developed universal thalassemia/hemglobinopathay carrier detection kit. This kit is simple, two steps, Cost effective Community based Screening Test for Thalassaemias and Haemoglobinopathies from few drops of blood sample to identify the carrier. This does not involve sophisticated equipment or trained person to perform and interpret.

Current stage of development

Validation

Innovative Element(s)

This kit can screen for Haemoglobinopathies and Thalassaemias, both carriers and patients and also unstable haemoglobin No such method is currently available with such wide coverage.

Market Potential

Currently 14-15% of the Indian population are carriers. The thalassemia carriers are asymptomatic. The only way to tackle this problem is through prevention, by means of population screening. The proposed kit can be used for screening. Thus huge Indian market is available.

National/Societal relevance

Hemoglobinopathies like thalassemia are a huge burden especially to countries like India. As these genetic diseases occur due to recessive mutations, carrier screening and family planning accordingly can prevent them. In countries like India where a large portion of the population still live in the rural, remote areas. They don't get access to HPLC based tests for thalassemia carrier screening, which prevents most of the population from getting these tests done. This kit addresses the problem because it doesn't need any such instruments.

Project achievements

a. **Progress vis-a vis objectives -** The kit has been tested for the screening of α and β thalassemia carrier and sickle cell carrier. It has shown good accuracy both in terms of sensitivity and specificity.
b. **Technology/Product (to be) developed -** An universal field based thalassemia carrier screening kit for detection of both α and β type including of E-carrier with visual interpretation of result.
c. **IP generated/ Potential for IP generation -** Under process.
d. **Resources Generated -** Manpower recruited.

Plans to take innovation further

Industrial partnership may be taken for licensing, commercial production and marketing.

Risks envisaged

Stability of the kit.

Project coordinator:
Anupam Basu

Team Members:
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TURIYA INNOVATIONS PVT. LTD.

Title of the Proposal

MinDevice - A standalone wearable high performance consumer device & developer platform for acquiring EEG with self-adjusting frame & electrodes, to analyse & learn brain data along with a user interface to communicate between brain & computer.

Brief description

An advanced neuro-technology platform based on EEG Electroencephalography which would track the brain activity in real-time and train the user for higher cognitive control and better mental health using neurofeedback training.

The platform device would be a standalone high-performance consumer device and developer platform, capable of efficiently acquiring and analysing EEG, and learning brain data for identifying electrophysiological correlates and brain areas associated with poor mental health in real-time.

Current stage of development

Validation

Innovative Element(s)

Consumer grade EEG wearable with better/ same characteristics as high end technology EEG system. An intuitive headwear with a high density sensor system, AI/ ML based real time brain data processing are other unique sub-elements. Currently, no portable and/ or wearable EEG device matches a a high end technology EEG system.

Market Potential

With meditation and mental health as target markets for us. The market size in 2020 for Mental Health wearable device is estimated to be $8 B and the meditation sector market size is expected to be over 2 billion dollars by the year 2022.

National/Societal relevance

Neuroscience products/ neurotech market, as well as platforms for cognitive trainings, are still in its very early stages, while methods for physical training have evolved to come close to consumers.

Project achievements

a. **Progress vis-a vis objectives -** Developed a prototype - a headwear with the motherboard that can acquire the EEG data and process in real time on the mobile/ web application to detect relaxation and activity levels.
b. **Technology/Product (to be) developed -** They are upgrading the hardware, software, design, EEG analysis and conducting experiments with volunteers. They expect to reach the market in 1-2 years.
c. **IP generated/ Potential for IP generation -** In the process of filing two full patents on design and complete prototype and a subsequent electronics/ software patent.
d. **Resources Generated -** They have engaged full time/ part time employment/ freelancers/ consultants 8-10 people in different roles.

Plans to take innovation further

Making the prototype ready for validation by external agencies, planning to sign an MOU with a yoga school in Rishikesh for ongoing user research & raise funding for scaling.

Risks envisaged

i) Security- As it involves brain data, security is a challenge. ii) Behavioural Switching cost in wearing a device on the head iii) Fast technological advancement in the sector could make any technology redundant soon.

Project coordinator:
Mohit Virmani

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New Delhi 110049

TVASTA BIO-SCIENCE PVT. LTD.

Title of the Proposal

Manufacturing of Customized PEEK Implants using 3D Printing

Brief description

Tvasta is developing a High Temperature 3D Printer that uses PEEK Polymer as raw material to manufacture customised implants for patients in the area of Spinal surgeries.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Usage of 3D Printing technology custom designed 3D Printer and Software to customise the implants for the use of each and every patient. Tvasta is also using a polymer named PEEK which is biocompatible for the purpose of implanting.

Market Potential

The Indian market for Trauma and Spine is $173 million and the global market is $12 billion

National/Societal relevance: India is a country which imports more than 70% of its medical devices requirements. Their solution can enable the country to produce this using a Make In India approach and enable distributed manufacturing which can enable the technology to penetrate large rural parts of the country.

Project achievements

a. **Progress vis-a vis objectives -** Tvasta has successfully manufactured the 3D Printer and has printed the implants that has to be used for the implanting into the patients. Tvasta is also currently procuring a filament manufacturing system for the purpose of manufacturing raw materials.

b. **Technology/Product (to be) developed -** Tvasta has developed a 3D Printer, a Software System, an Implant system and is procuring a Filament Manufacturing system. Tvasta has to test and implement the implant device to take it to the market.

c. **IP generated/ Potential for IP generation -** Tvasta will be patenting the system used for 3D Printing. They will be trying to attempt the process of customising the implants.

d. **Resources Generated -** developed nearly 11 vendors for the purpose of manufacturing the 3D Printer. Tvasta has also employed 4 people and has trained nearly 7 people for the purpose of manufacturing and maintaining the 3D Printing system.

Plans to take innovation further

Tvasta is striking a partnership with a large implant manufacturing process based out of Chennai. Tvasta is also planning to raise investments and is currently is in the process.

Risks envisaged

Current risks include price capping measures, regulatory risks, cost of medical testing and the high cost of failure which includes fines and regulatory costs due to failure after implanting.

Project coordinator:
Adithya VS

Team Members:
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UNIVLABS

Title of the Proposal

Insulin Patch Pump

Brief description

World's smallest Syringe Based Wearable Insulin Patch Pump. This device can dose 200 to 300 units of Insulin with precise accuracy on pre-programmed basis. Its dimension is 41It can be worn on body for 3-5 days and is waterproof. User can wear it continuously 24*7.

Current stage of development

Validation

Innovative Element(s)

UnivLabs syringe is always 30 smaller than anything deigned using traditional syringe. This syringe can be used to deliver Insulin or other biologics from 1ml to 50ml. Device can be made in various sizes. Currently they are developing it for wearable Insulin Delivery Device.

Market Potential

There are 600 million diabetics worldwide. Apart from Insulin our device can be used deliver biologics, pain medication & vitamins.

National/Societal relevance

India has one of the world's largest diabetic population. UnivLabs device is affordable and will cost only 30 of the price of imported wearables. It will help people control diabetes more effectively.

Project achievements

a. **Progress vis-a vis objectives -** Concept and bigger form factor device is already proven . Now they are working to reduce form factor to make it world's smaller device in 2ml Insulin category.

b. **Technology/Product (to be) developed -** A wearable infusion pump for Insulin and Biologics of the size of matchbox to deliver medication over prolonged period for better effectiveness. Size is 40mm X 36mm X 16mm. Actual form factor device will be ready be end of December 2019. Clinical trails start April 2020.

c. **IP generated/ Potential for IP generation -** Already have granted patent . We can generate more patent by making specific use case devices.

d. **Resources Generated -** 4 engineers are on the project. Two Mechanical , 1 Electronic, 1 Software apart from suppliers and consultants. Project is funded through BIRAC IIPME grant of INR 48 Lac . They have utilized INR 28Lac . They still have INR 20 Lac of fund available with us.

Plans to take innovation further

In discussion with BIOCON . Along with we plan to file patent for device in China , Japan, Europe and USA.

Risks envisaged

Since the device delivers Pharma composition there is prolonged process of Clinical trials. It may take additional 18 months before they enter market and cost us additional INR 5 to 7 Cr.

Project coordinator:
Sunil Singh

Team Members:
C S Neeraj, C K Rahul,
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URVOGELBIO PVT. LTD.

Title of the Proposal

Development of non-invasive Alzheimer disease diagnostics

Brief description

They had developed an early, non-invasive screening panel to detect populations at-risk for CNS diseases, including Alzheimer disease AD and other dementias. They at Urvogelbio are decoding the information released through molecular internet of the body Exosomes and arriving at a diagnosis non-invasively, which is practically impossible until now and substantiating with optical biomarkers.

Current stage of development

Validation

Innovative Element(s)

Establishment of an early and minimally invasive diagnostic tool for detection and management of AD which is currently unavailable through implementation of biomarkers. The diagnostic is a simple and cost effective solution for early diagnosis and non-invasive diagnosis of AD.

Market Potential

AD-diagnostics and imaging market is growing at a CAGR of 19.6/18.7. Revenues in 2014 for diagnostics are 2855.3$ millions. Revenues from AD-imaging is 852.2 $million. Urvogelbio projects sales of $103 million by 2023 and revenue is projected through three-streams i.e. sale of panel, licensing-fees and CDX/CDIx services for clinical trials.

National/Societal relevance

AD is a neurodegenerative disease effecting memory and cognition of individuals. AD constitutes 50-60% of total Dementias. There are about 4.2 million AD patients in India and a conservative estimate accounts for only 10 diagnosis.

Project achievements

a. **Progress vis-a vis objectives -** They have developed proof of concept for retinal amyloid imaging and neuronal exosome profiling. They are currently validating the technology.
b. **Technology/Product (to be) developed -** The technology is a combined retinal and exosome based platform for identifying Alzheimer's and differentiating from other dementias. This technology is extrapolatable to other neurodegenerative diseases.
c. **IP generated/ Potential for IP generation -** Technology for Alzheimer diagnostics is patent pending 201941037878 . This patent would cover for the process, diagnostic panel.
d. **Resources Generated -** Manpower - 1 Scientist, Technology - Retinal amyloid imaging, Neuronal exosome profiling, Patent - 201941037878., Funds - Funds generated for developing companion diagnostic

Plans to take innovation further

The platform applications are three pronged diagnostic, clinical trials and pharma companies. They are currently developing a companion diagnostic for Biopharma Company for a MS drug. They are forging partnerships for validating their technology

Risks envisaged

Identification of patient cohorts is the biggest challenge, we are mitigating the risk by entering into collaborations with various hospitals. and convincing the doctors with the platform and technology.

Project coordinator:
M.V.Sasidhar

Team Members:
Subhashini Prabhakar
T. Anusha

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Hyderabad- 5000033

VALETUDE PRIMUS HEALTHCARE PVT. LTD.

Title of the Proposal

Fluorescence & Artificial Intelligence-based Cell Enumeration and Imaging Technology for Tuberculosis Detection

Brief description

The project involves development of a point of care automated tuberculosis diagnosis platform called Fluorescence & Artificial Intelligence-based Cell Enumeration and Imaging Technology for Tuberculosis Detection FACEIT-TB. This platform technology is used for imaging sputum smears. The images are then analyzed using deep-learning model for TB diagnosis. This approach eliminates the need for skilled lab technicians for TB diagnosis. The IoT enabled device also allows the user to send images directly to the cloud so that these can be shared with medical practitioners anywhere in the world.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Artificial intelligence deep learning and total internal reflection fluorescence microscopy for improved sensitivity.

Market Potential

In the 22 high burden TB countries, over 77 million smears are performed annually. An accurate smear replacement test would have a market size of at least 30.8 million tests and a potential market value of 154 million USD per year

National/Societal relevance

India has been successful with TB treatment success rate of 85, however new case detection rate is only 70. National Strategic Plan for TB control envisions to detect 90 of TB cases in 2025. Lack of coordination and inconsistent follow-up by frontline healthcare workers has necessitated the minimization of human intervention for effective diagnosis of TB at the community level. Using our intervention, we propose to eliminate the role of human intervention for TB diagnosis, and improve the sensitivity of TB diagnosis to detect millions that are left undiagnosed

Project achievements

a. **Progress vis-a vis objectives -** The device has been manufactured & assembled, and AI has been trained to detect TB bacilli.
b. **Technology/Product (to be) developed -** They are developing a technology for automated sputum smear microscopy and diagnosis of tuberculosis.
c. **IP generated/ Potential for IP generation -** IP has been filed for the planar waveguide-based illumination technology 2673/DEL/2015.
d. **Resources Generated -** 4 research assistants have been trained, and an additive manufacturing facility has been setup

Plans to take innovation further

They are looking for fund raising to fund clinical validation of the technology.

Risks envisaged

Regulations related to use of AI for in-vitro diagnostics are not clear, and hence regulatory approval is expected to be a key risk for market entry.

Project coordinator:
Vikas Pandey

Team Members:
Vikas Pandey
Saurabh Singh

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VIKAS SAHU

Title of the Proposal

Handheld smart dental instrument to visualize "dental pulp chamber and canal orifice" for root canal treatment.

Brief description

Developing an affordable handheld smart device to visualize the pulp chamber and canal orifice in a more efficient way to enhance the efficiency of dentist to perform the root canal treatment and increase the success rate of root canal treatment.

Current stage of development

Proof-of-Concept

Innovative Element(s)

A portable, handy to use root canal visualizer RCV is a specifically designed to solve the problem of visualization of pulp chamber and root canal orifice using simple optical principals and device design consideration and the image can be projected in the LCD screen future mobile screen so there will be no need to straining eyes as with microscope and loups and limited vision with dental mirror indirect vision.

Market Potential

North America and Europe is the major shareholder of global endodontic market. Asia Pacific is a very rapidly growing endodontic market because of a. Increase awareness of oral health b. Development in healthcare infrastructure c. Increase in medical tourism d. Also area in digital dentistry has advantage over the conventional techniques e. CAD/CAM technology and image mapping have enabled to produce superior products.

National/Societal relevance

Solving the problem of visibility of pulp chamber and root canal orifice will help the dentist to increase their efficiency to perform root canal treatment and reduce the chance of reinfection. The proposed root canal visualizer will improve the outcome of root canal treatment by providing dentists with improved visibility of pulp chamber and root canal orifice.

Project achievements

a. **Progress vis-a vis objectives -** Proof of concept is ready and is being tested in pre-clinical phantom head.
b. **Technology/Product (to be) developed -** The expected time to enter into the market is 3 years.
c. **IP generated/ Potential for IP generation -** IP will be filed once product design is finalized.
d. **Resources Generated -** None

Plans to take innovation further

Partnership / merger or acquisition depending upon the condition suitable.

Risks envisaged

Restricted collaboration with hospitals due to ethical issues; Consent from patients; Clinical test, availability of patients, doctors; Awareness program to attract volunteer; Non-autoclavable material in prototype so surface sterilization; Timely delivery of required instrument, infrastructure, and funds.

Project coordinator:
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Team Members:
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Priyabrata Rautray

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VINEESH V S

Title of the Proposal

Worlds first smart wrist band for the elderly to ensure timely help in cases of medical emergencies: Emergency call with a button press, automatic fall alerts, assured peace of mind to the caretaker when they are away from their loved ones.

Brief description

To upgrade the current prototype of a wristband which detects fall and predicts behavioural abnormalities by detecting the daily activities. The wrist band syncs its data to the cloud server through an android application. It also has an emergency button. If an emergency is notified either manually through a button press or automatically during fall our web-based console along with an SMS notification will notify the eldercare service centre with the user information so that they can send an ambulance/ medical help at the earliest.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Fall detection has been actively pursued in products like Apple watch. The major challenge faced is the lack of sufficient data for training the model. They have implemented a robust framework starting from the data collection from a wristband which have been designed and manufactured to the prediction using data analysis in the cloud.

Market Potential

The market for such systems is expected to reach $600 M by 2029 with 2X growth in the Asia Pacific region.

National/Societal relevance

Personal emergency response systems market will be worth $11.1 B by 2025. The worldwide revenue from fall detection systems was $380 M in 2018.

Project achievements

a. **Progress vis-a vis objectives -** Finalized the electronics in the hardware and product design; Android application and server back-end as well as watch manufacturing. Trial run for validation of the test set-up.
b. **Technology/Product (to be) developed -** Wrist band for activity and fall data collection, two android application, one web-server for the homecare/ emergency service providers, AWS cloud setup which does activity and fall prediction based on machine learning models, SMS and app-based notification to the caretakers in case of emergencies.
c. **IP generated/ potential for IP generation -** Design of the wristband, the machine learning model based on neural networks, the end-to-end system architecture for fall and activity detection starting from the data collected from the user to connecting home care services.
d. **Resources Generated -** Trained and mentored more than 10 people in terms of internships and full-time/ part-time jobs.

Plans to take innovation further

To do further validations by collecting more data from a refined version of the product and improve our machine learning models. We would then continue on our track of building more partnerships and fundraising.

Risks envisaged

1. Pricing of the product in a very competitive market. 2. Accuracy of predictions in a wide range of emergency scenarios for the elderly in our country.

Project coordinator:
Vineesh. V. S

Team Members:
Surayakant Toraskar

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VMP ORTHO INNOVATIONS LLP

Title of the Proposal

Navigation in Orthopaedic and Trauma surgery.

Brief description

Purely X-ray/C-arm image based Non Invasive, Real time, Affordable, Universal, Navigation system: a. Predicting future position of Guide wires, bone implants like Screws, Plates including locking plates, Intramedullary interlocking nails and other implants in 2D and 3D for fracture fixation b. To eliminate trial and error, thus improving accuracy, reduce complications, reduce surgery time, reduce radiation and reduce bone loss.

Current stage of development

Validation

Innovative Element(s)

Developed navigation system for Orthopaedic and trauma surgery based on X-ray /C-arm image processing is non-invasive and avoids excessive radiation. Navigation systems currently used are based on invasive tracker based technologies, CT scan data or by 3D reconstruction using more than 100 images by C-arm excessive radiation.

Market Potential

About 20% of all Fractures will need some type of fixation. Even if in a fraction of these surgically treated patients orthopaedic navigation is used numbers are big.

National/Societal relevance

It is well established that probability of cancer risk increases with increase in radiation exposure. Radiation to OT staff over a period of years can be significant. Use of our system will significantly reduce the radiation thereby reducing the risk of cancer and other medical issues. Our tests results for hip module have shown upto 80% reduction in radiation. Most Indian patients seek treatment at affordable costs. Established Navigation systems are expensive. Hence, a standard alternative at an affordable cost is being proposed.

Project achievements

a. **Progress vis-a vis objectives -** Working towards demonstration of Navigation system both Software and jigs on bone models in operation theater. As immediate next step the system will be made user friendly and can be deployed in operation-theater during surgery.

b. **Technology/Product (to be) developed -** A non-invasive navigation system for Orthopaedic and trauma surgery based on X-ray /C-arm image processing

c. **IP generated/ Potential for IP generation -** Indian Patent Granted on 31 July 2019 Patent No. 317256, Application No. 3571/MUM/2011, US patent granted on 7th November 2017, Patent No. 9808265 B2.

d. **Resources Generated -** Manpower trained: one engineer. Propose to train two OT technicians

Plans to take innovation further

Plan to licence the product to C-arm manufacturers/Orthopaedic implant manufacturers. Plan to licence to individual orthopaedic surgeons through partner companies.

Risks envisaged

Regulatory approvals are required as the Navigation system is most beneficial in Operation Theater. The system falls into class B category and the approvals may take some time.

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VOXELGRIDS INNOVATIONS PVT. LTD.

Title of the Proposal

Compact, lightweight, next generation magnetic resonance scanners.

Brief description

The objective of this proposal is to accelerate the commercialization of compact, lightweight, next generation magnetic resonance imaging scanner that is made in India. Specifically, accelerated indigenization of critical sub-systems such as the superconducting magnet is envisaged.

Current stage of development

Development of magnet sub-system in progress.

Innovative Element(s)

Indigenous superconducting magnet manufacture, innovative Rf antenna design, first full body portable MRI scanner manufacture.

Market Potential

The total installed base of MRI scanners in India is 4800 while that of CT scanners is 12,000. Therefore, there is huge potential for market penetration subject to the development of the appropriate product.

National/Societal relevance

Cost effective MRI scanner can bring the cost of MRI scans down by factors of 2-3X. Furthermore, precious foreign exchange can be saved through indigenous production.

Project achievements

a. **Progress vis-a vis objectives -** The first milestone has been completed within 4 months relative to the 12 month timeline that was proposed.

b. **Technology/Product (to be) developed -** Superconducting magnet cryostat vessels and magnet bobbins.

c. **IP generated/ Potential for IP generation -** First of its kind portable MRI scanner can result in IP generation.

d. **Resources Generated -** Manpower recruited-15, facility created for manufacturing and received investment offers from Siemens, Philips and Tata group.

Plans to take innovation further

Voxelgrids is in advanced talks with strategic investors to take our product into the marketplace.

Risks envisaged

The mobile platform is a first of its kind in the world and will require multiple innovations that will need to be perfected.

Project coordinator:
Arjun Arunachalam

Team Members:
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S Vigneesh, Guruprasad,
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YOSTRA LABS PVT. LTD.

Title of the Proposal

Clinical validation of "Kadam", a novel device for treatment of Diabetic Foot Ulcers using warm oxygen therapy.

Brief description

KADAM is an advanced wound care device based on warm oxygen therapy that enables accelerated healing of Diabetic Foot Ulcers. The medical equipment in the proposed therapy involves exposing the patient's foot with diabetes to a constant stream of warm oxygen inside a disposable therapy bag.

Current stage of development

Validation.

Innovative Element(s)

Compared to the current treatment methods available in the market, KADAM is portable - the treatment can be given at the comfort of the patient's home. The wound healing rate is superior as compared to the current standard methods of treatment.

Market Potential

Advanced Wound Care market size is expected to exceed $13.5 Billion by 2025 at a CAGR of 4.9. National/Societal relevance In India the cost of diabetic foot ulcer requiring amputation is 5.7 years of patient's income. Medical bankruptcy is a common phenomenon in India where patients have to pay from pocket, with an amputation and a family to support, their livelihood is severely impacted. KADAM provides a portable and economical solution for treatment of Diabetic Foot Ulcers. KADAM can impact diabetic care in the following ways: Reduce hospital admissions of patients with diabetic foot ulcer. Reduce the need for lower leg amputation due to aggravated diabetic foot ulcer. Reduce the health care costs due to hospital admissions and/or need for leg amputation.

Project achievements

a. **Progress vis-a vis objectives -** The applicant has developed the Prototypes, Clinical Validation Protocol and obtained approval from the Internal Ethics Committee to validate the product.
b. **Technology/Product (to be) developed -** Once the clinical validation is done, Industrial Design and development of the device will be carried out for commercialization.
c. **IP generated/ Potential for IP generation -** Patent has been filed.
d. **Resources Generated -** Manpower recruited -2 .

Plans to take innovation further

Compliance testing and pre-commercialization of the device will be carried out in the next 12 months.

Risks envisaged

From a commercialization perspective, key partnerships need to be forged for better market access.

Project coordinator:
Vinayak Nandalike

Team Members:
Ram Mohan Rao, Maruthy, Sanjay Sharma, Pranav Kumar, Srivatsa Bhat, Neeta Kowdi, Kavita Tandsi, Sheshagiri Tantry, Akshay P Rao and Supradeep Vasista.

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Karnataka, India-560034

YOSTRA LABS PVT. LTD.

Title of the Proposal

Sparsh - Affordable diagnostic device for screening Diabetic Peripheral Neuropathy.

Brief description

NEURO TOUCH is a Point of Care, battery powered, multi-parameter screening device for professional doctors to screen diabetic patients for symptoms of Peripheral Neuropathy. NEURO TOUCH can perform Tactile Threshold Monofilament Test, Vibration Perception Threshold Test, Thermal Perception Threshold Test and Infrared Skin Temperature Measurement.

Current stage of development:

Commercialization

Innovative Element(s)

Conventional Diabetic Peripheral Neuropathy screening devices available in the market are bulky, not portable, and expensive and need trained healthcare workers to operate the device. Compared to them, NEURO TOUCH has been developed specifically to enable mass screening of diabetic patients at healthcare centres. It is portable, provides multiple parameters, generates an interpretable online report and is CE certified.

Market Potential

NEURO TOUCH has a unique market opportunity of approximately INR 1800 Cr in India.

National/Societal relevance

Currently the screening setup medical equipment and trained healthcare workers for Diabetic Peripheral Neuropathy (DPN) is available only in a select few tertiary hospitals. Lack of screening for DPN at Primary Healthcare Centres, district hospitals and healthcare setup in Tier-II/III cities has resulted in the DPN cases going undetected till aggravation to diabetic foot ulcers. NEURO TOUCH makes Peripheral Neuropathy screening to be more accessible and affordable to patients of all socio-economic strata.

Project achievements:

a. **Progress vis-a vis objectives -** The company has completed the project and commercialized the product.
b. **Technology/Product (to be) developed -** The company has commercialized the product.
c. **IP generated/ Potential for IP generation -** Patent has been filed.
d. **Resources Generated -** Manpower recruited -7

Plans to take innovation further

NEURO TOUCH is available for sale in India. Further, the company is looking forward to expand sales beyond India.

Risks envisaged

Scale-up of the product needs investment in manufacturing setup and having a dedicated sales team to cover different geographies.

Project coordinator:
Vinayak Nandalike

Team Members:
Ram Mohan Rao, Maruthy, Sanjay Sharma, Pranav Kumar, Srivatsa Bhat, Neeta Kowdi, Kavita Tandsi, Sheshagiri Tantry, Akshay P Rao and Supradeep Vasista.

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INNOVATION PROFILES

AGRICULTURE

BIG

ADNAN NAIM

Title of the Proposal

Cryopreservation of Chicken Kadaknath and Aseel Primordial Germ Cells for Commercial Poultry breeding line development.

Brief description

Naim will be providing a solution to the problem of losing the valuable high quality avian and poultry germ plasm by bio-banking the cells carrying the genetic information. Due to climate change, the biggest challenge will be to protect high-quality poultry breeds so that the country's nutritional challenges can be safeguarded..

Current stage of development

Proof-of-Concept

Innovative Element(s)

Semen Cryo-preservation is a traditional approach for the conservation of avian species germ plasm. However, the limitation is that we only get male genetic traits conserved and we lose the female. Through bio-banking of the germ plasm carrying cells, harvesting and cryo-preservation we can conserve the complete genetic traits of that particular breed including male and female.

Market Potential

The expected potential of the technology in Indian market could reach upto 1-10 crores.

National/Societal Relevance

Indian market doesnt have an existing technology. The expected potential of the technology in Indian market could reach upto 1-10 crores.

Project achievements

a. **Progress vis-a vis objectives-** To isolate the germ plasm cells of Indigenous Chicken breeds and in-vitro propagate it and cryo-preserve it. Reuse the cryo-preserved germ plasm carrying cells to reconstitute the pure line chicken breed.

b. **Technology/Product (to be) developed –** In another 6 - 8 months the technology will be available for commercialization and its practical application.

c. **IP generated/ Potential for IP generation –**It has great potential to generate IP.

d. **Resources Generated –** Intern students, skilled technical staff , Facility to Bio-Bank the avian germ plasm is established

Plans to take innovation further

Yes

Risks envisaged

It may take time to convince the stakeholders that this technology can revolutionize the poultry breeding companies and research organization which may limit its market entering potential.

Project coordinator:
Aadnan Naim

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AGRICULTURE

BIPP

A. G. BIO SYSTEMS PVT. LTD.

Title of the Proposal

Scale Up, Bioefficacy& Toxicology study of developed myco-herbicides for control of Water hyacinth, Parthenium and Lantana weed

Brief description

The present proposal is a step in this direction of much desired final translation of technologies evolved in the laboratory in to final useful end products through scale-up. In continuation of the efforts, we propose to make R&D efforts to develop effective myco-herbicide

Current stage of development

Discovery

Innovative Element(s)

The innovative elements of our proposal related to the development of patented myco-herbicide for control of weeds Parthenium, Lantana and Water hyacinth. We have selected effective host specific fungal strains with herbicidal properties viz., AGWH11 for Water Hyacinth, AGPH04 for Parthenium and AGLC14 for Lantana camara. These pathogenic fungi were isolated from infected tissues of their mother weeds.

Market Potential

Worldwide markets for myco-herbicide are increasing since chemical herbicide market is based on board spectrum than the selective. Broad spectrum chemical herbicides are damaging grazing land in some cases crop due to drift and herbicide resistance to weed is opening selective herbicide market world over. In the world pesticide market herbicide constitute about 25-30 % market.

National/Societal Relevance

Growing concern over the presence of chemical residues in the food chain, the evolution of herbicide resistant weeds, the loss of registration of some of the more effective pesticides or their phasing out, have generated an interest in the development of alternatives to synthetic agro-chemicals that are both effective and economically feasible. Sales of organic products have increased in recent years in world, and organic farming is the fastest growing sector of agriculture and an important point in the Indian Agri-food policy.

Project achievements

a. **Progress vis-a vis objectives-** Generation of 6 pack toxicological data for 3 fungal strains {AGWH11 Setosphericamonoceras, AGPH04 Alternariaalternata, AGLC14 Fusarium moniliforme .

b. **Technology/Product (to be) developed –** Proposed work would be in the form of herbicidal secondary metabolites for management of Parthenium hysterophorus, Lantana camara and Water hyacinth.

c. **IP generated/ Potential for IP generation –**In this project, there is a possibility to generate a patent for the herbicidal bio-active compound as novel herbicide for above mentioned weeds.

d. **Resources Generated -** Manpower, equipment and facility created

Plans to take innovation further:

Fund raising, Licensing

Risks envisaged:

Potential risks from this product are minimal

Project coordinator:
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AGRICULTURE

PACE-AIR

ANDHRA PRADESH STATE SERICULTURE R & D INSTITUTE

Title of the Proposal

Popularization of silkworm sex-limited foundation cross SLFC27 for cocoon colour with Pure Mysore PM race in the production of cross breed for Industrial seed production.

Brief Description

In general, practice at commercial silkworm seed production centers, production of Multi x Bi hybrids crossbreeds are prepared through the mating of polyvoltine female parent with bivoltine male parent. Due to this discarding of the respective other sex in both the parents to avoid selfing during emergence is inevitable. In this context, development and introduction of sex limited breeds for cocoon colour as a male component with Pure Mysore plays a major role in the production of cross breed for commercial purpose. This project meet the demand of the Sericulture industry in the preparation of true hybrid which saves labour cost and time in the preparation of silkworm eggs and reduces the silk loss through cocoon cutting.

Current Stage of Development

Early stage validation

Innovative Element(s)

Utilization of silkworm sex-limited foundation cross for cocoon colour as a male component with Pure Mysore in the production of commercial hybrid is first such attempt in Sericulture Research and Development R & D in India.

Market Potential

Helps in the preparation of silkworm true hybrid and reduces the grainage economics by utilizing the male FC cocoons and unused females could be sent to reeling.

National/Societal Relevance

PM X SLFC27 is an improved cross breed ICB over the existing commercial Cross Breed PM X CSR2. It exhibits better performance in terms of Non-breakable Filament length, Reelability, Cohesion, Elongation, Tenacity and Neatness traits thereby producing â€˜Gradable Silkâ€™

Project Achievements

a. **Progress vis-a vis objectives -** The proposed Sex limited foundation cross SLFC27 eggs were prepared and reared along with Pure Mysore and prepared the PM X SLFC27 cross breed for commercialization.

b. **Technology/Product (to be) developed -** Developed a silkworm sex-limited foundation cross SLFC27 for cocoon colour to be crossed with Pure Mysore race in the production of cross breed for Industrial use.

c. **IP generated/ Potential for IP generation -** There is a potential for IP generation

d. **Resources Generated -** Three Manpower. Rearing Manager (1) and Technical Assistant (2) are employed. Audio Visual System, cocoon preservation racks, power sprayers and small Cold storage unit are procured under Non-recurring.

Plans to take innovation further

Introduction of sex limited foundation cross as a male component with pure mysore in the production of cross breed helps in reducing the labour, time and silk loss at Egg production centres which saves crores of rupees to the Indian Sericulture Industry. This new hybrid will be popularised among the Sericulture farmers

Risks Envisaged

Not Applicable

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AGRICULTURE

SPARSH

ANITHA PETER

Title of the Proposal

Development of biosensor for the detection of papaya ringspot virus infecting Carica papaya.

Brief Description

Papaya Carica papaya L. is one of the most widely grown fruits in the tropics and subtropics. The production of this economically important fruit crop is being limited because of the destructive disease caused by papaya ringspot virus (PRSV). Prevention of spreading of disease is the best strategy to overcome the loss of yield. This can be achieved by diagnosis of latent infection. Immunodiagnosis is one of the most preferred techniques to achieve this. Coat Protein (CP) is one of most important protein of PRSV having the functions of encapsidation, assisting viral RNA amplification, virus movement both cell-to-cell and long distance, and aphid transmission. A rapid 30 minutes test has been developed for detection of PRSV in leaf sap. The device should be easy to use and handheld such that the tests can also be performed by farmers in the field. However, amperometry much like other immune sensing techniques provides much better sensitivity and specificity under controlled conditions. The company has been able to develop a handheld Chronoamperometry based device for the detection of PRSV.

Current Stage of Development

Proof-of-Concept

Innovative Element(s)

A multi-disciplinary approach where in a gadget has been developed, which can help in early detection of PRSV based on chronoamperometry which is as sensitive as ELISA.

Market Potential

The device has been successfully employed for the detection of PRSV nationally and globally. It can be extended for its use for a number of other pathogens of plant, animal and human origin. Some plant pathogens like tomato yellow mosaic virus infect seeds, the value of which is high. Hence, this device has good potential.

National/Societal Relevance

The device when improved on further improvement can definitely benefit the farmers for obtaining disease free planting material and seeds

Project Achievements

a. **Progress vis-a vis objectives -** The PRSV CP gene was isolated, expressed and polyclonal antibodies developed against the recombinant protein and a handheld chronoamperomatery based device has been developed for the early detection of PRSV

b. **Technology/Product (to be) developed -** The product has to be improvised and validated , which will require at least 2 years

c. **IP generated/ Potential for IP generation -** There is potential for IP generation

d. **Resources Generated -** Manpower, equipments

Plans to take innovation further

Discovering opportunities

Risks Envisaged

Since it was a multi-disciplinary approach, it was a challenge to find an efficient engineer.

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AGRICULTURE

PACE-AIR

BAIF DEVELOPMENT RESEARCH FOUNDATION

Title of the Proposal

Development of high biomass, drought and salinity tolerant mutant lines in Lucerne Medicago sativa

Brief Description

Lucerne Medicago sativa is an important legume fodder which is a major source of protein and calcium for animals. Drought and salinity are limiting factors in cultivation and sustainable production of perennial types. Development of a variety/ies tolerant to drought and salinity is need of day. TILLING Targeting Induced Local Lesions IN Genome, a non-GM technology is the possible alternative. A candidate gene SPL8 from Medicago truncatula has been identified as an excellent candidate for generating high biomass, drought and salt tolerance Gou et al., 2018. TILLING of this particular locus will be carried out to develop mutants from selected germplasm.

Current Stage of Development

Discovery

Innovative Element(s)

TILLING combines traditional chemical mutagenesis with sensitive molecular screenings to discover induced point mutations in genes controlling important traits. It is non-GMO without genetic modification based approach and no regulatory hurdles as like GM. TILLING works with crop own genome and aims to add new traits in already existing germplasm/varieties.

Market Potential

Mutant lines further will be utilized for development of variety/ies suitable to drought and salinity conditions. Estimated seed requirement of Lucerne by 2020 of Breeder and foundation stage " approx. 37 and 950 MT respectively and thereby large-scale revenue generation for public and private sectors.

National/Societal Relevance

At present in India salinity and drought affected area is ~ 27 and 510 lakh ha respectively. This area will be brought under cultivation of newly developed high biomass, drought and salinity tolerant variety/ies of Lucerne which will increase total green fodder production at national level. This will help in reducing the shortage of legume green fodder at national level and balancing the animal diet.

Project Achievements

a. **Progress vis-a vis objectives -** Optimization of mutagen treatment & growing M1 plants of Lucerne: Standardized 0.8, 1 of EMS as a LD 50 Dose and seed treatment was given. Established 7010 M1 plants.
b. **Technology/Product (to be) developed -** Ten potential mutants with high fodder biomass, drought & salinity tolerance. After backcrossing drought & salinity tolerant varieties will be developed in 5-6 years.
c. **IP generated/ Potential for IP generation -** There is a potential to register the lines under PVP act and also file worldwide patent on the world first high biomass, drought and salt tolerant Lucerne non GMO variety.
d. **Resources Generated -** Two Senior Research Fellows were employed under the project. Facilities for establishment of mutated Lucerne plants and DNA extraction from M2 plants were created.

Plans to take innovation further

Backcrossing of mutant lines with parental line for cleaning of undesirable background mutations and variety development. Screening of same TILLING population for other candidate genes e.g. miR 156, MtSGR, MsSPSA.

Risks Envisaged

The mutant lines necessarily to be developed into variety/ies and further tested under ICAR AICRPFC programme for notification and release. Unless the variety is notified by ICAR it may not come under seed multiplication chain.

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AGRICULTURE

SPARSH

DTRONICS TECHNOLOGY PVT. LTD.

Title of the Proposal

Proof of Concept on development of field portable Arsenic testing kit

Brief Description

Under the ongoing project, the company has developed two handheld systems; one is web camera based Arsenic concentration detection in Smart phone and second is Raspberry Pi based system for Arsenic concentration detection.

Current Stage of Development

Validation

Innovative Element(s)

Image processing technique has been used for detection of arsenic in ground water.

Market Potential

Field trials are ongoing and the company is envisioning building a handheld arsenic detection system which will accurately detect arsenic concentration in less than 4 minutes.

National/Societal Relevance

Many locations in India such as southern part of West Bengal, lower Assam, Uttar Pradesh and other regions have ground water contaminated with Arsenic. With a handheld system, appropriate authority can easily detect arsenic affected area and take necessary action.

Project Achievements

a) **Progress vis-a vis objectives -** Detection of Arsenic in ground water
b) **Technology/Product (to be) developed -** Battery operated handheld system has been developed for detection of arsenic in ground water.
c) **IP generated/ Potential for IP generation -** The company will file IP based on the developed work
d) **Resources Generated -** Three Manpower were involved for duration of 18 months.

Plans to take innovation further

The company is trying to collaborate for removal of arsenic from water.

Risks Envisaged

The company has initially started to develop image processing using the smart phone camera. However, after changing the smart phone, huge difference in the captured image is found. Now the web camera and Raspberry Pi Camera have been fixed for developing the system.

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AGRICULTURE

SBIRI

INDO AMERICAN HYBRID SEEDS

Title of the Proposal:

Marker assisted gene pyramiding of blast and bacterial blight resistance genes into CMS & maintainer lines of rice

Brief description:

Marker assisted recurrent selection approach was adopted in breeding program to eliminate donor genome and pyramiding only selected genes into recipient genome. Through this approach BB resistance genes Xa21, xa13 and Blast genes Pi1, Pi2 and Pi54 were stacked in maintainer B lines background and subsequently in to its cognate lines CMS A. The gene pyramided resistant CMS lines will be used in hybrid breeding program by using specific restorer lines.

Current stage of development:

Proof-of-Concept

Innovative Element(s):

The unique element of project is pyramiding resistant genes in the hybrid female lines background of cytoplasmic male sterile lines A and its cognate lines B. As a result that many high yielding resistant hybrids can be developed by crossing common disease resistant female lines with potential restorer R lines.

Market Potential :

The market potential of released present rice hybrids is about 800 tonnes, however with the resistance of bacterial blight and blast would certainly escalate to 1600 tonnes.

National/Societal Relevance:

It enhances the production of grain yield by reducing losses due to diseases. The rate of pathogen reproduction is considerably reduced which limits the spread of disease. It increases the food security

Project achievements:

a. **Progress vis-a vis objectives -** Gene pyramided maintainer B lines DCF5 have been evaluated in disease hot spot in Kharif 2019. Initiated F1 crosses to convert CMS lines and subsequently BC1F1 CMS lines have been and followed by foreground selection was done at BC1F1

b. **Technology/Product (to be) developed –** The CMS lines conversion is in progress. Using converted lines, hybrid will be developed and might enter the market by Rabi 2020

c. **IP generated/ Potential for IP generation –** IP will be generated after line conversion program done

d. **Resources Generated –**Resource personnel has been trained for disease screening and pathogen isolation

Plans to take innovation further:

The improved lines shall be used to pyramid other biotic resistance genes to develop multiple disease tolerance hybrids

Risks envisaged:

There might be more chances of resistance break down of hybrids if any new races emerged.

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AGRICULTURE

BIPP

JIVA SCIENCES PVT. LTD.

Title of the Proposal

Development of MLBSS chip for bovine sperm sorting

Brief description

Microfluidic based laser assisted Bovine Sperm separation (MLBSS) machine prototype is proposed to be built around the prototype bovine sperm sorter built in phase I of the project. Overall system design will include pressurized flow and control, coupled opto-electronic system, specific lasers for fluorescence and ablation, advanced photodetectors for high-sensitivity detection and a microscope objective for abalation. The system will have electronics which detects and process data in nanoseconds for real time detection and ablation of undesired Y sperms.

Current stage of development

Validation

Innovative Element(s)

The approach is based on developing a novel fully integrated, a high-throughput optofluidics machine for bovine sperm cell detection and separation. At the heart of this platform is the custom designed microfluidic device which is capable of aligning cells in 2D and 3 D flow using hydrodynamic focusing

Market Potential

India is the largest producer of milk, and dairy product which are a primary source of nutrition in country. Only female caves ensures next generation of cows for dairy operations. The bovine sperm sex sorting machine will be sold to semen stations and the cattle breeders in India, to counter the non-availability of the same in India.

National/Societal Relevance

Important for diary industries. Only female valves ensures next generation of cows for dairy operation. Non-productive male cattle is of no use these days. Bovine sperm sexing for female sperms is a very good approach which is focused on utilization of biotechnology for socio-economic welfare of farmers and to restrict unwanted bulls being born.

Project achievements

a. **Progress vis-a vis objectives -** Prototype development with laser device interface & functional analysis of the device

b. **Technology/Product (to be) developed –** Technology for proof of concept is established. Commercial machine is needed to be developed.

c. **IP generated/ Potential for IP generation –** One patent field in India, three more patents would be filed by end of 2018

d. **Resources Generated –** Created infrastructure with Microfluidics, optics, applied biotechnology and sperm sexing state of art technologies, IVF and Embryo preservation

Plans to take innovation further

Jive sciences Pvt. Ltd. Is the R&D division of tropical animal Genetics Pvt. Ltd. Which has state of art technologies for improving food availability across the globe with specific focus on India

Risks envisaged

.Unforeseen time delays in machine development and high expenditure in R&D can cause the product to become expensive. Also, the capital expenditure to set up high production facilities for manufacturing, machines required for 100 million doses of sperms in our country per year is quite substantial. However, Jive Science already has a forward contract with the NDDB to reduce risk and financial requirement.

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KRIMMI BIOTECH LLP

Title of the Proposal

Validation and bench-scale production of beneficial nematodes on waste silkworm pupae against agricultural pests like root grubs, shoot borers, root weevils, fungus gnat etc., to protect crops like arecanut, sugarcane, banana and other vegetative crops.

Brief description:

The methodology will be an alternative to the laborious and time consuming process of culturing of galleria melonella as the host organism, as waste silkworm pupae is readily available at the reeling industry and can be used for mass production of the EPNs

Current stage of development

Validation

Innovative Element(s)

Using discarded silkworm pupa as replacement or alternative to Galleria mellonella model organism to mass multiply EPN would drastically reduce the health hazard caused by discarded silkworm pupa from reeling industries, as there is 26,000 MT of annual discharge of silkworm pupa to the environment.

Market Potential

The global market is projected to reach USD 10.05 Billion by 2020, growing at a CAGR of 14.5% from 2015 to 2020. Indian Scenario: The Indian biopesticide market projected to grow at a CAGR of 20.2% from 2010-2020 with the market of USD 23.92 million in 2015. The existing technology of using the Galleria to mass multiply nematodes have limited scope of meeting the market demand and hence an alternative approach of using silkworm pupa will be of great potential.

National/Societal Relevance

In India, out of all the agricultural production of 2, 80, 792 million tons, 26 of total crop losses is due to insect pest infestation. Agriculture sector face severe loss of about 1, 300 crores for the crop failure due to infestation by insects. With the available present solution of applying chemical fertilizers to the crops will control the insect infestation but would severely destroy soil quality. Unlike chemical pesticides, EPN application on soil would maintain soil pH at normalcy and do not degrade the soil texture.

Project achievements

a. **Progress vis-a vis objectives -** Developed a low cost, affordable EPN based product and successfully completed field trial validation of the product as well Collaborated and entered into MoU with UAS-Dharwad for carrying out further trials and validation studies
b. **Technology/Product (to be) developed –** Through this project we have developed an alternative cost effective and faster method for culturing beneficial nematodes on waste silkworm pupa. These nematodes can be used to control various insect pests.
c. **IP generated/ Potential for IP generation –** 1 provisional patent has been filed; Patent Number: 201641027873
d. **Resources Generated -** R&D unit was developed for bench-scale production of EPN.

Plans to take innovation further

In discussion with potential distributors in various regions of Karnataka for better marketing and reach of the product. As the seed money required, we planned to take initial deposits for the distributors.

Risks envisaged:

None

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KWAKLEI AND KHONGGUNMELEI ORCHIDS PVT. LTD.

Title of the Proposal

Commercial orchid breeding and production of clones of elite hybrids

Brief description

Utilization of the rich orchid resource of India can be achieved through breeding of the potential species either for pot plant or cut flower. Kwaklei and Khonggunmelei Orchids Pvt. Ltd. has been focusing mainly on synthesis of new hybrid orchids using potential parents available in India, particularly in the northeastern states.

Current stage of development

Proof-of-Concept

Innovative Element(s)

This project focuses on development of novel hybrid orchids using the resource available in India. This breeding effort shall result in production of hybrid orchids suitable for commercial cultivation in different parts of India.

Market Potential

Orchids are very sought after horticultural items worldwide. India has been importing from other heavyweight orchid producing countries. So, there is high market potential both at domestic and international.

National/Societal Relevance

Despite having rich orchid resources India has been importing orchids from other orchid producing countries in SE Asia for commercial purposes. One of the reasons is lack of elite commercial orchid breeds developed in India. Those orchids developed in tropical Asia may not perform well in sub-tropical or temperate climates. Hence, there is the need for development of specific commercial breeds for providing to the growers in different climatic regimes in India.

Project achievements

a. **Progress vis-a vis objectives -** Approximately 100 primary as well as secondary hybrids are maintained in the laboratory and greenhouse. Clonal propagation of some of the elite hybrids is done. Some of the acclimatised plants are nearing maturity to flower.
b. **Technology/Product (to be) developed –** New hybrid orchids are the product of this project and at present there are approximately 100 new hybrid orchids being developed.
c. **IP generated/ Potential for IP generation –** Plant variety protection can be done once the clones flower.
d. **Resources Generated –** One project fellow and one field assistant have been appointed. Equipment including a laminar flow cabinet, an autoclave and a pH meter have been purchased.

Plans to take innovation further

Equity funding being applied to NEDFi for commercial micro-prppagation and production of orchids.

Risks envisaged

None

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AGRICULTURE

BIG

MADHUSUDHANA MURTHY J

Title of the Proposal

Synergistic formulation for effective control of agricultural pests

Brief Description

Product, Vrunda-one controls major pests and pathogens which cause losses to commercial crops such as vegetable and cotton crops. Vrunda-one features dual mechanism to control bacterial/fungal pathogens and lepidopteran insect pests at the same time. In addition to this Vrunda-one affect all the stages of pest life cycle with different mode of actions. Major advantages of the product are nontoxic even to the treated insects and require less number of applications in the field.

Current Stage of Development

Validation

Innovative Element(s)

Market available products focused on contact toxicity to control either pests or pathogens not both, which has high chances of eliminating beneficial organisms. Vrunda-one is unique product developed which is nontoxic in nature and controls both pests and pathogens at same time with two different mechanisms of action.

Market Potential

No product is available in market, which works on both pathogens & insect pests in eco-friendly manner. Among 55,000 MT, more than 53 percent of pesticides used to control these pests and pesticides in India. Vrunda-one is cost effective and has potential to swap the pesticide market in India.

National/Societal Relevance

Vrunda-one is prepared from botanical origin and has benefits such as Nontoxic nature, cost effectiveness with less applications and control of both pests and pathogens.

Project Achievements

a. **Progress vis-a vis objectives -** Identified most effective insecticides and plant defenses inducers (2 in number) from preliminary work. Lab studies profiling of defense enzymes in treated plants has also been completed. Field assessment on minimum of 6 germ plasms for product development has been completed

b. **Technology/Product (to be) developed -** Product, Vrunda-one is prepared. Now it is in validation stage and requires 10 to 12 months to reach market.

c. **IP generated/ Potential for IP generation -** One granted Indian Patent and one is under progress.

d. **Resources Generated - Manpower employed -** 5 traines were trained for 3 months as a part of master programme. Incorporated Joish Agri Sciences OPC Pvt. Ltd. to continue the innovation progress, promote and sell products.

Plans to take innovation further

Applying for funds to complete go to market strategies such as PRISM, BIPP and VCs. Planning to launch in market by own or collaborating with larger market players to reach farmers quickly.

Risks Envisaged

Vrunda-one works on non toxic mode. So convincing farmers about different mode of actions will be difficult this can be involving farmers in the field trials or demonstration of results of results to them.

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AGRICULTURE

PACE-AIR

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY

Title of the Proposal

Development of Lateral Flow/ELISA Detection Kit for the early diagnosis of theileriosis in Cattle.

Brief description

Theileriosis caused by Theileriaannulata is life and economic loss USD 300-499 Million per annum threatening disease of cattle and buffaloes. The incidence rate is increasing due to change in global climatic conditions and co-infections. Cysteine protease TACP is an immunogenic novel target as we found high immunogenic response in Mice. GNG collaborated with MAFSU NVC in developing sandwich ELISA and lateral flow assay which will detect TACP antigen in serum samples. The kit could be easily used by the field vets for accurate diagnosis of Theileriosis.

Current stage of development

Discovery

Innovative Element(s)

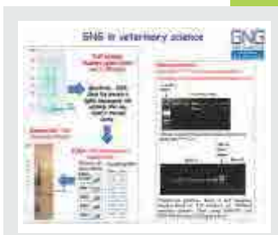
Delayed diagnosis and treatment of Theileriosis creates mortality fear and disease transmission to healthy cattle. Clinical symptoms, observing piroplasms in RBCs and Koch TMs Blue Bodies in lymphocytes and PCR are available tools for diagnosis of Theileriosis but mostly misleading. The sandwich ELISA and lateral flow assay will detect TACP in serum samples.

Market Potential

Currently field diagnostic test kit for Theileriosis, a tropical disease is not available in the Indian and other tropical countries market. The proposed diagnostic test will be used by field veterinarians or technicians at the pen side and the disease will be diagnosed in early phase.

National/Societal Relevance

Theileriaannulata causes Bovine Tropical Theileriosis (BTT) in cattle and buffaloes. At present Buparvaquone chemotherapeutic like only anti theilerial drug is available for the BTT treatment but effective at early stages otherwise multiple doses required for several days. The PCR based kits available in the market are imported which cost around INR 1 lakh for 50 reactions. GNG made diagnostic kit will have several advantages including as it is exclusively for Theileriaannulata, cost effective, easy to use and accuracy.



Project achievements

a. **Progress vis-a vis objectives-** Performed PCR using kit developed by GNG for Theileriaannulata, GNG produced polyclonal and monoclonal antibodies against TACP.

b. **Technology/Product (to be) developed –** The validation and commercialisation of sandwich ELISA and lateral flow assay for Theileriosis will start as soon as preliminary antigen antibody interaction studies over.

c. **IP generated/ Potential for IP generation –** Patent writing on antigen and antibody production is under process.

d. **Resources Generated –** GNG created the facility for the production of cystein protease and anti-cystein protease antibody. MAFSU NVC trained few students for the PCR detection of Theileriosis.

Plans to take innovation further

GNG is committed to take the innovation further in collaboration with Veterinary University.

Risks envisaged

The challenges could be monitory basis as the antibody and antigen production costs very high.

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AGRICULTURE

SPARSH

ONE ACRE VENTURE PVT. LTD.

Title of the Proposal

Nutri Plant Health Application for Farmers

Brief description

Agri Nurture as an application for the integrated nutrient management is integrated with a human-digital intelligent platform Blooom (old name: farmchalo) to connect smallholder farmers, who have limited or no access to information, knowledge, finance and markets

Current stage of development

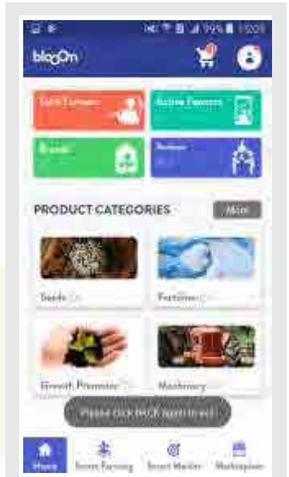
Commercialization

Innovative Element(s)

Agri Nurture offers knowledge based and customized information to the farmers on: Required nutrients based on specific crops and current state of the soil specific fertilizer types, quantity, dosage and application procedure Availability of recommended fertilizer with the entrepreneur.

Market Potential

After the implementation of Agri Nurture in India, Nepal, Haiti and venturing into Kenya and Uganda by Nov 2019. Reaching out to 330000 transacting farmers with an earning opportunity of US$ 442 for input and US$ 1735 for output per farmer in Odisha and US$82 for input and US$413 for output per farmer in Nepal during 2022. Net commission on transactions are expected to be US$16 in Odisha and US$ 8.7 in Nepal per farmer.



National/Societal Relevance

It creates a holistic digital ecosystem that brings a precise and highly personalised approach to addressing farmersâ needs while delivering a series of benefits to governments, companies, cooperatives, suppliers, buyers, consumers and other stakeholders who work with small holders.

Project achievements

a. **Progress vis-a vis objectives -** Successfully released Agri Nurture along with Fam Chalo now Blooom and collected the feedback from the users, both entrepreneurs and farmers.

b. **Technology/Product (to be) developed –** Micro nutrient recommendation is to be developed. Integrated plant nutrient management is to be developed.

c. **IP generated/ Potential for IP generation –** None

d. **Resources Generated -** NIL

Plans to take innovation further

Generated partnerships in Kenya and Uganda

Risks envisaged

Unavailability and restrictions of bulk fertilisers for commerce sales

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AGRICULTURE

BIG

PIOUS THOMAS

Title of the Proposal

Feasibility of Long-term Micro-propagation of Papaya [Carica papaya L.] and the Prospects of Commercial Level Scaling Up

Brief Description

The focal technology for the company now is micro-propagation of papaya. An elite papaya selection has been identified, designated as Dawn Delight. This is a female line which is propagated exclusively through tissue culture, often giving sweet seedless fruits. The offered technological products include i, Micro-propagated plants of "Dawn Delight" for direct supply to the farmers or nurserymen, and ii, Primary hardened plants in protrays given to other tissue culture units or nurseries involved in supplying papaya planting material.

Current Stage of Development :

Validation

Innovative Element(s)

Papaya is generally propagated through seeds with seedling population showing segregation to different sex forms. There are no viable vegetative propagation methods for papaya. Micro-propagation is suggested as an alternative, but commercial production has not been successful. At TBCCB, a viable technology for micro-propagation of papaya is developed. This is now being expanded to commercial scale.

Market Potential

Papaya is grown in over 100,000 hectares in India. Availability of elite genotypes and quality planting material are serious limitations. There is considerable market scope for supplying planting material throughout the country and the micro-propagation protocol overseas.

National/Societal Relevance

Supply of tissue culture elite papaya plants will help to reduce the dependence of seed imports and saving of foreign exchange besides adding to make in India and providing job opportunities.

Project Achievements

a. **Progress vis-a vis objectives -** The major objective was selective micro-propagation of papaya matching to "˜Red Lady" An elite female line with parthenocarpic seedless fruits has been selected and its enhanced micro-propagation is underway.

b. **Technology/Product (to be) developed -** Micro-propagation of papaya.

c. **IP generated/ Potential for IP generation -** IP generation is underway on different aspects relating to micro-propagation of papaya.

d. **Resources Generated -** Currently, eight personnel employed. Tissue culture and hardening facilities created. From applicant individual status, a company OPC was launched within 3 months. About Rs, 20,000 already generated from the sale of TC papaya plants.

Plans to take innovation further

Support under the BIRAC and other central and state agencies will be explored.

Risks envisaged

Tissue culture papaya is a new product in the market. Production of TC plants involves multiple steps with high input cost which make the plants more expensive.

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AGRICULTURE

SPARSH

PROXIMAL SOILSENS TECHNOLOGIES PVT. LTD.

Title of the Proposal

An affordable soil monitoring system for precise irrigation

Brief Description

At Soilsens, the company wants to give a tool to farmer for better understanding of his crops and make right decisions for his crops. They have designed, developed and tested in the field, the IoT enabled sensor based SMART system and weather station.

Current Stage of Development

Pre-Commercialization

Innovative Element(s)

The company have made their own sensors and products at an affordable price. The product is almost 20 percent less of the cost compared to similar systems available outside. Affordability, modularity and service support are the biggest advantage of the systems.

Market Potential

Global Smart agriculture market is more than 13 billion USD. Just the Soil moisture sensor market is 2.5 billion USD.

National/Societal Relevance

The company will provide reliable field data directly from the farm which can be used to advise farmers about optimum irrigation and probable occurrence of diseases. They will also develop sensors and other systems at an affordable cost which can estimate the environmental parameters, soil quality and plant health.

Project Achievements

a) **Progress vis-a vis objectives -** Development of IoT enabled sensor based system for controlled irrigation, development of dash board, mobile app, comparing with remote sensing data. Demonstrating the integration of system with sprinklers

b) **Technology/Product (to be) developed -** Product is developed and piloted across three states Gujarat, Maharashtra, Telengana in India with crops like Potato, Tomato, Moong, Soyabean, Maize, sugarcane, citrus, cotton etc.

c) **IP generated/ Potential for IP generation -** The company has already applied for IP for this product as part of research during the PhD at IIT Bombay. Proximal Soilsens have exclusive license agreement with IIT Bombay.

d) **Resources Generated -** A facility has been set up at Pune for manufacturing, testing of systems at IIT Bombay. The company has trained 6 people - Engineers, Technicians with BIRAC funding. They have piloted systems and created few initial paid customers.

Plans to take innovation further

The PI has signed MoU with NGOs to take this technology to farmers. We are exploring partnership with agricultural companies with complementary skills. We are also looking for distributors to take this product for commercialization.

Risks Envisaged

Customer challenge: Mind set of farmers, Operational expenses like deploying systems at various farm level. Technical challenge: In-field calibration of sensors.

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AGRICULTURE

BIPP

SAVEER BIOTECH

Title of the Proposal

Towards Smart and Efficient Nanopesticides for Indian-Agro Industry

Brief Description

The company has developed a novel nanoinsecticide using Zinc Oxide nZnO and silica nSiO2 nano particles using Induction plasma synthesis IPS technology. In the developed product, nSiO2 has potential insecticide activity through physical abrasion of insect cuticle, while nZnO has fungistat property as well as potent nutrient zinc source.

Current Stage of Development

Early Stage validation

Innovative Element(s)

The product contains amorphous nanosilica and rod shaped zinc oxide nanoparticles which are synthesized from physical process not from traditional wet chemistry methods, where there are chances of organic contaminants. Further, insect resistance to silica nanoparticles does not occur. Also, the developed product has fungistat and plant germination acceleration capabilities due to ZnO in the final product.

Market Potential

Several nano-products of agricultural sector have been launched in the market by technology-oriented mid-sized companies that produce soil-enhancement products to promote water distribution, storage, and consequently water saving Transparency Market Research. However, nano products for storage pest management are not available in market. Hence, deployment of these inert dust nano insecticides has huge potential in market outreach.

National/Societal Relevance

This product will be user friendly and not having any problem of insect resurgence, resistance, residues and environmental hazards as compared to the chemical pesticides. Further, farmer need not to reapply the product once applied which is a usual practice with chemical pesticides; this saves the money of farmer.

Project Achievements

a) **Progress vis-a vis objectives -** Silica and zinc oxide nanoparticles were synthesized and formulated with suitable carrier. They have proved to be nontoxic in nature and has exhibited both insecticidal and fungistat properties.

b) **Technology/Product (to be) developed -** Apart from product development, the company has developed a technology for synthesizing several nanoparticles which would be helpful for making agricultural products. These nanoparticles can be used directly or mixing with other ingredients to make products.

c) **IP generated/ Potential for IP generation -** The technology used for synthesizing silica and zinc oxide nanoparticles is under process of provisional IP filing.

d) **Resources Generated -** 11 Trained Man power

Plans to take innovation further

Saveer has created a separate Nano Tech Division within house Scientists and other supporting staff for furthering activities with the state of the art facility established for synthesis of high quality nano materials.

Risks envisaged

There are no proper set of guidelines for conducting environment safety and other risk associated parameters for nanopesticides from CIB, India.

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AGRICULTURE

BIG

SRIKARA BIOLOGICALS PVT. LTD.

Title of the Proposal

Development of a live, attenuated Fowl Adenovirus 4-based candidate poultry vaccine against Hepatitis-Hydropericardium Syndrome

Brief Description

Hepatitis-Hydropericardium syndrome HHS, caused by members of Fowl Adenovirus type 4 FAdV-4, is prevalent in Northern states of India and in many countries across the world. The company has proposed to use naturally avirulent FAdV4 isolates to develop novel live attenuated vaccines against viral hepatitis/HHS in poultry.

Current Stage of Development

Proof-of-Concept

Innovative Element(s)

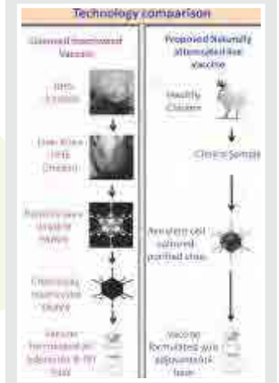
The company proposes to use naturally avirulent FAdV4 strains isolated from field and the proposed virus is a novel strain, which is genetically different from known avirulent FAdV4 strains.

Market Potential

Poultry industry is growing at 8-10 per annum and the estimated market size in India is Rs. 58,000 crores. India is the 2nd largest supplier of poultry products. There is a huge market demand for a hepatitis vaccine across the world.

National/Societal Relevance

Poultry farmers at least in India practice unethical methods like using antibiotic-supplemented feed to protect the birds from infections. High cost of vaccination and poor efficacy of some of the available vaccines in the market, encourage them to adopt these unethical practices. Adulteration of food chain with heavy doses of antibiotics is contributing to the development of multi-drug resistant MDR bacteria. It is therefore important to improve the efficacy and reduce the cost of vaccination in order to emphasize on vaccination.



Project Achievements

a. **Progress vis-a vis objectives -** Produced bulk quantities of the proposed virus in different cell cultures. Conducted poultry trials under laboratory conditions and under simulated field conditions. Isolated few more novel viruses and their characterization in progress.

b. **Technology/Product (to be) developed -** Developing live attenuated vaccine for viral hepatitis in poultry using a novel naturally avirulent strain of FAdV4. Poultry trials are ongoing and expecting to file the IP by March 2020.

c. **IP generated/ Potential for IP generation -** Yet to file an IP as the trials are ongoing. However, being the first of its kind for viral hepatitis, a lot of potential is there for IP generation.

d. **Resources Generated -** Employed two fellows and established tissue culture facility. Establishing POC and subsequently would work towards creating an enterprise.

Plans to take innovation further

Exploring possibilities like partnering with established players in poultry industry and approaching vaccine industries for funding

Risks Envisaged

Achieving the desired efficacy of at least 80-90 percent under simulated field conditions during the POC trials.

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AGRICULTURE

SBIRI

T. STANES & COMPANY LTD.

Title of the Proposal

Development of an integrated product with plant growth & defense potential through end to end utilization of marine biological resources.

Brief Description

The project was undertaken on the utilization of the marine bio-resources.

Current Stage of Development

Pre commercialization

Innovative Element(s)

Discovery of the unique characteristics of the microbes associated as epiphytes on the marine macro-algae isolated from the marine environment and development of effective microbial consortia for degradation of spent waste obtained during the production of macro-algal extracts, generation of bio-methane and its utilization for the production units.

Market Potential

The technology developed is based on the combination of microbial/natural macro-algal extracts that are constantly demand driven.

National/Societal Relevance

The products developed are effective organic in-puts, and only few cost effective microbial based products with multiple functions i.e as a source of nutrient solubilization P, Zn, Fe, S & N , bio control activity & elicitation potential are available for Agricultural use.

Project Achievements

a. **Progress vis-a vis objectives -** The objective to develop a multi-spectrum product by utilizing the potential marine biological resources has been accomplished. In addition, the objective of utilizing the by-products generated from spent macro-algae during manufacture, of low economic value was realized, and that ensured no waste generation.

b. **Technology/Product (to be) developed -** A product developed with a poly-functional microbe selected trade name - 5MIN represents a distinctive and alternate organic input for sustainable agriculture.


5-MIN
Stanes
SAMPLE PACK
Net Weight-100g

c. **IP generated/ Potential for IP generation -** Potential isolates from the marine environment has been safe deposited at NBAIM, MAU & for Patent deposit at IMTECH, Chandigarh. ITS & Whole Genome sequence of the potential isolates also submitted in NCBI Nucleotide - ITS & Bio project- WGS. Company has already initiated the Patent process for IP protection for the product developed.

d. **Resources Generated -** Technical staff and Infrastructure facility

Plans to take innovation further

The innovation will be marketed after establishing the facility for manufacture of the products

Risks Envisaged

Risks that stems up is the rising cost of introducing new concept products, infrastructure for production, high incidence of climate change, price realization, marketing channels with long supply chain & the high marketing costs.

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UTILIS BIOSCIENCES PVT. LTD.

Title of the Proposal

Orchi Dia - Test strips for simultaneous detection of Cymbidium Mosaic Virus and Odontoglossum Ring spot Virus infecting Orchids.

Brief Description

A simple, rapid, multiplexed and low-cost lateral flow test strip for simultaneous detection of Cymbidium Mosaic Virus and Odontoglossum Ring spot Virus infections in commercial orchid production and quarantine.

Current Stage of Development

Discovery

Innovative Element(s)

The novelty of Orchi Dia lies on the concept of using the engineered single chain variable fragment as the virus specific immunomolecules, with colour coded signals indicating the presence of ORSV and CymMV.

Market Potential

Orchids are one of the most economically important cut and potted floricultural crops in the world contributing 10 of the total international floriculture trade with a value exceeding 0.5 billion USD. India is an emerging orchid commerce sector with approximately, Rs. 200 crores worth of production per year.

National/Societal Relevance

CymMV Potexvirus and ORSV Tobamovirus are two of the most prevalent and serious viruses infecting orchids. Visual diagnosis of these viruses in young plants or planting material is always not possible as they remain asymptomatic while infected and indistinguishable from healthy orchids, potentially spreading the viral inoculum to the healthy stock. In this context, an appropriate rapid on-site diagnostic method is necessary to effectively save time and money involved.

Project Achievements

a. **Progress vis-a vis objectives -** Generation of single chain variable fragments as diagnostic immunomolecules against CymMV and ORSV, followed by preparation of components and assembly of the lateral flow assay and its validation

b. **Technology/Product (to be) developed -** A lateral flow test strip based multiplexed detection kit for presence of Cymbidium Mosaic Virus and Odontoglossum Ringspot Virus infections in commercial orchid production and quarantine.

c. **IP generated/ Potential for IP generation -** The IP generation lies in the novel engineered single chain variable fragments generated in the project against CymMV and ORSV

d. **Resources Generated -** Two junior research assistants are employed by the company so far. Instruments such as Thermocycler, Probe Sonicator and Lateral Flow Assay Reagent Printer were purchased by the company.

Plans to take innovation further

The company is exploring follow-on funding for extended validation and commercialization of the product in India and abroad.

Risks Envisaged

The technical risk is the sensitivity of the assay format to detect an early infection in the plat propagule. The business risk is to achieve the B2B model focusing the orchid growers and tissue culture companies.

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UTPAL TATU

Title of the Proposal

Animal Disease Diagnosis and Treatment

Brief description

The product developed by team is highly sensitive and specific point-of-care diagnostic kit specifically designed for detection of trypanosomiasis in cattle. The unique features of the kit include its ease of use by the end user, scope of economical pricing and robust validation using molecular and immunological assays. The test uses a drop of serum from the animal and can be simply read as positive or negative for the parasite in a time frame of 15 minutes.

Current stage of development

Validation

Innovative Element(s)

Using immunological tests ELISA and molecular approaches PCR , the field clinical samples have been used to extensively calibrate and validate robustness of the proposed lateral flow kit.

Market Potential

Surra affects 20 of cattle and leads to economic loss of ~470 million rupees every year in India. More than 48 countries worldwide are affected with surra. Diagnosis is the major constraint in curbing animal diseases. Thus, this kit can provide an excellent business perspective, both in India and abroad. Given its scope of economical pricing, robustness under various storage conditions and ease of use, it has a potential to penetrate worldwide markets.

National/Societal relevance

India is a predominantly agrarian society with heavy dependence on cattle for milk and meat production. Each year, the cattle industry suffers severe losses due to animal diseases like surra. The kit comes as an easy to use device and can be easily used by the end-user, who in this case would be mostly farmers. Thus, the innovation can help a large part of the community including the grass-root level.

Project achievements

a. **Progress vis-a vis objectives-** Validated the kit with several animal samples.

b. **Technology/Product (to be) developed –** In a time period of 2-4 months, their team at Equine Biotech should be ready to launch the product in the market.

c. **IP generated/ Potential for IP generation –** The product is based on a unique parasite antigen and thus has a potential for IP generation.

d. **Resources Generated –** The work has been done under the Enterprise Equine Biotech. It has resulted in extensive training of manpower and amalgamated basic research with a tangential translational output.

Plans to take innovation further

Shortly Equine Biotech will be ready to commercialize the product.

Risks envisaged

Development and marketing of these diagnostic kits require continuous training of manpower, use of a variety of resources and constant funding, which are the major challenges.

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AGRICULTURE

BIG

VASEEHARAN

Title of the Proposal

Development of marine polysaccharides mediated nano-products for shrimp disease management

Brief description

Marine polysaccharides like fucoidan and alginate will be purified from the marine sea weeds. The polysaccharides based nano-composite will be developed using green procedure. The developed polysaccharides mediated nano-products will enhance the immune activity and disease resistant effect against the major shrimp aqua-culture pathogens V. parahaemolyticus, V. harveyi and WSSV in shrimp Litopenaeusvannamei to conserve the aqua-culture industry from the deleterious effects of harmful vibriosis and White spot diseases.

Current stage of development

Discovery

Innovative Element(s)

Currently, no shrimp feed was developed from nano-technology and the marketed feed just focused to reduce the load of bacteria in the farming system. Developed zinc based nano feed mix will enhance growth, immune and disease resistance in the cultured shrimp system.

Market Potential

The developed feed mix will meet more than 50,000 cultures per hectares in the important states of India. Globally, the developed feed mix will meet the demand of about approximately 1, 00,000 tons of shrimp feed.

National/Societal relevance

Aqua-culture is the major food producing sector in the India, which provides livelihood to millions of people and protein supplementation to mankind. This industry is occasionally facing setbacks, due to infectious diseases which are major impediment to the development of aqua-culture particularly, shrimp aqua-culture. Accordingly, the developed feed mix from the project will enhance the growth, immune responses and disease resistance in shrimp against V. parahaemolyticus, V. harveyi and WSSV.

Project achievements

a. **Progress vis-a vis objectives -** Polysaccharides like fucoidan and aliganate were extracted and characterized. The polysaccharides were used to develop zinc oxide nano-composite and it was further characterized.

b. **Technology/Product (to be) developed -** Marine polysaccharides mediated nanomix will be developed.

c. **IP generated/ Potential for IP generation -** Primarily, the extraction procedure was filled for Indian patent Application No. 201941035845.

d. **Resources Generated -** Three numbers of man power were generated.

Plans to take innovation further

Further steps will be taken for the product development in association with IDEAL BIOSCIENCES, Trichy.

Risks envisaged

None.

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AGRICULTURE

SBIRI

VISARGHA AGRI SCIENCES PVT. LTD.

Title of the Proposal

Development of an accelerated and precision breeding system for trait integration in plants

Brief Description

The company has developed a direct DNA delivery in plants exploiting cell wall architecture and DNA binding molecules to achieve high transformation efficiencies both in vitro and in planta and in this project its efficacy is being demonstrated by developing anthocyanin rich tomatoes and submergence tolerant rice by precisely modifying Ant1 and Sub1A genes respectively.

Current Stage of Development

Validation

Innovative Element(s)

The unique transformation systems aid in high transformation efficiencies and is well adapted for in planta transformation leading to easier and accelerated development of gene edited plants. This can be exploited for testing and correlating the genotype/phenotype, varietal background effects and deployment and integration of novel traits.

Market Potential

Novel trait and crop variety development is largely carried out with R&D of the seed companies/national institutes and this can be accelerated through precise gene editing technologies. This niche area, sought of contract research can be exploited with high efficiency DNA delivery system and commercialize the technology in form of services.

National/Societal Relevance

Ushering in second green revolution for the national food security and increasing the farmers income is the need of the hour. Accelerated and precision breeding can play a significant part in this, by decreasing the time lines and input costs of novel crop varieties development. Aided by the novel DNA delivery technology this can rapidly advance testing, development and deployment of novel varieties helping the food security and crop productivity issues

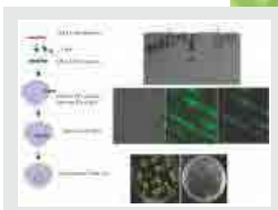
Project Achievements

a. **Progress vis-a vis objectives -** Gene edited rice and tomato plants for Sub1A and Ant1 gene imparting submergence tolerance and high anthocyanin content were successfully developed and are being evaluated at the molecular level

b. **Technology/Product (to be) developed -** The technology is a system for rapid testing and deployment of allelic diversity for crop variety development and we expect to soft launch the technology in a collaborative mode by middle of 2020.

c. **IP generated/ Potential for IP generation -** Patentability opinion is taken and will apply at the end of the project

d. **Resources Generated -** Two people at the level of research associate and assistant are employed and trained



Plans to take innovation further

The principal mode of commercialization of the technology would be in the form of research services for precision breeding and contract research for novel trait development.

Risks Envisaged

The company expects Initial entry barrier as a start up and clarity with regard to regulatory scenario of genome editing in India is not present

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INNOVATION PROFILES

INDUSTRIAL BIOTECHNOLOGY

ALGALR NUTRAPHARMS PVT. LTD.

Title of the Proposal:

Pre-pilot scale production and validation of docosahexaenoic acid from microalgae

Brief description:

Docosahexaenoic acid (DHA), an important omega-3 fatty acid has been manufactured from microalgae. DHA extracted from algae is 100% vegetarian. Algae DHA oil and DHA powder are manufactured in compliance with the set of industrial standards, FSSAI, CODEX, ISO 22000:2005 and European standards, using patented technology in a state-of-the-art production system. The by-product, de-oiled biomass cake, has also been commercialized to poultry, pet-food, and aquaculture industries for value-addition.

Current stage of development:

Commercialization

Innovative Element(s)

Algal DHA oil is processed to the highest quality to match with the US and European standards. It is ultra-clear and highly stable without using external antioxidants, unlike any other Algal DHA oil. Algal DHA oil comes in 20 to 80 percent purity.

Market Potential

The Indian market for omega-3 fatty acids is at US$29.4 million at a CAGR of 11.4. The global algae omega-3 DHA and EPA market is forecasted to reach US$1.2 billion by 2024 growing at a CAGR of 11.3 during the forecast period 2019 - 2024.

National/Societal Relevance

Until now India is importing vegan DHA oil from the US and European suppliers. Now our own indigenous algae DHA production technology, which can meet our demand without compromising on the quality at a very competitive price.

Project achievements

a. Progress vis-a vis objectives- Demonstrated the production of algae DHA in 7500 L and the products were commercialized.
b. Technology/Product (to be) developed –Production of vegan DHA from microalgae has been developed. Algal DHA Oil - 20-80%, Algal DHA powder 10-40%, Algal DHA Biomass 10-30% were developed and commercialized.
c. IP generated/ Potential for IP generation – Microalgae and methods for producing docosahexaenoic acid
d. Resources Generated – Algal DHA oil production facility up to 24 MTPA has been created. Funds mobilization for a value of 8.5 Cr. has been done.

Plans to take innovation further:

Planning to scale-up the production to 200 MTPA.

Risks envisaged:

The global algae omega-3 ingredients market is fragmented, as key players are focusing on partnerships and joint ventures to increase their production capabilities and consumer base across various regions.

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ANASUYA ROY

Title of the Proposal

Antimicrobial water storage containers for underprivileged urban and rural population

Brief description

The aim is to develop Safeplast, a cost-effective and antimicrobial polyethylene container of 20 L capacity infused homogenously with copper-clay complex which will sterilize stored water and reduce water-associated illnesses.

Current stage of development

Discovery

Innovative Element(s)

The active antimicrobial species is a natural clay infused with copper in its ionic state. Although antimicrobial copper based surfaces and products are available, this is the first time copper ions are supported in substrate clay to enable sustained release and therefore better durability.

Market Potential

In India, approximately 91.4 crore people are ruralites. Assuming a 0.1 market penetration in 1 year b family of 4, the number of containers required is 2.2 lakh 9.14 lakh /4 . The cost of one 20 l container is 350 INR, therefore gross annual revenue will be 7.7 crore. Also, water stressed countries like Africa and Middle East will be targeted.

National/Societal relevance

Providing safe drinking water is an instrumental step in uplifting standards of the underprivileged population of India.

Project achievements

a. Progress vis-a vis objectives- Production of antimicrobial additive and testing is completed and preparation of antimicrobial polymer material and testing is in progress.
b. Technology/Product (to be) developed- A polyethylene water storage container with inherent antimicrobial activity for safe-keeping of potable water in the underprivileged population.
c. IP generated/ Potential for IP generation- 1. Copper and silver immobilized nano-sized montmorillonite clay with antimicrobial properties Filed: 201911034631. 2. Metal-clay based polymer nano-composite formulation with excellent antimicrobial and cytocompatible properties Filing under progress
d. Resources Generated - A private enterprise start-up company created to generate and manage sale of the product. Two personnel trained and hired to manage the pilot scale production trials.

Plans to take innovation further:

Following proof of concept, commercial trials will be undertaken.

Risks envisaged

1. Bulk trials to produce antimicrobial additive nano-material presents challenges of handling costly nano-material.
2. Penetration into well-established manufacturing units to produce containers in small scale.

Project Coordinator:
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ANNA UNIVERSITY

Title of the Proposal

Production of L- 2-aminobutyric acid from citraconate by biotransformation and cell free system

Brief description

L-2-ABA is a key chiral intermediate for the synthesis of important drugs namely anti-epileptic levetiracetam, brivaracetam and anti-tuberculotic ethambutol. L-2-ABA produced by chemical methods lead to undesirable racemic mixture. L-2-ABA produced by glucose fermentation by metabolic engineering strategies yields low productivity levels of 9.33g/L. The current process, enzymatic bio-transformation from threonine, achieves 97.3% of theoretical yield. This process uses inefficient enzymes, and redox imbalanced pathway that requires additional raw materials.

Current stage of development

Validation

Innovative Element(s)

L-2-aminobutyric acid is produced by cell free metabolic engineering and bio-transformation through a novel pathway using a cheap substrate Citraconate containing efficient enzyme system.

Market Potential

L-2-ABA is required at the scale of 10,000 MTA world wide and 4,000 MTA in India alone. Currently it is imported from China.

National/Societal relevance

By producing the drug intermediate in-house, the cost of anti-epileptic and anti-tuberculotic drugs shall be stabilized and if possible decreased. The drugs will be affordable by increased production to the people who are economically backward.

Project achievements

a. Progress vis-a vis objectives- Cell free enzymatic conversion was carried out which resulted in 99% conversion of 0.25M. Further optimization has to be carried out to reach greater than 100g/L 1 M .

b. Technology/Product (to be) developed – Cost effective technology to produce anti-epileptic and anti-tuberculotic drug intermediate, L-2-ABA by cell free enzymatic conversion and whole cell bio-transformation through pathway that uses cheaper substrate and efficient enzymes.

c. IP generated/ Potential for IP generation - International patent PCT has been filed for Production of L-2-aminobutyrate from pyruvate / citrmalate / citraconate by bio-transformation and cell free system

d. Resources Generated - Manpower trained.

Plans to take innovation further

The work has been presented to few pharmaceutical industries.

Risks envisaged

With respect to technology, the risk could be procuring the substrate at the scale of 10,000 MTA and unknown factors influencing purification in this alternative process. With respect to technology transfer, the risk could be ascertaining the technology cost and finding more partners for licensing.

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Ramalingam S

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ARJUNA NATURAL LTD.

Title of the Proposal

Process validation and development of a highly stabilized Omega-3 fatty acids in liquid matrix, value addition of its byproduct, preclinical and clinical evaluation of safety and bioavailability for use in pediatric and general population

Brief description

Omega 3 fatty acids (EPA and DHA) are essential fatty acids not synthesized by the body and has to be supplemented through diet. The newly developed Omega 3 liquid suspension is without unpleasant odour and flavour, but with added fruity flavor, this will be an attractive option for supplement to children. The second product, obtained from the by-product of Omega 3 manufacturing, is Poultry feed supplement, which in turn resulted in Omega 3 enriched eggs.

Current stage of development

Validation

Innovative Element(s)

The indigenous technology developed will cater to the huge market demand for omega 3 rich liquid formulations for use in pediatric and general population, especially geriatric people.

Market Potential

The packaged products is projected to reach $34.7 billion in 2016, representing a compound annual growth rate CAGR of 6.4% over 2011. Infant formula is projected to continue as the largest EPA/DHA omega-3 product category, claiming a market share of 40.7 in 2016.

National/Societal Relevance

This may be the first liquid fish oil supplement manufactured in India. Apart from this main product, the fish oil waste is utilized for the development of poultry/animal feed supplements.

Project achievements

a. Progress vis-a vis objectives- The Project is progressing as per the objectives.

b. Technology/Product (to be) developed – The project has been completed and the above mentioned products have already been developed.

c. IP generated/ Potential for IP generation – Generated two IPs 1. Fish oil based Fowl Feed Composition and a method thereof. 2. Fish oil based Flavored Omega-3 syrup for pediatric and geriatric juice.

d. Resources Generated – Scientists, Senior and Junior Research Associates and Technicians were hired. Equipment and resources such as Fish oil Storage Tank, Carbon Filter, Acid Value Treatment Vessel, Deodorizing Vessel, Tintometer, Pelletizing were installed.

Plans to take innovation further

The products are ready for commercialization.

Risks envisaged

None.

Project Coordinator:
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BAIJNATH PHARMACEUTICALS PVT. LTD.

Title of the Proposal

Commercial Scale Production of Tea Catechin from Green Tea Leaves, Development of Formulations as Nutraceuticals and their Human Intervention Studies

Brief description

Present technology involves a green and sustainable process for the extraction and purification of these high-value phytochemicals and development for new formulations as tablet, capsule, cream, sachets etc.

Current stage of development

Validation

Innovative Element(s)

Green technology for extraction and purification of catechins from tea leaves

Market Potential

Tea catechins are highly sought-after polyphenols consumed worldwide accounting for 72.5 % of total market volume in 2012, with the fastest-growing polyphenol product, growing at an estimated CAGR of 8.8 % from 2013 to 2020. The global market for black tea polyphenols is expected to exceed USD 25 million by 2020 at an estimated CAGR of 6.3% from 2013 to 2020.

National/Societal Relevance

Tea is a crop of commerce. For the manufacture of different teas only fresh tender tea, shoots are used. But due to labour shortage, there is difficulty in maintaining the flush and the shoots overgrow. During the rainy months, the tea factories are not able to handle the flush which results in low manufacturing and poor quality.

Project achievements

a. Progress vis-a vis objectives - Upscaling the process for extraction and purification of tea catechins at industrial scale

b. Technology/Product (to be) developed - Development of different products based out of catechins.

c. IP generated/ Potential for IP generation - None

d. Resources Generated - Yes

Plans to take innovation further

Planning to take them to International market.

Risks envisaged

None

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BHAPRA BIOSOLUTIONS PVT. LTD.

Title of the Proposal

Development of mosquito repellent military uniform impregnated with micro-encapsulated formulations through novel and unique pressure plasma technique

Brief description

The project will result in nano-formulated mosquito repellent clothing for military/security uniforms, with impregnating nano encapsulated molecules and oils with different permutations and combinations of permethrin with other insect repellents, though robust methodology.

Current stage of development

Validation

Innovative Element(s)

The company proposes to utilize the permethrin, FDA approved, to kill the disease-carrying insects, in combination with other insect repellent essential oils incorporated into mesoporous silica nano-particles, which would enhance the efficacy of the mosquito repellent properties of uniform up to 60-70 washes.

Market Potential

The company has already partnered with M/s Baij Nath Asharfi Lall, Laminated Polyester Fabrics to commercialize this product for the Indian Army and overseas market. The partnered company is already supplying permethrin treated mosquito nets and tents to the Indian Military for several years.

National/Societal Relevance

During these days, military forces have frequently deployed to several localities that have been characterized by extremes of environment, possessing endemic diseases with inadequate public health resources. In terms of vector-borne infectious diseases, such as malaria and the arboviruses, stand out as major concerns for military deployments and also influencing the result of major military operations in the border areas.

Project achievements:

a. Progress vis-a vis objectives - The company has standardized the mosquito repellent formulation in combination with EPA approved permethrin and essential oils. Furthermore, incorporation into the newly synthesized mesoporous silica nanoparticles has been already achieved.

b. Technology/Product (to be) developed – Treatment of cloth with the microencapsulated mosquito repellent formulations is under progress.

c. IP generated/ Potential for IP generation – Work is ongoing to file an Indian and PCT patent applications.

d. Resources Generated - Most of the equipment related to the treatment of fabric were installed Four people were employed as team members.

Plans to take innovation further

The company has a MoU with M/s Baij Nath Asharfi Lall Company to commercialize the product.

Risks envisaged

None.

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CAROT LABS PVT. LTD.

Title of the Proposal

Capillary Bioreactor - bringing major reduction in water requirement for algal cultivation

Brief description

Traditional suspension based algal cultivation is not economically feasible because of its high production cost and contamination. Thus, the proprietary capillary bioreactor along with a machine learning artificial intelligence system named as algAI, is a cutting edge technology for algal cultivation that comfortably sees a 5 fold reduction in water consumption compared to the conventional methods with drastic reduction in batch failure rates because of real time monitoring of cultivation process through algAI.

Current stage of development

Validation

Innovative Element(s)

Capillary Bioprocess system, for augmenting various processes such as growth, carotenogenesis, lipid accumulation, in situ cell disruption and in situ cell extraction.

Market Potential

The opportunity is a multi billion dollar for a standardized scalable water efficient algal technology

National/Societal Relevance

Change in the cost-dynamics of various beleaguered algae biofuel industry that have failed/failing and will ensure revival of algae industry by its water and cost efficiency.

Project achievements:

a. Progress vis-a vis objectives- The beta version prototype of capillary bioreactor with several fold water reduction as compared to conventional methods is achieved.

b. Technology/Product (to be) developed – Commercial scale demo facility is possible through partnering with strategic MNC's.

c. IP generated/ Potential for IP generation - The company is in the process of securing IP

d. Resources Generated - Nine man power were employed and trained and sophisticated research facility with proprietary capillary reactor system exclusively designed for algal cultivation.

Plans to take innovation further

Focus now is on establishing strategic partnerships to enable a technology scale-up to setup a commercial scale demo facility.

Risks envisaged

The yields are subject to variability of process condition. Initial setup cost will be higher compared to conventional systems. Strain specific fine-tuning of reactors need to be done.

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CSIR-NATIONAL INSTITUTE FOR INTERDISCIPLINARY SCIENCE & TECHNOLOGY

Title of the Proposal

Valorization of spent turmeric/amla: Process development for antioxidant dietary fibre enriched products as metabolic enhancers

Brief description

Preliminary studies at CSIR-NIIST indicated great scope for dietary intervention using spent materials generated from agri/food/nutraceutical industries as metabolic enhancers as these are rich source of bioactives and dietary fibre. Arjuna Naturals generates huge amount of spent turmeric which was found to be rich in resistant starch.

Current stage of development

Validation

Innovative Element(s)

The focus of the current project is on process development of extraction of dietary fibre and bioactive from spent turmeric generated form industry for application as metabolic enhancer.

Market Potential

Development of scientifically validated dietary fibre enriched formulated products in the form of supplements/ functional foods/nutraceuticals as metabolic enhancers will be value addition to these materials which is otherwise discarded as waste. Moreover, as metabolic syndrome is one of the major health concerns all over the world, the market for scientifically validated formulation for dietary intervention is promising.

National/Societal Relevance

The efficient utilization of the by-products from food industry can help in reducing the negative cost, reduce environmental pollution, demonstrating sustainability in food industry and that has direct impact on the economy and food security of the country.

Project achievements

a. Progress vis-a vis objectives- Phytochemical fingerprinting of bioactive in spent and fresh turmeric, extraction of resistant starch and prebiotic activity PAS , in vitro bioactivity studies antidiabetic and antiinflammatory studies.

b. Technology/Product (to be) developed – Process for extraction of prebiotic dietary fibre resistant starch with metabolic enhancing activity from spent turmeric

c. IP generated/ Potential for IP generation – New IP may come out.

d. Resources Generated - Three project students and two PhD are being trained under this project.

Plans to take innovation further

Once optimized, the process will be scaled up and commercialized by the industry partner.

Risks envisaged

Scale-up of the process and development of product with consistent activity and resistant starch content is the major challenge envisaged.

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FERMENTECH GSV PVT. LTD.

Title of the Proposal

De-regulated expression of CodY controlled proteins in Lactococcus lactis for enhancing nisin production using CRISPR/Cas9 genome editing

Brief description

Scar free mutations produced through CRISPR technology offer excellent scope for biological food ingredients manufacturing to line up with the requirements of Generally Regarded As Safe GRAS status of US-FDA. In this project, enhancement in nisin fermentation parameters such as specific productivity & nitrogen up-take is envisaged through up-regulation of codY target genes.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Modification in nitrogen metabolism by targeting a pleiotropic transcription regulator

Market Potential

Indian dairy industry alone is importing 10 to 15 MT per year of nisin primarily from China. Every year, cheese manufacturers amend the food additives list by working with regulators to extend the application of nisin to variety of cheese including non-processed ones. Bakery segment in India has recently got the approval for using nisin in cream and its spreads.

National/Societal Relevance

Demand for processed foods has been rising with increasing disposable income and urbanization. Relevant aspects are: Relaying on cheap chemical preservatives-Nothing has replaced sorbates and benzoates even though the harmfulness is well known to the peer and public; Necessity for add-on resources to support the idea of post-harvest management including cold storage

Project achievements

a. Progress vis-a vis objectives- Robust production host is under development
b. Technology/Product (to be) developed – Nisin Formulation, GSV-234
c. IP generated/ Potential for IP generation – None
d. Resources Generated - Man power- 2 PhD, B.Tech

Plans to take innovation further

Collaboration with JSI, Europe

Risks envisaged

To combat imports from China is critical.

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HIMEDIA LABORATORIES PVT. LTD.

Title of the Proposal

Development of cost effective production technology for production of microbial hydrocolloids for biotechnology application

Brief description

The production of gellan gum is an insignificant amount from unique & stable mutants SM-80 & SM-81 obtained by Ethyl methanesulfonate, during media optimization studies using shake flask level. Gellan gum so produced has required gelling properties and complying sodium and calcium ion test which are the key tests of physical properties.

Current stage of development

Validation

Innovative Element(s)

The unique stable mutants of Sphingomonas strains obtained by chemical mutagens; Downstream methods involve the use of acid and alcohol at ambient temperature rather than traditional chilled solvents.

Market Potential

The global market for gellan gum including India raked in estimated revenues worth US$ 50.15 million in 2018, which are likely to increase at 4.3% CAGR to reach US$ 70.2 million by 2026.

National/Societal relevance

For its need for Gellan gum, which is considered as agar substituent, India depends on 100% on imported material, especially the USA, China, and Germany. Hence in India, there is a need to provide the gellan gum at affordable prices. This is possible for HiMedia only if they design & develop the indigenous fermentation process.

Project achievements

a. Progress vis-a vis objectives- Shake flask optimization studies of the two mutants SM-80 & SM-81 and characterization of the isolated hydrocolloid is completed. Optimization under 10 L bioreactors ongoing along with downstream optimization.
b. Technology/Product (to be) developed – The technology for fermentation of high viscous fermentation is being developed followed by its downstream processing optimization studies of the broths.
c. IP generated/ Potential for IP generation - Currently, no IP generated.
d. Resources Generated - A doctoral student; a small Fermentation upstream facility has been created by HiMedia with 2 bioreactors and their accessories including other infrastructure associated with the upstream facility.

Plans to take innovation further

On successful development of upstream and downstream of the hydrocolloid from at least one of the two mutants, the technology will be ready for the pilot-scale studies through BIRAC support.

Risks envisaged

The project may have risks related to cost and schedule. Capex cost involved in the project is higher.

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INNOTECH INTERVENTION PVT. LTD.

Title of the Proposal

Production of organic mushrooms fortified with Vitamin D: A mission to enhance skill, livelihood and profitability in northeast India

Brief description

Developed a technology and patented a simple yet innovative protocol by using specific UV rays attaining consistent higher levels of Vitamin D concentration in the mushrooms. It would be first non-GMO and natural vehicle for vitamin D supplementation.

Current stage of development

Commercialization

Innovative Element(s)

Developed an innovative intervention to increase the natural property of mushrooms in accumulating vitamin D. This product 250 gms/packet twice in a week can provide the recommended dose 400-800 IU/day of vitamin D.

Market Potential

Vitamin D deficiency is very predominant among the women and elderly of the northeast. Thus under this they would like to target and test the concept of fortified mushrooms in north east.

National/Societal relevance

The ambition to End Hunger, achieve food security and improve nutrition and promote sustainable agriculture is captured in SDG, however, at-least 12 out of the 17 goals contains indicators that are highly relevant to nutrition. Thus we would be actively working to achieving the SDGs. By providing the small holders farmers with the technology, training and infrastructure to produce the fortified mushrooms, they can sell the product in premium. Thus we will be a major incentive in doubling farmers income under the mission of current government. Thus aims specifically to target overcome these lacuna and proposed to consider vitamin D fortified mushrooms as a major revenue earning source for the growers .

Project achievements

a. Progress vis-a vis objectives- Completed the target of producing 10 Kg mushrooms with enhanced Vitamin D with 4000 IU/100g.

b. Technology/Product (to be) developed – Through a specific UV rays in production chamber higher levels of vitamin D concentration in the produce mushroom.

c. IP generated/ Potential for IP generation - Indian Patent filed

d. Resources Generated - Established a mushroom production unit that produces 10 kg per day mushrooms enhanced with Vitamin D.

Plans to take innovation further

Developing a cluster based model to enhance the production to 400 kg per day.

Risks envisaged

Logistics is one of the barriers for bringing this technology to the market because of its being perishable in nature .

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INNOVATION BIOLOGICALS PVT. LTD.

Title of the Proposal

Laboratory optimization of fermentation and downstream processing for recombinant Hansenula polymorpha based Human Papilloma Virus (HPV) L1 protein

Brief description

The company has developed a laboratory scale process for production of purified virus like particles VLPs that are immunogenic against Human Papilloma Virus serotypes 6,11,16 and 18. The immunogenicity has been confirmed against HPV antibodies against serotypes 6,11,16 and 18. The VLPs are produced by fermentation in a recombinant yeast, and the final product has been purified to homogeneity

Current stage of development

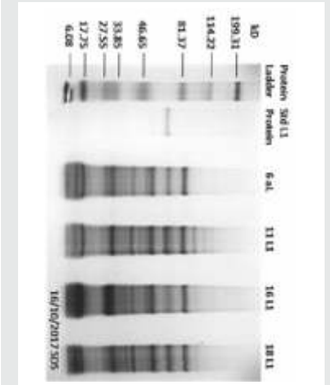
Validation

Innovative Element(s)

High cell density fermentation and unique downstream processing method.

Market Potential

The market potential in India is enormous as there are close to 450 million Indian women in the high risk area. Addressing an Indian Market would be in itself a challenge. Cost is a major issue and the company is hoping that the product can be produce at a cost that is affordable to its Indian users



National/Societal Relevance

In India the annual deaths due to cervical cancer approximate 100,000. There is a need to produce a vaccine against HPV at an affordable cost.

Project achievements:

a. Progress vis-a vis objectives- The company has developed a laboratory process for manufacture of VLPs for the serotypes 6,11,16 and 18. This is a basic step, which will have to undergo efficacy immunogenicity trials.

b. Technology/Product (to be) developed – The product is ready at laboratory scale. The efficacy trials will have to be followed by clinical trials as per FDA and other regulatory norms

c. IP generated/ Potential for IP generation – None

d. Resources Generated – The company has trained 3 project Associates.

Plans to take innovation further

The company would be interested in doing a tech-transfer for manufacture of these VLPs as they are too small a company to enter primary manufacture

Risks envisaged

Though the company has tested immunogenicity against commercial antibodies of HPV serotypes 6,11,16 and 18 some additional studies may be required to confirm immunogenicity and efficacy.

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KALPANA JOSHI

Title of the Proposal

Proof of Concept for a bacteriophage resistant dairy starter culture for industrial dairy fermentation process

Brief description:

Developing bacteriophage-resistant dairy starters that will an ethnic taste

Current stage of development

Validation

Innovative Element(s)

The use of bacteriophage resistant dairy starters will avoid the failure of batches in dairy industries.

Market Potential

Plan to come with dairy cultures which will be bacteriophage resistant. It will help to reduce the import of culture which is helping to improve consistency but not giving bacteriophage resistivity.

National/Societal relevance

Most of the dairies import cultures from European countries. There is no solution to resist bacteriophage in the dairy industry to avoid losses

Project achievements

a. Progress vis-a vis objectives- LAB strains screening
b. Technology/Product (to be) developed – Starter Cultures Product under development- after 9 months product will enter the market
c. IP generated/ Potential for IP generation - One patent has been filed
d. Resources Generated - The company has 3 competent employees and good microbiology laboratory

Plans to take innovation further

The product will be distributed to the local dairies. The company will continue to innovate more dairy products and solutions

Risks envisaged

The challenge of the selection of packaging material

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KRIMMI BIOTECH LLP

Title of the Proposal

A Novel Eco-friendly process to induce the silkworm to produce naturally colored silk fibre of desired choice with increased yield

Brief description

The current invention relates to the process of obtaining a naturally colored silk by incorporating natural pigments from plant origin which also acts as a plant silkworm growth promoter. The intended product is provided in a vial which can be mixed with water and spread on the mulberry leaves. This project mainly thrives to reduce the usage of carcinogenic synthetic colours that are being used during reeling and dyeing process.

Current stage of development

Proof-of-Concept

Innovative Element(s)

The cocoons of desired choice spinned on spot without any artificial ingredient. The silk is forced spun into a planar structure thereby reducing the process of reeling, dyeing and spinning. The proposed silk can be value enriched for biomedical applications, undergarments, sportswears etc through this technique

Market Potential

There is interest among the reelers and farmers who can get additional revenue.

National/Societal Relevance

The proposed technology intends to develop naturally colored silk by incorporation organic dyes in the silk glands of silkworms. This process can save more than 60% water being used in the conventional dyeing processes and eliminates the usage of synthetic dyes.

Project achievements:

a. Progress vis-a vis objectives- Development of various colour cocoons through natural impregmentation in the silk gland; Identified several natural colours from different sources; Isolation of the natural colour from different plants; Standardizing the concentration of the dye required for silkworm; Feeding the dyed mulberry leaves to silkworm; Bioassay to determine the feed response percentage
b. Technology/Product (to be) developed – Replacement of the conventional dyeing technique will be done by inducing the silkworm to produce naturally coloured cocoon of desired choice.
c. IP generated/ Potential for IP generation - One provisional patent has been filed for the proposed technology of natural colour into the silk gland and organic planar silk.
d. Resources Generated - Employment generated: 3; A facility created towards the smooth execution of the project

Plans to take innovation further

Would enter into the market through strategic alliance with Marketing agencies and corporates.

Risks envisaged

Do not envision any risks in field trials and commercialization

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KUANTUM PAPERS LTD.

Title of the Proposal

Cellulosic Ethanol Pilot Plant For Rice Straw Management

Brief description:

Agricultural residue or ligno-cellulosic biomass is a proper resource to displace fossil resources for energy and useful chemical production. To harness the energy potential, an economically viable and patented technology has been developed to saccharify Hemi-cellulose and cellulose into monomeric sugars and assimilate these to generate ethanol.

Current stage of development

Validation

Innovative Element(s)

Thetechnology uses mild conditions for treatment of the biomass, thereby generating minimal recalcitrants detrimental to viable production of ethanol. The biomass is fractionated into its components and separated for independent processing and treatment. Inorganic matter contained in the biomass is also converted to value added saleable compounds and the lignin is valorised for steam and chemical recovery.

Market Potential

The market is primed to commercialize bio-refineries of 100 Kilolitre capacities. Potentially, 75 bio-refineries in Punjab, 15 in Haryana and 25 in Uttar Pradesh alone can be established based on Paddy straw.

National/Societal relevance

The commercialization of the technology creates a perennial source of fuel, reduces import dependence, and above all creates energy security. It provides a direct incentive to farmers to earn from rather than burn the agricultural residues.

Project achievements

a. Progress vis-a vis objectives- To ascertain the production cost of ethanol and recovery of steam, alkali, silica and Lignin from Black Liquor in a continuous process with automated plant and machinery optimization of storage conditions for rice straw and disposal of gypsum were the objectives and all these have been established.

b. Technology/Product (to be) developed - 2nd generation ethanol from patented technology has been demonstrated on a pre-commercial scale plant and the technology is ready for commercialization in the next six months.

c. IP generated/ Potential for IP generation - None

d. Resources Generated - Manpower has been trained starting from operators and other officers to run continuous plants setup using this patented technology. The facility created is state of the art with machinery developed and used for the first time in such a process.

Plans to take innovation further

Fund raising is being explored. Punjab Government and the Government of India are also keen for setting up large 2nd generation biofuel bio-refineries. Potential private investors and Oil marketing companies will be approached soon.

Risks envisaged

The availability of long-term supply of feedstock i.e. rice straw if critical for success of cellulosic ethanol plants.

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MALLIPATHRA NUTRACEUTICAL PVT. LTD.

Title of the Proposal:

Bench scale production of snow flake Cordyceps and Cordyceps militaris through solid-state and sub-merged fermentation respectively for nutraceutical application

Brief description:

Developed a technology for growing Cordyceps artificially without compromising the quality which took 60 days to complete its life cycle. The major focus of this technology is to develop a Nutraceutical products like fruiting body, Mycelia powder, Cordyceps Capsules etc., from Cordyceps mushrooms for various lifestyle disorders and ailments.

Current stage of development

Validation

Innovative Element(s)

The major objective of this project is to artificially simulate the environmental conditions favouring the growth of Cordyceps, on silkworm pupa which is cheaply and abundantly available throughout the year and also standardization of vegetative substrate for growing Cordyceps fruiting body and mycelium mat. Culturing of Cordyceps on cheaper substrates like silkworm pupa and low cost vegetative substrate would enable us to produce economically viable products with combined therapeutic benefits of silkwsorm pupa and Cordyceps which can cure different lifestyle disorders and ailments.

Market Potential

There are huge demand for good quality Cordycep in the international B2B market.

National/Societal relevance

Due to its high value and increasing demand has led to over exploitation of the natural resources and this mushroom have made it endangered species

Project achievements

a. Progress vis-a vis objectives- Completed the standardization of cultural conditions for solid state and sub-merged fermentation of Cordyceps. Establishing fingerprints such as HPLC/HPTLC profiling of bioactive components of Cordyceps, DNA sequencing has been completed. Standardization and validation of scale up up to 25 kg, solid state fermentation. batch size studies on various vegetarian and non-vegetarian substrates is in progress

b. Technology/Product (to be) developed – The technology for the growing of Cordyceps in an artificial environment both for vegetarian and non-vegetarian media and submerged fermentation have been standardized.

c. IP generated/ Potential for IP generation - None

d. Resources Generated - Trained personnel have been hired to handle the project efficiently.

Plans to take innovation further

Scaling up the technology by optimizing the culture conditions and develop products of national interest.

Risks envisaged

None

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NATIONAL CHEMICAL LABORATORY, PUNE

Title of the Proposal

Production of low molecular weight fungal chitosan for healthcare applications

Brief description

Fermentation conditions, medium, inoculums yeast/mycelia/mixed were statistically optimized to obtain more fungal biomass with higher chitosan content. Chitosan was successfully extracted from the fungal biomass with ~25 yield and 40-43 kDa molecular weight. Its potential healthcare applications as drug carrier, for sustained drug release were demonstrated.

Current stage of development

Validation

Innovative Element(s)

As against commercial chitosan obtained from marine sources, in present study it is extracted from fungal biomass. Fungal chitosan has low molecular weight and higher degree of deacetylation.

Market Potential

It will be value addition/byproduct for mycotech industry as waste fungal biomass can be used to obtain fungal chitosan. Homogenous preparation with low mol. wt. and high deacetylation has lot of applications in healthcare sector.

National/Societal Relevance

Presently in agriculture, chitosan is used to increase soil microbial diversity and fertility, while control of plant pathogens is being achieved with low mol. wt. chitosan. In healthcare, it is used for weight reducing activity, to increase penetration of drugs, in the drug delivery, treatment of arthritis, paradontitis etc. Production cost is a major concern which can be addressed by scale up and enzymatic deacetylation processes.

Project achievements

a. Progress vis-a vis objectives - The identified objectives, viz. optimization for biomass and chitin deacetylation production, scale up for biomass production in fermenter, enzymatic deacetylation and health care applications were successfully completed.

b. Technology/Product (to be) developed – Chitosan from fungal source

c. IP generated/ Potential for IP generation - Know-how for optimization for biomass production and enzymatic deacetylation of chitin.

d. Resources Generated – Employment generated

Plans to take innovation further

Greenvention Biotech Pvt. Ltd. industry partner has shown interest to take up the technology further for commercialization. The necessary Technology transfer has already been done between CSIR-NCL and Greenvention Biotech.

Risks envisaged

Higher production cost than marine chitosan.

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R. ASWATI NAIR

Title of the Proposal

Development of endophyte-based biopesticides for pre- and post-harvest soft-rot disease management

Brief description:

Soft rot disease caused by Pythium species is of serious concern especially in ginger, an export-oriented spice crop wherein resistant cultivars are non-existent. Being soil-borne, disease management is difficult with Pythium-induced decay jeopardizing productivity in various ginger-producing regions resulting in complete crop devastation and reduction in marketable yields. The group has developed a formulation impregnated with molecules that prevents Pythium infestation through rhizome in soil.

Current stage of development

Validation

Innovative Element(s)

Cost-effective formulation, easy to apply and safe.

Market Potential Area under ginger cultivation in India is 164.85 thousand ha in 2016-17. Currently Trichoderma based biopesticides for Pythium infestation control in many crops cost around Rs. 100 per acre. Thus the market size of the segment is INR 4,000 crores with a huge opportunity for new formulations

National/Societal Relevance

Global ginger market revenue amounted to $5.3B in 2018 with approximately 3.3MT of ginger produced worldwide with India being the leading producer. Ginger production is seriously affected by soft rot caused by Pythium species resulting in absolute production loss, the severity of which is reported every year.

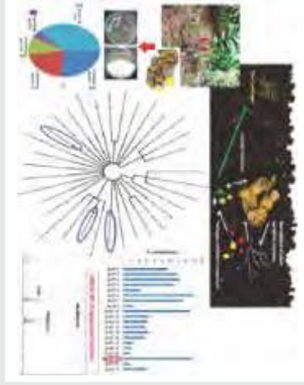
Project achievements:

a. Progress vis-a vis objectives- Developed a biopesticide formulation for effective control of soft rot disease caused by Pythium myriotylum.

b. Technology/Product (to be) developed – Formulation developed. Expected time to enter market is one year subject to completion of registration formalities

c. IP generated/ Potential for IP generation - IP registration process initiated

d. Resources Generated - Trained two personnel under BIG funding in addition to two Ph.D scholars; Established facility



Plans to take innovation further

Partnership through technology transfer effected by licensing agreement

Risks envisaged

Regulatory approvals and finding partners for commercialization of product.

Project Coordinator:
R. Aswati Nair

Team Members:
Vaishak Ravindran,
Agnisrota Mazumdar,
Harsh K,
Ms. Harshitha K

Contact:
Department of Biochemistry
and Molecular Biology, Central
University of Kerala, Periye,
Kasaragod-671316

RAJKUMAR HALDER

Title of the Proposal:

Writable-erasable coatings on articles and usage thereafter with high positive social impact

Brief description:

The applicant has developed an indigenous writable-erasable coating that can be written with Pencil, Marker and sketch pen and erase thereafter without leaving any ghost images. This product can be used for 360-degree classroom and also can be used as a learning slate for an individual. This indigenous coating can also be applied on any surface wall, gypsum board, glass, cloth and etc. for learning, teaching, discussion and self-improvement.

Current stage of development

Validation

Innovative Element(s)

This is a first in kind an indigenous product that can be written with any kind of pencil, whiteboard marker, permanent marker, sketch pen, Gel pen and erased thereafter. One pencil and one slate made of the coating can change individual for self-sustainable development, save paper and save trees means save the environment too.

Market Potential

There is a minimum of 800 million users in India and more in abroad. The product can be used from classroom to kitchen and from office to parliament and hospital. Even though whiteboard is available but our product is much more efficient with broad application.

National/Societal relevance

The product will be used to make slate where student can write with pencil (Rs. 4/Pencil), does not need an expensive marker and erase thereafter without leaving any ghost images. This coated tool will help every student to learn fearlessly, coated wall can be used for teaching and discussion. This innovation carry a huge potential for sustainable societal development.

Project achievements:

a. Progress vis-a vis objectives- Large scale product is ready and demo sample will be out for testing.

b. Technology/Product (to be) developed – Product is already developed

c. IP generated/ Potential for IP generation - A patent has been drafted and filling is under progress

d. Resources Generated - Private investors are interested to invest in this project.

Plans to take innovation further:

The fund raising process is underway.

Risks envisaged

Finance is very much needed for market entry and developing production unit. There is no risk factor associated with the product.

Project Coordinator:
Rajkumar Halder

Team Members:
Gabriele Pertuzi,
Ganapati Mandal, Prem Narayan,
Ranjeet Kumar Sah,
Rabindranath Das,
Krishna Mohan Halder, Ganga

Contact:
Plot-123, Pocket-2,
Jasola Vihar,
New Delhi-110025

RAM RAJASEKHARAN

Title of the Proposal

Development of novel, economical process for the recovery of Sucrase Inhibitor from sugar refinery spent for controlling calorie intake

Brief description

The company has identified and characterized sucrose inhibitor in sugarcane, which is the major source of dietary sucrose and demonstrated that invertase inhibitors can be used for inhibiting the sucrose metabolism to control the calorie intake.

Current stage of development

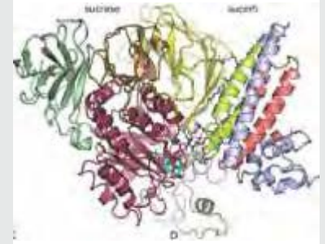
Proof-of-Concept

Innovative Element(s)

The specific aim of the proposed project is to develop a novel, cost-effective, and viable process to isolate the sucrase inhibitor from sugarcane press mud for moderating calorie intake.

Market Potential

Diabetes affects approximately 422 million people worldwide, including nearly 75 million in India. It is estimated that GDP impact in India of diabetes and other chronic diseases exceed 2.1. With India's GDP around USD 2.5 trillion PPP equivalent USD7.5 trillion , the impact on the economy in real terms is pegged at USD 52 billion in PPP terms ~USD 157 billion .



National/Societal relevance

The proposed nutraceutical intervention for dietary management of calorie intake is a critical unmet need for the treatment of patients with diabetes and obesity.The deliverables are highly connected with social impact and have a lot of market pull.

Project achievements

a. Progress vis-a vis objectives- From the study, a strong affinity of human sucrase enzyme with sugarcane invertase inhibitor indicates that it could control the release of glucose from sucrose and thereby control the glucose level in the blood. Additionally, the observation assists in the molecular level understanding of protein-protein interaction.

b. Technology/Product (to be) developed – This study shall give clues on mechanism and directions for a new protein as a complementary therapy for controlling glucose levels that leads to a delay in pre-diabetic conditions

c. IP generated/ Potential for IP generation - The outcome of this work will have high patent value of global importance. Here, the applicant is the first one to show that invertase inhibitors from sugarcane can be used for inhibiting the sucrose metabolism in mammals to control the calorie intake

d. Resources Generated – Man power recruited-2.

Plans to take innovation further

Licensing the technology

Risks envisaged

None

Project Coordinator:
Ram Rajasekharan

Team Members:
Usha Dhandamudi,
Arun Kumar,
Sona Rajakumari

Contact:
Incubation Center Indian
Institute of Food Processing
Technology Pudukkottai Road
Thanjavur 613005

REVY ENVIRONMENTAL SOLUTIONS PVT. LTD.

Title of the Proposal:

Mass production of Anaerobic granulated sludge -an effective solution for organic waste/ waste water conversion to recover bio-gas and re usable water.

Brief description

Product is an Anaerobic granulated sludge of 1.5 -2.0mm size and more than 650 bacteria. This consortium is proven to treat waste water and the treated water can directly be used for irrigation purposes. This ready to use product will provide 26X faster start of AD/ UASB reactors. It can withstand 10 X higher loading rate. It has a capability to reduce 1.5 X higher COD/BOD while giving 2 X higher biogas yield

Current stage of development

Validation

Innovative Element(s)

A case study of dairy ETP reflects that use of UASB with Granulated sludge will require 73% less space, less pre-treatment, can handle 20% higher organic loads, will give 38% more energy as compared to conventional process, less maintenance and 81% lesser time for startup of UASB digester

Market Potential

It is estimated that the waste water treatment equipment market is worth approximately Rs. 220-367 million.

National/Societal Relevance

Around 62,000 MLD sewage is generated but no more than 18,883 MLD 21% of sewage is actually treated. Out of 816 STPs, only 522 are operational. Thus, there is an urgent need for efficient water resource management through enhanced water use efficiency and waste water recycling.

Project achievements

a. Progress vis-a vis objectives- Pilot Plant commissioning is over and currently validation of the technology developed is ongoing.

b. Technology/Product (to be) developed – Successfully completed the PoC development and now are in pilot scaling phase which will be over in next 6 months followed by commercial manufacturing by end of 12 months

c. IP generated/ Potential for IP generation - IP Application submitted for the methodology developed of producing granular biomass with key operational and experimental parameters. Completed Trade mark registration of the product developed along with its content

d. Resources Generated - Employed – 12; Trained – 20; Facility Waste water testing & Analysis Created – 1; Company formed - REVY Environmental Solutions Private Ltd.; Grant –Rs. 29 akhs; Fund Mobilized – Rs. 50 Lakh bootstrapped

Plans to take innovation further

Scale up R & D unit and commercialization of technology developed

Risks envisaged

Raising capital for mass production, building strategic partnerships, recruiting, and retaining top scientific talent and compliance with regulatory bodies

Project Coordinator:
Vanita Prasad

Team Members:
Rajneesh Prasad,
Bhavik Kathrani

Contact:
313-314, SIDDHARTH
UPSCALE, Vasna Road,
Vadodara, GUJARAT
India-390007

SABRAN BIOENTTRI PVT. LTD.

Title of the Proposal

Green Fodder Forever" - Deficit of over 665 million ton of green fodder in India can be ably met via lush green and nutritious algal biomass as feed coat to dry fodder making it "Green Fodder Forever" in an innovative biotech way.

Brief description

The re-entry of much-needed bio-Nutritionals via algal biomass route thus will make the dry fodder, Green Fodder Forever with making of its availability at will and based on the instant demands. Green Fodder Forever is a proprietary product and a much-needed biotech need for good of the livestock, the owners and the nation as well.

Current stage of development

Proof-of-Concept

Innovative Element(s)

The new type of innovative algae and agri-biotech based product with the least competitors and only possible competition is from monsoon or available potable water-based traditional green fodder grower and its supply by manufacturers and maybe the farmers themselves.

Market Potential

The feed industry is nearing to 50 billion dollars by 2025. Product delivery of CAD 5 million sized in Canada. Bigger market share awaiting in USA, NZ, and Brazil. India alone as an annual demand of 665 million ton of green fodder annually

National/Societal Relevance

A new biotech innovation to address a deficit of over 65 Million tons of Green Fodder in our country India alone. Indian Livestock based milk, meat, and wool delivery often fall short in terms of nutritious feed & fodder. Maize, Sorghum, Paddy, and wheat straw which may be made to silage to increase their Nutritionals. Bioenttri of Algae biomass is the need of the hour and is a perennial eco-sustains for multiple job generation.

Project achievements

a. Progress vis-a vis objectives- Growing and upscaling of cultures of algae Chlorella, Spirulina, Dunaliella and Tetraselmis species in 500 to 1000 litre of live cultures in mini growth ponds of 400 sqm at the factory site achieved.

b. Technology/Product (to be) developed – These consortia of nutritional algae, Aloe Vera gel, Guar or Acacia gum will serve a green nutritional coat on dry fodder to make it re-green and reloaded with bio-nutrition as Green Fodder Forever.

c. IP generated/ Potential for IP generation - Patent filed: 201621044159; Inventor: Randhir S Gajraj and Pulomaja R Gajraj; Process of harvesting, drying motile, non-motile algal forms; The patent filed Year: 2016 ;Patent Attorney: Krishna and Saurastri Associates LLP, Mumbai

d. Resources Generated - Facility is being under progress to make and deliver the product - Gf2.

Plans to take innovation further

Foundation stone laying of the venture GF2 as Sabran Bioenttri Canada Pvt Ltd based at Toronto, Canada to begin as our first overseas venture

Risks envisaged

None

Project Coordinator:
Randhir S Gajraj

Team Members:
Ashish V Polkade,
Deepak Shrivastava, N Jeeji Bai,
Dharmendra Singh,
Rameshwar Narayan,Naresh Jain,
Sabita R Gajraj

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402 A, Swapnalok Apartments,
A K Vaidya Marg, Malad East
Mumbai-400097

SENGATHALI BIOFIBER PVT. LTD.

Title of the Proposal

Novel process and device to extract banana sap and center core dietary fibers

Brief description

Development of a Novel process and Device to extract the banana sap and banana center core Dietary fibers.

Current stage of development

Proof-of-Concept

Innovative Element(s)

Unique Device and process to extract this fiber and sap.

Market Potential

There is enormous scope for market potential to India and Abroad. Our technology and market size we can expect more than 10,000 crores. Because the Dietary fiber is useful for food products and the banana sap is used as a fertiliser and special value added products just like Natural hair dye preparation etc.

National/Societal Relevance

India is an agriculture country. Most people are living in Rural background and rural economy is the major one. This product will give good income to the rural economy and it will boost the rural income and it will generate lot of rural employment opportunities and it will solve the environmental problems.

Project achievements

a. Progress vis-a vis objectives- Developed the innovative device to extract the banana center core dietary fiber. The banana sap extraction unit is under fabrication. It will become successful after the third mile stone completion.

b. Technology/Product (to be) developed – Developed the innovative device to extract the banana center core dietary fiber.

c. IP generated/ Potential for IP generation - The process and products both are having the potential for IP Generation

d. Resources Generated – Facility for production of prototypes

Plans to take innovation further

In discussion with the machine manufacturers from Coimbatore to manufacture this machine and sell in the market.

Risks envisaged

Protection of IP.

Project Coordinator:
K. Murugan

Team Members:
Lalitha M,
Arul Prakash M

Contact:
29A/1, Bryant Nagar,
8th Street,Thoothukudi,
TAMILNADU, India-628008

SHAON RAY CHAUDHURI

Title of the Proposal

Microbial consortium based biofertilizer for increased Ramie Fiber yield

Brief description

It is a process by which the dairy waste water is microbially converted into liquid biofertilizer inside a biofilm reactor system within 16 hours of incubation with 3 to 6kW energy per 500m^3 biofertilizer production in a single unit operation. The conventional system requires 7 units of operation, 120 hours incubation as well as 70kW energy for 500m^3 effluent treatment. The biofertilizer produced using this system substitutes use of chemical fertilizer and fresh water for cultivation of economically important crop with enhanced yield and maintained quality.

Current stage of development

Validation

Innovative Element(s)

This technology is only one of its kind till date for converting dairy wastewater into biofertilizer which could enhance production of economic crop while conserving fresh water from being misused for agriculture.

Market Potential

Considering the fact that there are about 820 dairy farms in India and around 10000 dairy farms globally, the cost of a biotreatment plant of 600 thousand liters/day processing capacity is Rs 300 lakhs. Hence the Indian Market is Rs 2460 Crores while that globally is Rs 30000 Crores.

National/Societal relevance

This technology will address the problem of fresh water scarcity by minimizing about 90 percentage wastage of fresh water for agriculture per day. Chemical fertilizer requirement will drop and hence rock phosphate import will decrease.

Project achievements

a. Progress vis-a vis objectives- Developed the pilot plant at two different locations and validated both the biotreatment plant functioning and the biofertilizer performance for different varieties of economic crops.

b. Technology/Product (to be) developed – Biotreatment plant for converting dairy effluent to biofertilizer developed

c. IP generated/ Potential for IP generation - One Indian patent filed Bio-fertilizer production from bacterial consortium. 201731003023 dated 27th January 2017 . Second patent with higher efficiency claim to be filed

d. Resources Generated –Man power trained: 6, Employment for 2.

Plans to take innovation further

Licensing is planned

Risks envisaged

Protecting the consortium after commercialization from being replicated without licensing

Project Coordinator:
Shaon Ray Chaudhuri

Team Members:
Lalit Mohan Gantayet,
AshokeRanjan Thakur

Contact:
Department of Microbiology,
Tripura University,
Suryamaninagar,
West Tripura 799022

SIR MVIT (SIR M. VISHVESHWARAYYA INSTITUTE OF TECHNOLOGY)

Title of the Proposal

Evaluation of a non-antibiotic feed supplement towards enhancement of immune response against mycoplasma infection in poultry to prevent the occurrence of Complicated chronic respiratory disease

Brief description

The project is aimed towards development of a novel technology to prevent the occurrence of Mycoplasma infection in the poultry which causes respiratory disorders knows as CRD and CCRD. Antibiotics are the only method of treatment available. As an alternative solution, a poultry feed supplement comprising of unique combination of different probiotics, prebiotics and expectorants has been developed which helps in the prevention of CRD and CCRD.

Current stage of development

Proof-of-Concept

Innovative Element(s)

This formulation comprising prebiotics, probiotics strains, fermented agriculture produces, expectorants etc., works as a immunopotentiator, competitively eliminate the mycoplasma and work as a growth promoter.

Market Potential

Non antibiotic feed additive for broiler farms- premix formulation to reduce the symptoms of CRD and enhanced gut conditions. Non antibiotic feed additive for egg layer and breeder farms-Premix Formulation from Day 1- to prevent the occurrence of CRD & Secondary Infection.

National/Societal relevance

Occurrence of CRD has resulted in a global economic loss of 780 million USD and loss of 250 million USD in the India scenario. This is accompanied by reductions in body weight gain of about 20-30 percent, loss of FCR by 10-20 percent, chick mortality of 10-20 percent and decrease in egg production of around 15-16 percent.

Project achievements

a. Progress vis-a vis objectives- Completed the formulation of non-antibiotic poultry feed supplement with optimal parameters. The evaluation of the effect of the feed additive on immune response is under progress

b. Technology/Product (to be) developed – A poultry feed supplement developed comprising of a unique combination of probiotics, prebiotics and herbal expectorants which in combination has the properties of immunopotentiator and prevent the occurrence of CRD, CCRD and secondary infections.

c. IP generated/ Potential for IP generation - One provisional patent application filed with details: In201841036165

d. Resources Generated - 3 BE students and 1 MTech students trained for their academic projects. Probiotic culturing facility developed through this project

Plans to take innovation further

Once the product is formulated and developed, validation with industry partner would be undertaken

Risks envisaged

None

Project Coordinator:
H G Nagendra

Team Members:
Ashwathy S Das,
Budhi Lal

Contact:
Krishnadevaraya Nagar,
Hunasemaranahalli,
Yelahanka, KARNATAKA
India-562157

SOWBHAGYA BIOTECH PVT. LTD.

Title of the Proposal:

Production of plant growth promoting factors by Bacillus subtilis SR1 under the influence of feather protein hydrolysate with control of plant pathogens

Brief description

The development of bio-fertilizers using chicken feather wastes is becoming the focus of much research interest. Feather meal being nitrogen-rich, inexpensive and easily available source serve as a potential bio-fertilizer.

Current stage of development

Validation

Innovative Element(s)

The application of Chicken feather protein hydrolysate amino acids for foliar use is based on its requirement by plants in general and at critical stages of growth in particular.

Market Potential

In India and abroad there is different single product are available for example in market it is available of PGPR bacteria, Amino acid-based product, and bio fungicide product separately. In the present product one product work as mutliple way like pgpr, amino acid and biofungicide.

National/Societal relevance

Foliar Nutrition in the form of cereal protein Hydrolysate Known as Amino Acids Liquid and foliar spray provide ready made building blocks for Protein synthesis.

Project achievements

a. Progress vis-a vis objectives- Comparative studies with amino acids derived from chicken feather protein from SR1 in feild trails.

b. Technology/Product (to be) developed – Technology has developed a focus on the commercialization process.

c. IP generated/ Potential for IP generation - N/A.

d. Resources Generated – lab facility.

Plans to take innovation further

Plant for Fund raising for commercialization.

Risks envisaged

None.

Project Coordinator:
Narendra kumar

Team Members:
Sunil Kumar Gupta,
Malini,
M. Chaitanya,
Pradeep Kumar

Contact:
Plot No. 79, Phase-II, IDA
Cheralapally, Hyderabad
ANDHRA PRADESH,
India-500051

THE OXFORD COLLEGE OF ENGINEERING

Title of the Proposal

Efficient bioremediation tool for hydrocarbon contamination management. Scale-Up and Pilot Scale Study.

Brief description

The present research explains the process of development of a bioremediation formulation to remediate oil spills/hydrocarbons in aquatic and terrestrial habitat. The formulation consists of a novel fungal isolate hitherto unknown for the claimed activity. The formulation is developed in granular form and liquid form, suitable for terrestrial and aquatic application respectively

Current stage of development

Validation

Innovative Element(s)

Novel fungal strain, media composition and process. Most of the available products in the market is of consortium, present product is single organism based with optimised nutrient pack for efficient, fast and complete degradation of hydrocarbons

Market Potential

There is a huge demand for bioremediation product to degrade hazardous hydrocarbons from the effluents, spillage site, duck yards and natural oil exploration areas. At present only one product in the market

National/Societal relevance

In recent years, there has been increasing interest in developing in-situ techniques for remediation of oil spill. In India, apart from the accidental oil spills, the major and most regular threats for oil refinery is oil sludge. It is projected that approximately about 4,00,000 tonnes of petroleum sludge are produced every year. Hence the present product helps in developing an indigenous strategy to address hydrocarbon contamination

Project achievements

a. Progress vis-a vis objectives- Optimization process for Inoculum development is complete. Scale-up process for in-situ, ex-situ remediation is in progress

b. Technology/Product (to be) developed – The granular formulation; The liquid type formulation and Immobilized adsorbent pad; Re usable Nylon Mat/Net

c. IP generated/Potential for IP generation – Background IP exists. No new IP generated.

d. Resources Generated - Rs. 40 lakhs from DBT-BIRAC

Plans to take innovation further

Open for collaboration

Risks envisaged

Studies on Product performance under various environmental conditions safety studies; PCB approval

Project Coordinator:
B.K. Manjunatha

Team Members:
Praveen Kumar SV

Contact:
10th Milestone, Bommanahalli,
Hosur Road, Bangalore,
Karnataka India-560068

VIVEKANAND ARTS, SARDAR DALIP SINGH COMMERCE & SCIENCE COLLEGE

Title of the Proposal

Pilot scale studies of Electronic Waste Management using Economical and Eco friendly Method

Brief description

The project focuses on development of a commercially viable technology for economical as well as eco-friendly metal removal from enormously growing e-waste.

Current stage of development

Proof-of-Concept

Innovative Element(s)

An eco-friendly method consisting of utilization of bacteria for the removal of hazardous metals from e-waste and subsequent recovery by electrodeposition. The structural form of e-waste, type of biological and non-biological solutions and sequence of application of such solutions on e-waste is inventive step of the research.

Market Potential

Any industry which is engaged in e-waste management will take our technology this is because as, yet there is no any such eco friendly technology currently in use for treating e-waste.

National/Societal Relevance

The proposed technology can minimize the pollution caused due to traditional methods such as Incineration or acid leaching of e-waste treatment. The metals recovered can be reused. Successful commercialization will certainly be revolutionary in e-waste management .

Project achievements

a. Progress vis-a vis objectives- Optimization of leaching conditions and bioleaching of metals from waste PCB using the developed microbial consortium of acidophilic iron oxidizers Five reactors with capacity 10 liters is under progress.

b. Technology/Product (to be) developed – E-waste Management Technology. Expected Time to enter in Market is around 1 Year.

c. IP generated/ Potential for IP generation – None.

d. Resources Generated - 10 Liters reactor has been fabricated for pilot scale studies.

Plans to take innovation further

Initial Product promotion on social and professional media platforms, so as to attract investors. Pre launch partnerships with some NGOs, social groups for creating the awareness of e-waste management. Partnership would also be done with waste pickers association/companies. The complete know how will be transferred to buyers preferably on non-exclusive basis.

Risks envisaged

Dealing with e-waste which itself comes under hazardous waste, the safety precautions need be taken during the process.

Project Coordinator:
Adhapure Nitin Narhari

Team Members:
None

Contact:
Samarth Nagar,
Behind That Baat Restaurant,
Aurangabad, Maharashtra,
India-431001

GRAND CHALLENGES INDIA

GRAND CHALLENGES INDIA

GRAND CHALLENGES INDIA

Grand Challenges India (GCI) is the Indian arm of Global Grand Challenges, launched in 2012 and is the flagship program managed by the PMU at BIRAC and is collaboratively funded by Department of Biotechnology (DBT), Bill & Melinda Gates Foundation (BMGF), and the Wellcome Trust.

The main aim was to address some of the daunting challenges that we face today and tackle them by encouraging Indian innovation and research to develop affordable and sustainable solutions in order to improve health and well-being in India and then across the globe.

GCI is committed to seeking and rewarding established researchers, young entrepreneurs, and innovators from both academia and industry. GCI aims to help innovators expand the pipeline of ideas for developing new preventive and curative therapies, piloting new technologies, and exploring new ideas.

Over the years, GCI has grown both as an idea and as a partnership covering varied themes from maternal and child health to agriculture, nutrition, infectious diseases etc. in order to respond to the ever-changing needs of research in public health in India.

Presently, GCI supports a range of research and development activities. We have supported basic research, translational research, intervention trials, clinical trials, data integration and analysis, product and technology development. GCI also funds projects at various stages in their lifecycle; from basic science research in laboratories, to proof-of-concept projects and potentially to scale-up to innovation projects. GCI is currently wworking to expand the funding arenas and mechanisms.

In 2019, GCI took a step ahead and expanded its remit into entrepreneur support and capacity building through the newly launched "MedTech Challenge". This will be a one-of-a-kind program which, for the first time, which will have all the three funding partners, DBT, the Bill & Melinda Gates Foundation, and the Wellcome Trust working together to support entrepreneurs with business managementand helping for market entry for their products in India.

The Program Management Unit at BIRAC (PMU-BIRAC) was set up to execute, manage, and provide technical and financial oversight of this program as well as manage specialised programs on behalf of one or more of the partners.

What began as a suite of 3 programs till 2015 is now a flourishing partnership which implements and manages nearly 20 programs, across 7 themes.

Grand Challenges India and PMU-BIRAC run open calls as well as specialised programs or initiatives on behalf of the partners.

Open calls

Grand Challenges India runs open calls, or calls that are open to the public to apply under various themes. Among these, there are current calls as well as graduated programs where projects under the programs have been completed.

Open calls are typically run as a time bound program that provides a specific amount of funding for a specific time period. Most open calls are theme-based, i.e. each call is based around a 'Grand Challenge' with a specific mandate.

Since 2016, we have added 3 thematic open calls in the latest areas of research, 5 rounds of the Grand Challenges Exploration (GCE)-India call and 4 specialized programs. From funding 22 individual projects and programs in 2016, we are now on the way to funding nearly 75.

GRAND CHALLENGES EXPLORATION-INDIA

The Grand Challenges Exploration-India (GCE-India) is a unique program that intends to provide seed funding to the highly innovative ideas at pre-proof of concept stage to address challenges specific to the Indian public health domain. This fast-track program is aimed at identifying, nurturing and encouraging innovative ideas to create novel, indigenous technologies to improve the public health situation in India. Although, GCE-India mirrors global GCE program of the Bill & Melinda Gates Foundation (BMGF), however, being India-centric, it addresses challenges that are specific to the Indian health ecosystem. The program is being supported by the Department of Biotechnology, Government of India (DBT), and the BMGF. Being managed and administered under Grand Challenges India (GCI) portfolio, the program is implemented by IKP Knowledge Park, Hyderabad.

The program supports proof-of-concept or initial validation of ideas with seed grant that eventually lend themselves to be incubated in start-ups across India resulting in venture creation. As grantees are supported for 18 months to test their idea and generate initial evidence, the calls for application require only a two-page proposal on the basis of which ideas are chosen. The ultimate goal is the quest for new healthcare innovations in the form of medical technology devices, drug delivery systems, diagnostics, and technology enabled service models that can potentially be made available to people from all socio-economic strata. As healthcare innovation from within our nation will address the needs of our nation better; GCE-India is a supporting project that will enable to achieve the goal of equitable healthcare in country and beyond.

The program had been receiving exceptionally overwhelming and high-quality response and has demonstrated exponential growth in the last four years. Since, inception five calls have been launched under the GCE-India platform and in total 38 projects have been supported/ recommended for funding support. The mandates of last five callswere specifically drawn from diverse domain of maternal and child health (MCH), family planning, health or behaviour change wearables, mental health, geriatric care, artificial intelligence (AI), diagnostics and devices, antimicrobial resistance (AMR), nutrition, agriculture and sanitation.

The GCE-India platform supports projects, keeping in view the public health challenges that continues to be social, economic and political threat to the country and impedes the development of human populations. The grantees of supported projects are spread across India and from different strata of scientific community; academia (faculty, scientist) to industry (large corporates, small-medium enterprises), non-governmental organizations and individuals or entrepreneurs. By identifying, nurturing, and empowering, out-of-box ideas, the programs help exploratory research that might have a tremendous impact on developing world healthcare and development ecosystems.

The supported projects are mainly focused at developing point -of-care diagnostics (PoC) test or kit for AMR, tuberculosis (TB), malaria and HIV diagnostics: to make a way for better infection control. As improvement in maternal, newborn, and child health (MNCH) is an important public health goal that dictates the health for next generation and aids in prognosticating future public health challenges few of the supported projects are also seeking low-cost imaging modalities/tools for prognosis and predicting fetal distress, and biomarkers to predict asphyxia and sepsis among new born. One of the supported projects are also aimed at developing tool/algorithm that will equip mental health care professional to assess the onset of stress and depression. The scope of supported studies also includes development of nutrition specific intervention and kit for detecting malnutrition. Few of the supported projects intends to develop novel low-cost easy-to-use health monitor for geriatric patients. Considering cancer as a major health concern one of the projects has proposed high-throughput and low-cost test for diagnosing head and neck cancer, while another intends to develop novel alloplastic neo-bladder for replacement of bladder in patients with bladder cancer.In line with government Swachh Bharat Mission, one of the supported projects aims to eradicate the scourge of manual scavenging through world's first manhole cleaning robot.

The GCE-India platform through network of highly qualified individuals leverage the mentorship, resources and technical consulting to the grantees to help refine their business strategy and other hurdles in the early stage of development. The successful projects also have the opportunity to apply for follow-on funds from through other BIRAC schemes.

ALL CHILDREN THRIVING

The well-being of mothers, infants and children being an important paradigm of the healthy future is an important public health priority. Addressing maternal and child health concerns not only minimizes public health challenges ensuing within families and communities, but consequently reduces the overall burden on health care system. According to recent World Health Organization (WHO) estimates, globally around 830 women die during pregnancy and childbirth each day and there were 5.9 million deaths among children below 5 years of age in a year 2015. It has also been reported that approximately 45% of all child deaths under the age of 5 years, take place during the neonatal period (first 28 days of life). With WHO Sustainable Development Goals (SDGs) in mind, it will be important to ensure that not only all children thrive but also lead a healthy productive life. The main burden of children death, impaired growth and development impinges most heavily on the people of developing countries. Keeping in view these estimates, "All Children Thriving" (ACT) was launched as a third call under Grand Challenges India (GCI) framework. Although, birth defects, adverse pregnancy outcomes and developmental disabilities in children are interrelated functions of several known determinants (such as maternal health, nutritional deficiencies, infectious diseases, genetics, enteric health, water, and sanitation). Incidentally, much remains unknown about the root cause. The program intends to investigate the inter-paly of these factors and identify novel cost-effective measurement tools, interventions and mechanisms to combat unhealthy birth, growth and development.

The program by putting best strategies in place aims to ensure that not only all children survive, but also remain on the trajectory of healthy and productive lives and try to adequately alleviate the burden of birth defects, adverse pregnancy outcomes and developmental disabilities in children.

There are seven projects supported under ACT initiative. All the projects are aimed at exploring a unique element with special emphasis on innovative, impactful research on maternal and child health and development.

Three of the projects are aimed at developing simple low-cost biomarkers that can be applied early in pregnancy for predicting adverse outcomes among mother and children. Whereas the other three projects intend to validate/ develop interventions or packages of interventions for improvement in maternal and child health. The last project is aimed at development of biobanks/biorepository for long term storage of bio specimens to reduce time and cost for future research in this area. The biorepository project is aimed at creating India's first bio-bank or repository of longitudinally collected biological specimens from pregnant women, accompanied with well characterized information on the associated environmental, clinical, social and epidemiological determinants through the course of the pregnancy and birth.

Although, one of the seven supported projects (seed grants) under ACT has already ended while remaining six (5 seed grant and 1 full grant) are still ongoing.

IMPRINT (Nutritional Interventions to improve Linear Growth during Infancy in India)

A trial titled "IMPRINT: Nutritional Interventions to improve Linear Growth during Infancy in India (IMPRINT Trial)" is being conductedas a sub-study under one of the ACT projects titled "WINGS (Women and Infants Growth study) trial". The IMPRINT trial intends to answer relevant scientific questions on the role of improving maternal nutrition in promoting linear growth during the first 6 months of life, and the benefits of increasing protein quantity and quality in complementary foods forinfants to improve linear growth in the 6-12 months of life in a population with high rates of stunting. This trial is very critical to provide evidence for nutritional interventions that would be most efficient and suitable for mothers and children enrolled under WINGS trial.

The objectives of IMPRINT trial are:

I) To test the efficacy of a daily nutritional supplement for lactating mothers, that provides 600 Kcal of energy; with 25-30% of energy from fats (150 Kcal) and 20 grams of protein (mix of animal and plant source protein) plus micronutrients (80 to 100% of RDA) during the first six months after birth, in improving linear growth of their infants during the first 6 months of life compared to standard of care.

ii) To test the efficacy of two nutritional supplements given daily to infants between 6 to 12 months of age that vary in protein amount (125 Kcal and 2.5 g protein vs. 125 Kcal and 5.6 g protein) but are similar in, fat, micronutrient content and proportion of animal source protein out of the total protein [i.e. 30% (0.75 g vs. 1.68 g)] on their length for age z score at 12 months of age in comparison to standard care.

To test whether the use of the supplement with higher protein concentration (125 Kcal and 5.6 g protein) is more efficacious than the supplement with relatively lower protein concentration (125 Kcal and 2.5 g protein) in terms of increasing Length for age Z scores (LAZ) at 12 months of age

The knowledge generated from all these studies will be of immense use to inform public health policy.

IMPROVING IMMUNIZATION DATA SYSTEMS – INNOVATING FOR ACTION

Grand Challenges India fourth thematic call was announced in November, 2017 on 'Improving Immunization Data Systems (IDIA)', a program directed at addressing challenges faced in collecting, analyzing and using data on immunization and health. The program intended to support the set of projects aligned to the Indian strategy requirement and in technical partnership with the Ministry of Health and Family Welfare (MoHFW), Government of India (GoI), the Department of Health Research (DHR) and the Indian Council of Medical Research (ICMR), who provided their valuable technical and practical inputs in selecting and reviewing projects.

The program explicitly sought solutions that focus specifically on conceptualizing and demonstrating innovations in data systems for immunization to aid in real-time visibility of correlation between consumption and coverage of immunizations and should have the potential to be scaled up in multiple settings. The overall goal is to test ideas with grant support of maximum of $200,000 per project for developing proof of concept in 12-18 months that should potentially be translatable to practical interventions in India's immunization programme.

The call accepted 70 applications which underwent the internal screening which assessed early eligibility of proposals which reviewed the scope of the proposal as per the mandate pre-defined in the call RFP and did due diligence of submitted documents. Thirty Six applicants were selected for presentation to TAG, where 9 application were shortlisted for funding support. The shortlisted nine applicants underwent the technical and financial due diligence. The nine projects are sanctioned and have initiated the implementation activities.

In April 2019, a kick off meeting was conducted for the grantees with the government agencies, stakeholders and experts in the field. The goal of the Kick off meeting was to introduce the relevant Ministries, State Immunization Officers, mentors teams to facilitate conversations between the stakeholders, mentors and the grantees for effective implementation of the program to achieve the desired results.

The program is in mid of the implementation activities and will shortly initiate validating their developed technologies in the field.

These nine projects are a mix of technologies that are working to employ a variety of IT solutions such as GIS (Geographical Information Systems), blockchain technology, mobile applications, data warehousing and others to provide innovative back-end solutions to this challenge.

ANTIMICROBIAL RESISTANCE (AMR)

Antimicrobial resistance (AMR) has become a major healthcare threat in recent times due to excessive use of antimicrobials, especially antibiotics, leading to dramatic rise in resistance. India has been one of its worst-affected regions with a widespread presence of multi-drug resistant (MDR) strains of pathogenic microbes responsible for TB, malaria and other deadly infections. In light of the pervasive incidence and avoidable mortality among the poverty-stricken and under served sectors Grand Challenges India (GCI) team had launched its fifth call on AMR. This program was directed at addressing challenges that are being faced in tackling AMR in India and in comparable geographies.

This call is part of a global call on AMR, where Grand Challenges partners from Brazil, South Africa, Africa and India have come together and announced a call for proposals. Each partner country has run the call in their specific geographies with the understanding that there could be opportunities for cross-country collaborations during the course of the program.

This program aims at encouraging innovation in tackling AMR under three specific categories: solutions for better use of surveillance data to achieve actionable results, innovations in products and technologies to break infection cycles in healthcare settings and to remove antibiotics from effluents.

With the increased awareness on the threat of AMR in the last few years, this call was designed specifically to focus on certain areas that are particularly important for India and have had less research and funding. Under the mandate of surveillance, the call focused on innovations in new data sources, analytical methods and new biomarkers for surveillance, given that the Government of India (GoI) is heavily supporting the setting of traditional surveillance networks and systems through several vertical programs. There is a need to explore new data sources, analytical techniques and biomarkers that may allow us to gather better and more accurate data about how resistance develops and moves in the community. This kind of data will be particularly useful for establishing algorithms that can predict trends in resistance development and its associated factors so that appropriate interventions could be planned.

Another area where research is particularly important, especially for India, given its high rates of infectious disease, is innovative low-cost products and technologies that can be used to break the cycle of infections especially in healthcare settings. Since the drug development pipeline takes a very long time, another alternative to tackle resistance is to break the chain of transmission of these resistant microbes.

The effect of antibiotics in the environment is still not well understood, but what is known is that there is a large outflow of antibiotics/antimicrobials from various sources such as industries that produce Active Pharmaceutical Ingriedients (APIs) for antimicrobials, the community, farms, industrial agricultural set ups among others. It is therefore important to arrest this flow of antibiotics into the environment through new technologies and products.

In line with the call mandate the shortlisted projects are mainly supporting projects that are broadly aimed at addressing big gaps in the surveillance and response system for infectious diseases threats. The following ten projects recommended for funding support have just initiated:

1. **A blood-based host biomarker for discriminating viral and bacterial infections: A clinical decision support tool, Indian Institute of Science (IISc), Bengaluru.** The project proposes to develop a biomarker-based blood test to rapidly discriminate between viral and bacterial infections. The test will aid in stewardship efforts by reducing the indiscriminate use of antibiotics for all suspected infections in the clinical setup.

2. **High Resolution Genome Based Tracing of Antimicrobial Resistant Escherichia coli in Pork production chain to identify the Critical Control Points: A One Health Systems Study, ICAR-NEH in collaboration with 4 institutes.** The Project will quantitatively assess the dynamics of antimicrobial resistant E.coli across the pork-value-chain in three different states, Tamil Nadu, Karnataka and Meghalaya to identify critical control points of entry and exit of E.coli to design a relevant Hazard Analysis and Critical Control Points plans (HACCP).

3. **Low cost Ferroelectric Material based technology to combat microbial resistance and prevention; Indian Institute of Technology- Mandi:** The project proposes to develop new low cost technology based on ferroelectric materials bulk, powder coating/thick film to impair the life of microbial cells commonly found in drinking tap water, water storage tanks and nosocomial infections.

4. **Biomarkers for bacteremia, antimicrobial resistance and hospital acquired infections by NMR and Mass Spectrometry among febrile neutropenic patients, All India Institute of Medical Sciences, New Delhi :** The project aims to discover biomarkers to differentiate viral and bacterial infections using metabolomics including high throughput NMR spectroscopy and LC-MS mass spectrometry in febrile neutropenic cancer patients.

5. **Development of low cost Sericin coated industrial capacity filters to remove antibiotics and associated chemicals from effluents, Indian Institute of Technology- Guwahati:** The project proposes the development of a low-cost sericin coated filters for the removal of antibiotics from effluents. In first phase, large capacity sericin coated Ultra Filtration (UF) membrane will be developed with the collaboration of industrial partners. The second phase of the project will be focusing on optimal design of filtration system and field trial of the developed UF membrane across India.

6. **Development of Raman spectroscopy as a surveillance technology for antimicrobial resistance, Indian Institute of Science, IISc Bengaluru:** The project proposes creating a Raman database by collecting and recording Raman spectra at every step of various bacterial strains that are sensitive, intermediate or resistant to antimicrobial agents. The focus is to understand the progression/emergence of AMR to work as a supportive surveillance technology. The spectral database will also aid in prediction of possible resistance in bacterial strains.

7. **Harmonized One health Trans-species and community Surveillance for Tackling Antibacterial Resistance in India HOT-STAR-India, The INCLEN Trust International, New Delhi.** The study intends to implement an ecological multi-host surveillance to document the bacterial infections and antibacterial resistance (ABR) among humans, animals, birds and fishes sharing the environment and linkage with antibiotics and disinfectant exposures at individual, household/habitation and community levels from different sources. A multi-host and multi-species approach shall improve understanding on pattern and spread of bacterial infection and resistance considering the "One Health" perspective.

8. **Understanding the transmission of antibiotic resistance between hospitals and the environment, National Centre for Cell Science (NCCS), Pune.** The proposal aims at monitoring AMR at metagenomic level by focusing on unique microbial antibiotic resistance genes (ARG) signatures and tracking the resistance from the "source" to the "sink". The approach intends to provide direct information about AMR and its implications on vulnerable populations. This information is lacking in Indian context and a reliable catalogue would help in proper visualization of the network involved in AMR and to develop strategies to mitigate it.

9. **Community and Hospital Acquired Invasive Carbepenem Resistant Enterobacteriaceae: Longitudinal Study of the Gut Microbiome in Infected and Non-Infected Children and their families, Christian Medical College (CMC) Vellore.** The project, by collecting stool samples from children admitted to the Intensive Care Units (ICU) aims to identify invasive MDR Enterobacteriaceae. Serial sampling of these children and subsequently their family members in the community will allow for longitudinal study of the microbiome and the presence of carbapenemase bacterial genes in their fecal samples. This will allow assessment of the risk of secondary transmission of hospital acquired resistant strains to household contacts.

10. **Impact of AMR burden on the health Index of poultry farm workers, CSIR-Institute of Microbial Technology (IMTech), Chandigarh.** The project intends to study transmission dynamics of resistance in poultry farm workers to estimate the possibility of zoonotic transfer of pathogens. In addition, the team will also analyse humans, animals, air and water for microbial diversity and molecular signatures indicative of antibiotic resistance to gauge the potential for spread of AMR due to use of antibiotics in poultry rearing

KI DATA CHALLENGE FOR MATERNAL AND CHILD HEALTH IN INDIA

Data Science Approaches to Improve Maternal and Child Health in India

The sixth call "Knowledge Integration (ki) Data Challenge for Maternal and Child Health" under Grand Challenges India program, was launched on 3rd July with a goal to foster new approaches in data-driven decisions designed to answer critical scientific questions related to maternal and child health and development outcomes, using innovative data analytics and modelling approaches.

The utilization of the health and social data, is a key focus of this call which intended to engage a broad spectrum of collaborators - including research and clinical scientists working with data scientists, bioinformaticians, statisticians, epidemiologists, engineers and computer programmers - to identify how innovative data analytic approaches can be used to develop improved solutions to tackle the burden of maternal and child health problems in India with fund support of up to $100,000 USD per project in 12-18 months.

The purpose of the ki data challenge call is to have innovative data analytics solutions, results from which shall be used to inform policy decisions related to maternal and child health as well as design subsequent related challenges. GCI also welcomed applicants who have access to other relevant data sets, including publicly available data, clinical research, cohort and survey studies and other large data sets. The call was synergized with the Grand Challenges calls from Brazil and later with Africa.

Total 119 applications were received which underwent mandate eligibility screening, to ensure that the applications were relevant to the mandate set out in the Request for Proposals.

Technical Advisory Group Screened 38 applications and 10 applications were shortlisted for support.

The ten supported teams are using specialized skills and valuable experience that will help interpret conclusive results through additional analyses that may help predict pregnancy outcomes, birth outcomes and childhood health and development patterns.

HEALTHY BIRTH, GROWTH AND DEVELOPMENT KNOWLEDGE INTEGRATION (HBGDKi) INDIA

The Bill & Melinda Gates Foundation initiated the Healthy Birth, Growth and Development knowledge initiative (HBGDki) in India in 2014 with joint management and partnership with Program Management Unit (PMU) - Biotechnology Industry Research Assistance Council (BIRAC). This initiative supports the rapid aggregation and comparison of data from various fragmented sources by providing a single platform for this data to be stored.

This initiative will essentially create a knowledge compendium that allows researchers and others to access a variety of data from different parts of the world, to allow them to obtain a much clearer picture of global trends and analyses on factors that affect child birth and subsequent development. The three major areas of focus for this initiative are: Preterm birth, physical growth faltering and impaired neurocognitive development. Ten collaborators from India signed agreement to share their Indian datasets and 23 datasets have been curated and uploaded on GHAP (Global Health Analytics Platform).

Several efforts have been taken for capacity building and grooming of existing data modelers and public health scientists in India, who are well trained to work on India specific problems. PMU-BIRAC consistently plays an important role in leveraging such talent/expertise in India. As a part of capacity building, HBGDki-India Community Workshop was hosted by the PMU– BIRAC, in New Delhi in December, 2017. The meeting was attended by over 60 participants from India and abroad. The HBGDki sessions were designed to provide the audience with a detailed introduction to the working of the platform. The workshop also included Action Labs where participants were provided the access to tools and were introduced to its working, and could follow it on their own laptops for hands-on experience. Along with the workshop, a consultative meeting was organized with key stakeholders and HBGDki-India collaborators to discuss the current situation of HBGDki, how the insights from datasets will be used in country's context and next steps for HBGDki-India.

To provide more insight into the analysis of data sets on the GHAP platform, an online HBGDki-India webinar entitled: "Exploring aggregated HBGDki-India data: a descriptive epidemiology of stunting and wasting." was conducted on May 17, 2018. This webinar provided a detailed composite view of all of the India study data and initial findings of the analysis of datasets that were received from our current partnered community of HBGDki-India investigators. This analysis looked across the entire body of aggregated HBGDki-India data to characterize the epidemiology of moderate and severe wasting and stunting among Indian children from birth until the age of 24 months.

PMU team conducted a series of outreach sessions/roadshows in several parts of India/major Indian institutes such as AIIMS, IIT Delhi, ISI Kolkata etc. to find new data scientists, data modellers and public health researchers. This strategy was particularly useful for inciting interest and promoting Indian data science capacity for the 6th Grand Challenges India call on 'ki Data challenge for Maternal and Child Health'.

KNOWLEDGE INTEGRATION AND TRANSLATIONAL PLATFORM (KnIT)

KnIT – The platform

The Knowledge Integration and Translational Platform (KnIT) was launched in 2016 and is a unique knowledge synthesis platform that aims to bridge the gap between research and policy and facilitate evidence-based policy making for public health in India.

KnIT was set up as a response to the challenges discussed previously and specifically targets Indian policymakers as the end users of the knowledge synthesized, explicitly at the State level, in keeping with the current health policy structure, where the mandate of healthcare lies with the state. This is to ensure that the data and evidence collection is done with the overarching goal of developing and implementing cost-effective, sustainable interventions or packages of multi-sectoral health interventions that are appropriate to the context of different states in the country.

KnIT currently has two parallel streams of work.

The first, **knowledge synthesis,** is the responsibility of domain centers who work in specific themes in public health and seek to answer the most pressing questions in these areas through extensive analysis of currently available data in the Indian and comparable contexts.

The second, **knowledge translation,** is under the purview of the State Implementation Unit (SIU), a specialized unit that works with individual states to translate the synthesized knowledge and to package it for policymakers.

Currently, KnIT knowledge synthesis focuses on two tracks, maternal and child health (MCH) issues and nutrition.

The Nutrition track examines public health and medical interventions to mitigate stunting, wasting, severe malnutrition, low birth weight, optimal body composition and metabolic unfitness or obesity. The nutrition track is currently working on four areas where there are important questions to be addressed; low-birth weight babies, anaemia, complementary feeding and diarrhea.

MCH focuses on identifying the health system challenges that are barriers to effective, equitable, impactful delivery of health services and identifies strategies how to overcome them. It also focuses on designing delivery strategies based on evidence, and piloting and evaluating programs aimed at improving program delivery, directing implementation research to optimize primary and secondary level healthcare, and generating evidence-based, human resource linked strategies relevant to MCH. The MCH team is currently focusing on the care of sick and small newborns in the Small and Sick Newborn Care Units (SNCUs), to assess the state of treatment and the demand-supply gap in this space.

Currently, KnIT focuses on two tracks, maternal and child health issues and nutrition and has two Domain centers working in these areas.

The Society for Applied Studies, New Delhi is the Nutrition Domain Center. The International AIDS Vaccine Initiative, New Delhi is the maternal and child health domain center.

THE NUTRITION DOMAIN CENTER

The Nutrition track examines public health and medical interventions to mitigate stunting, wasting, severe malnutrition, low birth weight, optimal body composition and metabolic unfitness or obesity. The nutrition track has worked on areas where there are important questions to be addressed such as low-birth weight babies, anaemia, complementary feeding and diarrhea among others.

The nutrition track works primarily in the secondary data analysis space, using national survey data, or by conducting systematic reviews to present the current state of knowledge as well as identify gaps in research.

The center also conducts consultative meetings as a part of its methodology to understand and reach consensus regarding issues.

The State Interaction Unit

The domain center for nutrition also provides support to states through the State Interaction Unit. So far, KnIT Nutrition has supported the governments of Rajasthan, Himachal Pradesh, Haryana and Odisha.

The Government of Rajasthan requested assistance in the analysis and interpretation of the performance, strength and weakness of the 'POSHAN' project's design and delivery. POSHAN aims to identify and provide home treatment of children with Severe Acute Malnutrition (SAM) in 10 districts of the state. The key findings of the analysis by the KnIT helped the state understand that the program was showing impressive results within the limits of the analysis.

The Government of Himachal Pradesh requested an analysis of neonatal care in the hilly district of Sirmaur. Through this analysis, supported by the results of the implementation research project supported by WHO, the Central government has initiated the rationalization of neonatal care at the district level, emphasizing the shortcomings identified in the analysis.

In Haryana, the KnIT support to the state was to arrive at a strategy for the scale up of Kangaroo Mother Care (KMC) in the state through a consultation process that would review district-based projects. The conclusions were to relate to the need for change in both state and national strategy for rapid scale up of KMC in districts. Through this analysis, the expansion of KMC units was recommended across the country.

KnIT also participated in a consultation for the finalization of the strategy for a new nutrition mission for the state. Several recommendations from KnIT for the modification of the program were proposed and accepted.

At the request of the government of Odisha, KnIT was asked to provide district level evidence on why neonatal mortality was high in certain districts and suggest remedial measures.

THE MATERNAL AND CHILD HEALTH DOMAIN CENTER

Maternal and Child Health (MCH) focuses on identifying the health system challenges that are barriers to effective, equitable, impactful delivery of health services and identifies strategies on how to overcome them. It also focuses on designing delivery strategies based on evidence, and piloting and evaluating programs aimed at improving program delivery, directing implementation research to optimize primary and secondary level healthcare, and generating evidence-based, human resource linked strategies relevant to MCH.

The MCH team is currently focusing on the care of sick and small newborns in the SNCUs, to assess the state of treatment and the demand-supply gap in this space.

The major research questions were initially identified as the following:

1. What is the 'supply-demand gap' in the care of small and sick neonates at the district level?
2. What is the quality of care for admitted small and sick neonates at the district level?
3. What is the current status of follow-up and outcome of small and sick new-born care post-discharge from the facility in the district?

Some of the research question were addressed through systematic reviews (this incorporates cross-sectional, observation, randomized controlled and non-randomized controlled trials) that was supplemented by secondary data analysis (essentially from HMIS). The variation in quality of newborn care provided in the district facilities was studied through a facility survey (in Himachal Pradesh). The association between quality of care provided and outcomes was derived from survey and secondary data analysis. The surveys were conducted in operational SNCUs of district hospitals of two identified districts of Himachal Pradesh.

Data (from small and sick babies and their caregivers) for addressing some of the questions were collected through surveys (quantitative and qualitative) conducted in Sirmaur and Kangra districts of Himachal Pradesh.

During the course of the survey, the expert committee determined that it would be important to understand the continuum of care for sick and small neonates in the community. A qualitative survey has been conducted towards the primary objective of exploring responsiveness along the continuum of care for small and sick babies in the district.

It is expected that the findings from the qualitative and quantitative surveys (including facility assessments) would be triangulated to provide recommendation of care of small and sick babies in the district.

SENTINELS INITIATIVE

Sentinels initiative in India is intended to engage and support explicit innovation practitioners, new partners, new ideas and opportunities to solve gaps in existing strategies or create completely new opportunities and pathways to sought outcomes on the broader global health challenges.

This initiative aims at sourcing innovation for global health helping in catalyzing innovation for the discovery and translation of transformative solutions to global health and development inequity along with creating and fostering the delivery of more appropriate (affordable, deliverable, scalable) versions of extant interventions, the contribution could be by way of a new product, service or process.

The experiment uses special administrative mechanisms to ensure efficiencies and ideas, selected by a champion based review and do not require preliminary data or clear demonstrated capacity of the applicant. The judges intend to simplify the intellectual processes giving rise to its design and development.

The supported projects will fulfil a strong unmet societal need by delivering affordable deliverable, scalable versions of interventions which would have maximum access through public and private markets.

Also, a series of meetings were held at Centers of Excellence namely, IISc, NCBS Bangalore and CMC Vellore in April, 2018 to socialize the "Sentinels" experiment and find people who ideally are not working on global health problems but have relevant skills, technologies and potential passion.

Twenty four applications were received from a closed list of innovators/companies, academicians from the key institution like IISc, NCBS and other Institutes in Bangalore were reviewed by international experts. Out of which five applicants were selected for Sentinels Award of INR 50.00 Lakhs to help initiate the project activities.

The five supported projects aiming to solve a wide range of problems are enlisted below: piloting and testing varied concepts

- Two projects are exploring the nutrition predictive metrics and nutrient uptake and metabolism coordinates, one, through protein synthesis dynamics in the brain, in rat models and later is studying the Environmental Enteric Dysfunction(EED) in Drosophila Melanogaster (vinegarfly) a low-cost animal model.
- The other two projects are studying Mycobacterium tuberculosis, likely to identify the potential 'anti-latency' lead molecule(s) and the other is trying develop a novel mycobacterium OMV coated nanoparticles (OMV-particles) for efficient vaccine delivery system.
- Lastly one team plans to test a technique to establish a gene drive method and engineer into the carrier of Flaviviral infections, Aedes Aegypti population without disturbing the ecological niche.

REINVENT THE TOILET CHALLENGE

"Reinvent the Toilet Challenge - India", is one of the program that is directed at addressing the problems in sanitation and especially in the rural and urban areas. A major chunk of population are still struggling as to how to capture and store their waste, with no sustainable way to handle it once their on-site storage—such as a septic tank or latrine pit—fills up. Sustainable solutions supporting the entire value chain of sanitation from collection to treatment is the need of the hour.

Our ultimate goal is to help ensure clean cities in India with universal access to hygienic toilets as well as local solutions to contain, treat, and safely dispose of human waste. According to the World Health Organization (WHO) and UNICEF, sanitation rated as "safe for people" has increased by only three percent worldwide over the last five years.

The objective of "Reinvent the Toilet Challenge – India" is to develop a portfolio of Indian-led pilot projects that seek to contribute innovations which can be incorporated into a next- generation toilet that will reduce the burden of excreta-related disease and improve the lives. The aim is to expand the use of toilet and sanitation technologies that do not connect to a sewer, as this is by far the most common approach used by the poor. The first round of the RTTC program was launched in 2013 and six projects were funded under GCI. Out of six projects two technologies had successfully demonstrated proof of concept at a laboratory scale with experimental data. The developed technologies have been installed in some parts of Delhi for demonstration and greater visibility.

The two technologies that are simple, cost-effective, reliable and culturally acceptable would be supported under innovation-to-scale. Decentralization of wastewater treatment is a sustainable solution to address these problems that locally treats the sewage and also reuses as well as recycles. One of the technologies such as the electrochemical reactor that works on a novel electrochemical process in which the water to be treated is subjected to extremes of pH to kill the coliform and Helminth's.

The second technology is the completely solar powered eToilet which is connected to the NEW Generator thus creating a unique model of sanitation recovery with a perfect back-end processing through which resource generation and recovery is made possible. The NEW generator harvests nutrient fertilizers (Nitrogen, Phosphorous, and Potassium), energy through biogas, and clean water from human wastes. The machine achieves a high level of waste treatment through the use of anaerobic membrane bioreactor technology (AnMBR). A high level of pathogen destruction is performed to ensure safe sanitation.

With the improvements in coverage and access to sanitation in the country, there is now more need than ever for innovations in the sanitation space, and this continues to remain and important area of work for GCI.

THE MED-TECH CHALLENGE

The Med-Tech Challenge: Innovation to Impact Acceleration Training & Award program is designed around the needs of Indian innovators and entrepreneurs working in the areas of developing medical technologies for public health that have a validated proof-of-concept for their technology and are in the process of taking their product to the market.

The program aims to fill the gap in the development and delivery of affordable medical technologies in India and plans to address the low movement of affordable technologies through the development pipeline. It will therefore select and mentor Indian entrepreneurs to further develop their medical technology innovations, which will already have strong proof-of-concept data.

The funded projects will also be mentored from a business-readiness perspective to deliver affordable medical technologies which would have maximum access through public and private markets and fulfil a strong unmet medical need.

The aim of the program is to support medical technology innovations where the successful innovator will be supported through a series of training workshops and mentoring to augment their skill set to improve the probability of translation and speed up time to the market.

This program has been designed for entrepreneurs who are far along enough in the development pipeline to develop their market strategy. This program, through the workshop and mentoring components will aid these entrepreneurs in developing a realistic business development plan. They will be provided with the training and tools required for them to develop their customized business model that is targeted towards their specific medical technology or device.

ACHIEVING HEALTHY GROWTH THROUGH AGRICULTURE AND NUTRITION (AGN)

The Grand Challenges India (GCI) partnership announced the first call titled 'Achieving Healthy Growth through Agriculture and Nutrition' in August 2013 to target the linkage and relationship between agriculture, nutrition and health to shape and structure agriculture and food systems in ways that improve the nutrition, incomes and productivity of smallholders farmers and the rural poor. The program was supported by Department of Biotechnology (DBT), Bill & Melinda Gates Foundation (BMGF) and United States Agency for International Development (USAID) for four years to implement five projects.

The supported five pilot studies brought together a multi-disciplinary consortium of interventions to evaluate innovations at the nexus of agriculture, nutrition, and health to reduce the high incidence of low birth weight, early stunting and wasting among Indian infants and empower women in their multiple family roles.

All the projects under this call, stand completed at their respective sites.

- On-farm participatory models of Integrated Farming System (IFS) tested the viability of an alternative farming system on productivity, economic return and women empowerment.
- The domestic solar conduction dryer project tested a new technology to assess its impact on diet diversity of the participants and economic returns.
- VeggieLite piloted a supply chain innovation to assess its impact in improving access to fresh vegetables and fruits to supplement nutrition at affordable prices in rural and peri-urban areas.
- An ICT based pilot project, Digital Education, tested the impact of a combination of ICT and participatory approaches to improving knowledge of women on nutrition.
- The Zinc Bio-fortification project tested an agricultural intervention that used foliar application of zinc on rice and wheat crops to potentially address micronutrient deficiency through supplementation of food crops.

Therefore, consideration for a Transition to Scale Grant, recommended scaling up of the Solar Conduction Dryer intervention while adding more clusters to bring out a significant social impact.

The UN award winning Solar Conduction dryer (SCD) dehydration technology, women farmers cum entrepreneurs (research participants) produce dehydrated vegetables at the farm gate and sell to S4S. S4S farmers (research participants) earn extra money by reducing farm level losses and creating value added products where as S4S earns by top up margins on these unique and nutritive dehydrated products.

This unique business model where women farmers don't have to invest upfront in capital cost and complete buy back/market linkage is assured has also been covered under Forbes Future Food Factories Series and got Global Dell Social Innovation Award, USA.

INNOVATE IN INDIA FOR INCLUSIVENESS (i3)

NATIONAL BIOPHARMA MISSION

NATIONAL BIOPHARMA MISSION

The Cabinet Committee on Economic Affairs in May 2017 approved the Industry-Academia Collaborative Mission for Accelerating Discovery Research to Early Development for Biopharmaceuticals-"Innovate in India (I3) Empowering biotech entrepreneurs & accelerating inclusive innovation" of Department of Biotechnology, Ministry of Science & Technology to be funded by the Government of India.

Loan and project agreement signed between DEA, World Bank on 24th Apr 2018

The Mission is being implemented by Biotechnology Industry Research Assistance Council (BIRAC) - a Public Sector Undertaking of Department of Biotechnology. Total project cost to be funded by Government of India is USD 250 million for five years on a 50% cost sharing via World Bank loan.

The mission is focused to transform the health standards of the country through affordable product development and is currently working to bring 5-7 biopharmaceutical products closer to market in the coming 5 years.

Major activities within the umbrella of the Mission are:

1. Specific Product Development:

The mission has three major identified verticals for product development namely Vaccines, Biotherapeutics and Medical Devices and Diagnostics.

Vaccines:

The National Biopharma Mission is working towards addressing the gaps in the current vaccine development scenario in the country. The Mission is supporting development of Universal Flu Vaccine, Cholera Vaccine, Dengue Vaccine (live attenuated and recombinant) and Pneumococcal Vaccine. These vaccine candidates are currently at different stages of development.

Biosimilars:

Biosimilars are a cost-effective treatment modality, with a huge market potential. Considering a huge number of successful biologics are going off-patent by 2020, India assumes a great potential to capture this business opportunity. The National Biopharma Mission is working to bring biosimilar products (therapeuticproteins and monoclonal antibodies) closer to market. The Mission is supporting 3 biosimilar products namely Human Serum Albumin, Herceptin and Insulin Glargine catering to the following therapeutic indications: emergency situations, cancer and diabetes respectively. These are currently under different stages of development.

Medical Devices & Diagnostics:

The medical device market is dominated by imported products, which comprise of around 75% of total sales. This advocates for a critical need to channelize efforts towards promoting the medical device sector and focus on development of innovative and affordable medical devices and diagnostics relevant to the Indian public health needs. The Mission is focused on developing core technologies in this segment that offer cost effective indigenous alternatives to existing foreign makes. The mission has funded the following core technologies under this domain: Raw materials for bioabsorbable implants (bone implants), room temperature stable molecular diagnostic reagents, pumps for hemodialysis machines, slip ring for CT scanners, next generation endoscopes, next generation MRI scanners and medical grade camera for surgeries.

2. Building Shared Infrastructure:

The program is dedicatedly working to create an ecosystem that enables affordable product development in the country viz-a-viz creation of GLP, GMP, GCLP facilities besides cell line repositories and facilities for medical device testing and prototyping. Creation of translational research consortia and establishing clinical trial network are other areas of prime importance for the mission.

2.1. Facilities:

One GLP compliant facility for analytical characterization of biotherapeutics funded under the mission is now functional. The mission has funded a cGMP biologics pilot facility catering to clinical grade drug substance and drug product, two GCLP facilities for clinical immunogenicity (one each for bacterial and viral assays) besides facilities for medical device testing.

Description of these profiles is as under(as provided by the respective grantees):

GLP compliant facility

1. **Type of facility**

   GLP

2. **Name of facility**

   Centre for Advanced Protein Studies - CAPS

3. **Location**

   Syngene International Ltd, Biocon SEZ, Bommasandra IV phase, Jigani Link Road, Bangalore, 560099, India

4. **Brief description**

   Center of Advanced Protein Studies (CAPS) is a national analytical facility set up in collaboration with Biotechnology Research Assistance Council (BIRAC) under the National Biopharma Mission. The facility hosts state-of-the-art advanced analytical equipment including advanced LC-MS, Biacore, Analytical Ultra Centrifuge, UPLC, Capillary Electrophoresis, Image Capillary electrophoresis, SEC-MALS, Bioassay laboratory, etc. CAPS facility offers both end-to-end and modular advanced analytical characterization services at affordable costs and shorter turn-around time supporting clients with the product development, providing global quality technical data suitable for regulatory filings.

5. **Date for commencement of services**

   17th June 2019

6. **National/societal relevance**

   Indian entrepreneurial biotech community has been actively expanding with primary focus on innovation and product development. Niche advanced analytical services including characterization and bioassay studies provide critical data needed for advancing product development and their subsequent regulatory submissions. The current challenges faced by start-up biotech companies include large CapEx investments, access to advanced analytical equipment, technical know-how, affordable niche services, and regulatory guidance. Overseas analytical CRO'S though offer analytical services, however they turn out be highly expensive with longer wait times. CAPS with its advanced state-of-the-art analytical solutions and strong Syngene technical expertise provides affordable global quality analytical data packages in shorter turn-around time period. CAPS additionally offer training programs, workshops, priority based direct access to advanced analytical technologies. CAPS services revenue from its international clients will ensure to sustain the national facility in-terms of its maintenance and equipment replacement post the funding period of four years.

Centre for Advanced Protein Studies (CAPS) at Syngene, Bangalore

7. **Clientele/Market (within India & abroad)**

   CAPS is a unique business model of govt and industry partnership to promote product development and support start-up biotech industry. Potential clients of CAPS include researchers, academic groups, start-ups, SMEs and large Indian biotech companies and Syngene's International client base including both existing and future clients.

8. **Concessional service charges or discounted pricing available for (Academia/ Industry/ MSME)**

   CAPS facility offers a subsidized pricing structure to researchers, academic groups, start-ups and SMEs. Pricing details for analytical services are available on BIRAC NBM site **http://www.birac.nic.in/nbm/cms/page/facilities** and detailed information can also be obtained by writing to **CAPS@syngeneintl.com** or **ravi.krovidi@syngeneintl.com.**

cGMP facility

1. **Type of facility**

   Pilot GMP facility for production of biosimilars and novel biologics from CHO cell line

2. **Name of facility**

   Shilpa Medicare Ltd, Biologics Unit V

3. **Location**

   Plot No 532A/531, Belur Industrial Area, Dharwad 580031, Karnataka, India

4. **Brief description**

   NBM-BIRAC has part funded SML's Biologics Pilot Unit (Formerly Navya Biologicals Pvt. Ltd.) to "Set up a world class, flexible cGMP Biologics Pilot facility catering to clinical grade drug substances and drug product requirements of customers for human clinical trials and early commercial batches" under the National Biopharma Mission. The pilot GMP facility mentioned above consists of a pilot upstream production suite of

   A-1 Cell banking and Seed generation facility

   B-1 Upstream facility consisting of 50/200L single use-based bioreactors and perfusion unit

   C-1 Downstream facility consisting of depth filtration unit, automated chromatography and filtration units

   D-1 Pilot filling unit with Lyophiliser

   This facility is part of SML's fully integrated R&D cum large scale biopharmaceuticals manufacturing suite coming up at the 45000 sq.m Belur site. Potential partners/customers can also avail of SML's large scale commercial biopharmaceutical manufacturing services, Biopharmaceutical R&D services from the same site.

5. **Date for commencement of services**

   30th December 2019 for Drug Substance facility and March 2020 for DP facility after qualifications.

6. **National/societal relevance**

   - The Need / Pain point - India has significant number of biosimilars and biologics in development at various R&D laboratories (Commercial & Academic) presently. But most independent commercial R&D laboratories or academic labs do not have access to high quality cGMP CMC facilities to produce clinical grade biologics to help progress their products through Human Clinical Trial. Therefore, a significant proportion of the Indian biologics pipeline today is stuck at the entry to clinical stage programs.
   - Our solution - Setup and run a world class contract mammalian cell culture-based Biologics CMC facility including fill-finish facility for generation & supply of clinical grade drug substance and Drug product to conduct human clinical studies that is capable of complying with cGMP norms.
   - Capacities – 1 x 200 L disposable mammalian bioreactors with one common downstream facility that ensures optimum capacity utilization. Fill & Finish facility will consist of filling unit that can handle both, PFS and vials, as the case may be. Additionally, the design includes lyophilizer into the fill & finish facility.

7. **Clientele/Market (within India & abroad)**

   - Start-ups / Companies / Institutions with clinical stage leads that need to generate clinical grade material (Bulk formulated API)
   - Start-ups / Companies / Institution with clinical stage leads that need to generate filled-finished material for human clinical trials –Phase I, II and abbreviated Ph III PFS / vials (Liquid format) / vials (Lyophilised format)
   - Start-ups / Companies / Institutions having laboratory scale processes and now looking for a partner to carry out non-GMP scale up studies to generate material for formulation development and filling

   - Start-ups / Companies / Institutions having laboratory scale processes and now looking for a partner to carry out non-GMP scale up studies to generate bulk non-GMP formulated API and filled product to carry out stability studies –Long term, accelerated and degradation studies
   - Start-ups / Companies / Institutions intending to tie-up with SML for co-development of molecules where early work is already completed by them
   - Global start-ups with early stage lead that want to partner with Indian company for co-development of molecules with shared commercial rights with SML retaining part of the geographic rights including India

8. **Concessional service charges or discounted pricing available for (Academia/ Industry/ MSME)**

   SML intends to offer to BIRAC fundees - SML model with BIRAC fundees / Academic researchers for Contract manufacturing only.

1. Will be based on a Cost + model, with segregation between fixed and variable expenses being made transparent in the beginning. Plus component will include a margin of 10-15% above actual costs incurred.
2. Each service offering is segregated based on the customer need –
   - Development
   - Non-GMP scaleup and Engineering batches
   - GMP batches for API generation
   - Fill – finish batches
   - Stability data generation and regulatory filing
   - Formulation studies and filling studies
   - No milestone payments involved.

   A joint development model for select projects that are of mutual interest to SML and BIRAC fundees - SML model with BIRAC fundees / Academic researchers for joint development

1. Will be based on a Shared Cost model, with segregation between fixed and variable expenses being made transparent in the beginning
2. SML will being in its process development, manufacturing and regulatory experience
3. Partner expected to bring in discovery expertise, initial laboratory process
4. Commercialization model will be based on shared IP and commercial rights
5. This model will be on case specific basis only and both parties will need to agree on it.

cGMP facility at Shilpa Medicare, Dharwad

GCLP lab for bacterial assays

1. **Type of facility**

   GCLP facility of Pneumococcal Vaccine Immunogenicity Evaluation

2. **Name of facility**

   National Centre for Pneumococcal Vaccine Immunogenicity Evaluation

3. **Location**

   Central Research Laboratory, Kempegowda Institute of Medical Sciences, Banashankari, 2nd stage, Near BDA complex, Bangalore – 560 070

4. **Brief description**

   Dedicated pneumococcal vaccine immunogenicity evaluation facility, having three sections is built at CRL, KIMS. Three sections, MOPA, ELISA and Cell culture facility are equipped with Flow cytometer, Automated ELISA system, Luminex system, BSL-Type 2 biosafety cabinets, Deep freezers, CO_2 incubators, etc. They are connected with Raw/Generator and UPS power for uninterrupted power supply. Restricted entry, CCTV security monitoring, fire safety measures are in place. Connecting the equipments to LIMS is under process. Sample receipt, storage, documentation, finance sections are attached to the facility. It is supported by NABL accredited Microbiology, Molecular and Genomic sections, developed for Pneumococcal research.

5. **Expected date for commencement of services available**

   May, 2021

6. **National/societal relevance**

   Serotype specific ELISA and MOPA tests are the tests recommended by WHO for the evaluation of immunogenicity of Pneumococcal vaccines.

   Currently these tests are available at two WHO Pneumococcal serology reference laboratories at University College, London, UK and at The University of Alabama at Birmingham, Alabama, USA, who are providing services to Pneumococcal Vaccine manufacturers. WHO recognized that testing facility is not available in India. Presently, Indian vaccine manufacturers are dependent on the laboratories situated outside the country. Outsourcing brings in additional cost implications and delays in immunogenicity results and thereby delaying the regulatory approval for commercialization. With the introduction of Pneumococcal vaccine in the national programme and development of Pneumococcal vaccine manufacturing in the country, there is an urgent need to establish referral testing center in the country to meet the needs.

   The GCLP, NABL accredited facility at CRL, KIMS established with financial grant from BIRAC under the National Biopharma Mission, will address these challenges by developing state-of-art laboratory in par with WHO referral centers. The protocols and methodology will be standardized as per WHO and Govt. of India guidelines. Reagents, consumables and strains needed for testing will be developed in-house according to country needs. Expertise, skills and trained manpower needed for conducting the tests will be developed. The laboratory has collaborative agreement with Bacterial Respiratory Pathogen Reference Laboratory at The University of Alabama at Birmingham, Alabama, USA and other international organizations for transfer of technology, training and exchange program.

   The center has planned its activities under divisions, a) Establishment, standardization and providing the services for ELISA and MOPA testing, b) Production and supply of referral and control sera, reagents and bacterial strains needed for testing, c) Research, development and standardization of the protocols for vaccine serotypes manufactured in India, d) Providing consultancy and testing services to the vaccine manufacturers, researchers and policy makers, e) Collaboration with National and International organizations and researchers in building a robust Pneumococcal research activity mitigating the Pneumococcal infections in India, f) The center will build network with academia, public organizations and start-ups to address their requirement in the field of Pneumococcal vaccine development, vaccine efficacy testing, g) The facility will serve the Indian vaccine

National Centre for Pneumococcal Vaccine Immunogenicity Evaluation at KIMS, Bangalore

community by supporting immunogenicity assessment for Phase I -Phase III vaccine clinical trials of Pneumococcal vaccine making the vaccine affordable to Indian population.

7. **Clientele/Market (within India & abroad)**

   Clients and marketing opportunities are available with

   - Indian vaccine manufacturers (Serum Institute of India, Biological E, Panacea, Tergene)
   - Pre licensing testing for vaccine introduction in India, adjoining countries and other Asian countries.
   - Collaboration with research centers, manufacturers for development of pneumococcal vaccines
   - Supply of consumables, reagents to others

8. **Concessional service charges or discounted pricing available for (Academia/ Industry/ MSME)**

   The center will offer the testing services using fee-to-service model and differential pricing structure.Indian manufacturers will be supported with subsidized, competitive costing in comparison with other service providers.

   Concessional and discounted pricing is extended for researchers and academia to support them in their activities.

GCLP lab for viral assays:

1. **Type of facility**

   GCLP

2. **Name of facility**

   National Center for Immunogenicity and Antivirals

3. **Location**

   3rd Floor, Interactive Research School for Health Affairs, Bharati Vidyapeeth Dhankawadi Campus, Katraj, Pune -411043

4. **Brief description**

   NCIA is being developed as a GCLP and Biosafety compliant State-of-Art Laboratory. Our mission is to establish a world class facility for the evaluation of immunogenicity of vaccines & antiviral properties of drugs/preparations. Majority of tests required for vaccine evaluation are available with research facilities or institutions in the country. However, these research institution facilities cannot meet the rigid regulatory requirements of data keeping, traceability, equipment maintenance and calibrations due to various in-built constraints. This facility will provide laboratory services for comprehensive evaluation of clinical immunogenicity of viral vaccines such as Dengue, Chikungunya, Influenza and Respiratory Syncytial Virus. They have planned to set up different assays for the investigation of virus-specific humoral and cell-mediated immune responses as well as quantitation of viruses. All the tests will be brought under the scope of NABL accreditation as per ISO / IEC 17025: 2017 standards. The laboratory will absorb newer technologies from eminent research laboratories world over and put them in practice in accordance with regulatory requirements.

5. **Expected date for commencement of services available**

   1st April 2020

6. **National/societal relevance**

   GCLP compliant viral vaccine immunogenicity testing laboratories are not available in India. More often, blood or

National Center for Immunogenicity and Antivirals at IRSHA, Pune

plasma samples need to be shipped abroad. Testing abroad is not only expensive but cumbersome and time consuming because of the need for regulatory approvals for shipping the samples. Therefore, there is a definite need for State-of-Art laboratories providing comprehensive immunogenicity testing services at national level.

7. **Clientele/Market (within India & abroad)**

   a. Our facility meets the requirement of best quality infrastructure, equipment, competent personnel and accredited test as per ISO/IEC 17025:2005 standards. Such a unique environment will provide services to wide range of clients in India & abroad from vaccine manufacturers to pharmaceutical companies and research laboratories.

   b. It has been projected that multiple viral vaccines for Dengue and Chikungunya viruses are in pipelines for conducting clinical trials. This facility will provide a platform to conduct clinical trials and generate self-sustainable business avenue.

8. **Concessional service charges or discounted pricing available for (Academia/ Industry/ MSME)**

   Discounted price will be offered to conduct Proof of Concept studies in academic research and for start-ups.

Medical Device Testing Facility

1. **Type of facility**

   GLP accredited preclinical contract research organization

2. **Name of facility**

   Palamur Biosciences Private Limited

3. **Location**

   Located at SH-20, Karvina, Madigattla Village, Bhoothpur Mandal, Mahbubnagar, Telangana State – 509382 (on the Bangalore National high way NH 7- app 80 km from Hyderabad International airport.)

4. **Brief description**

   Palamur complies with various national / international Quality systems such as OECD GLP, ISO, USFDA GLP (21 CFR Part 58 rev. 2009), DSIR and NABL. Palamur is approved by CPCSEA for rodent /non-rodent breeding experimentation. It is the only approved facility in India for commercial breeding of Beagle Dogs and specializes in undertaking various types of Dog studies. It also has CPCSEA experimentation approvals for large animals such as Swine & Goat. Various available facilities include Rodent Breeding, Non-Rodent Breeding, Analytical Chemistry, Clinical Chemistry, In vitro Unit, Necropsy Unit etc. Now with the support of NBM –BIRAC, an integrated complex for Medical device testing is being setup, consisting of animal holding area including quarantine, Catherisation lab equipped with state-of-the-art cathlab for implantation, Non-invasive imaging including 4-D echocardiography, Invasive imaging including the latest generation of IVUS and OCT, Histopathology, OT, preparation/ post-operative care, conference room for demo and Scanning Electronic Microscope (SEM).

5. **Expected date for commencement of services available**

   The Medical device testing facility will be functional in all aspects effective from the 1st Quarter of 2020, and all the other facilities are currently in operation.

Medical device testing facility at Palamur Bioscience, Hyderabad

6. **National/societal relevance**

   a. The proposed Global testing facility assumes significant national relevance in the context of the Government encouragement TO MAKE the goods IN INDIA by reducing the hindrances encountered by the Indian manufacturers in terms of their testing requirements. This will encourage the local companies to take up the developmental projects and innovation and will also encourage the multinational companies to use this facility. After the stent prices control, the multinationals are pressurized to reduce their cost and hence they will be encouraged to set up facility in India. Their use of this facility will indirectly help the country get better technology.

   b. Medical device covers a variety of apparatus and equipment including cardiovascular implants, neurological products etc. and India currently does not have comprehensive pre-clinical facility to prove the safety and efficacy parameters of these devices at an affordable price. The Indian regulations are now revised and updated to closely match with the International Standards hence devices require facility to upgrade them.

   c. Further there is a training facility for the various doctors and cardiologist who come out of medical schools. Handling PTCA, exposure to new equipment like Cath-labs and IVUS software etc. will add significant value to doctors. In summary, we believe that this facility will address the paucity of the quality testing service requirements, assist in technology up gradation and the skill set improvement especially for the interventionists.

7. **Clientele/ Market (within India & abroad)**

   We are working with local companies for testing bioresorbable Magnesium stents along with catheters for cardiac and neural blockages on swine model. We are also in talks with Germany-based company who wish to support us and may shift their testing requirements to us. Other universities have also shown keen interest in the swine model for their efficacy studies. Along with the existing small animal and beagle dog testing facility and the upcoming swine model facility, we can also support all the BIRAC/ DBT funded project in their animal efficacy study requirements.

8. **Concessional service charges or discounted pricing available for (Academia/ Industry/ MSME)**

   Palamur will be in a position to perform the medical device testing at highly discounted price up to 40% of the international laboratories quoted price for the industries and for Academia, MSME etc. at price equivalent to our cost +15-20% margin

2.2. Translational Research Consortia

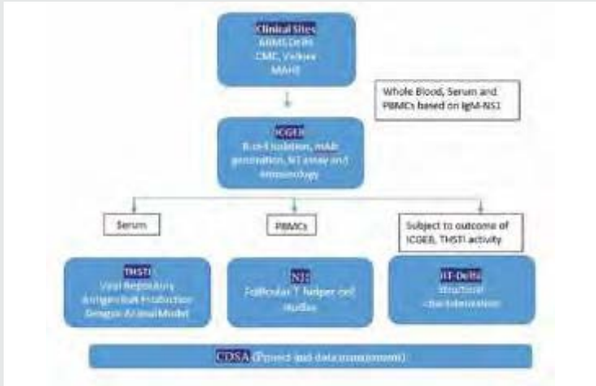
The National Biopharma Mission identified the growing public health problems owing to two of the most prevalent viral diseases in the country viz-a-viz dengue and chikungunya. A program to tackle these issues was envisaged via creation of translational research consortium for these two disease areas. A consortium of premier Indian institutions funded by the National Biopharma Mission shall establish a multidisciplinary translation ecosystem partnership platform to generate resources, reagents, infrastructure and knowledge that fast-track national efforts to tackle dengue and chikungunya. This impressive program will accelerate India's national capacities for biopharmaceutical development, testing and evaluation of vaccines and therapeutics through the 'Make in India' and 'Innovate in India (I3)' program of the Biotechnology Industrial Research Council initiatives.

TRC-Dengue:

The program entitled 'The Translational Research Consortium for Establishing Platform Technologies to Support Prophylactic and Therapeutic Strategies for Dengue - Discovery to Proof-of-Concept'is led by Dr. Anmol Chandele, Group Leader at the International Center for Genetic Engineering Biotechnology (ICGEB), New Delhi. Alongside consortia partners the Translational Health Science and Technology Institute (THSTI), All India Institute of Medical Sciences (AIIMS), New Delhi, National Institute of Immunology (NII), Indian Institute of Technology (IIT), Christian Medical College (CMC), Manipal Academy of Higher Education (MAHE) and Clinical Development Services Agency (CDSA), the programme delivers unique interdisciplinary, complementary and synergistic expertise to tackle dengue.

With clinical sites at AIIMS, CMC, and MAHE, the consortia will establish a biorepository of whole genome sequenced primary dengue viruses isolates for research work. It will also establish the dengue mouse model of infection with WHO reference virus strains and circulating strains that will be available to researchers as a fee for

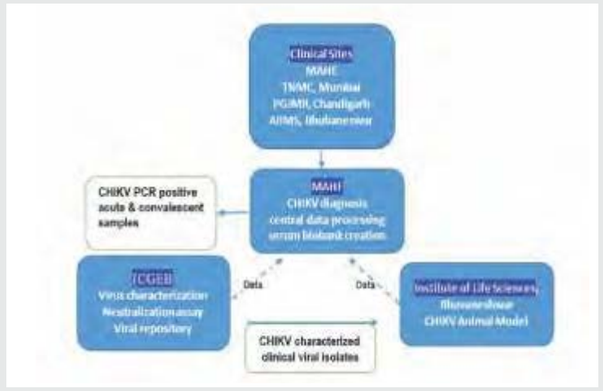
service. The researchers will also generate a bio-bank of well-characterized human sera that shall also be publicly available as reference controls for dengue neutralization assays. The team will also generate structurally well-characterized human monoclonals that will be tested for their dengue neutralizing ability in small animal models and thus provide opportunities for developing novel therapeutics against dengue. Additionally, the program envisages identifying T cell epitopes pertinent to dengue viruses circulating in India and establishes high-throughput virological and immunological assays for to facilitate future dengue vaccine testing and evaluation.



Dengue TRC

TRC-Chikungunya:

A unique consortium of medical and advanced research Institutions was created under the leadership of Manipal Academy of Higher Education (MAHE) (Deemed to be University), Manipal, with International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi, Institute of Life Science (ILS), Bhubaneswar, T.N. Medical College & B.Y.L. Nair Ch. Hospital (TNMC)-Mumbai, Post Graduate Institute of Medical Education and Research (PGIMER)- Chandigarh and All India Institute of Medical Science (AIIMS)-Bhubaneswar as collaborators to create accessible resources for Chikungunya translational research to Indian and international researchers and the Industry.



Chikungunya TRC

MAHE along with the partnering medical Institutes will identify and collect acute as well as convalescent (high titre serum) serum samples from laboratory confirmed Chikungunya cases to establish a public biobank at MAHE, Manipal. MAHE will also systematically study the adaptive immune response to Chikungunya virus infection in Indian population to create a database which will complement the biobank. It will be accessible to academic researchers and industry partners on a fee for service basis from 2021. ICGEB will establish a repository of well characterized Indian Chikungunya viruses including standard strains. Further, ICGEB will develop and make available highthroughput assays for Chikungunya viruses. The viral repository will be also accessible for Academic researchers and industry partners on a fee for service basis. ILS will develop animal models for Chikungunya virus and will be made available to stakeholders on a fee for service basis.

3. Building and strengthening domain specific knowledge and management skills:

The National Biopharma Mission jointly with BIRAC supported conduct of 6 regulatory workshops entitled "National workshop of Regulatory Compliance for Accelerating innovations" at New Delhi, Pune, Bangalore, Hyderabad, Guwahati and Vadodara.

4. Request for expression of Interest (REOI) and Request for proposals (RFP's) published:

The following request for expression of interest were published under the Mission: (1) Technology Knowledge Partner (2) Clinical Trial Regulatory Advisory and data Safety Consultancy (3) Consultancy for enabling and training personnel at TTO's.

The following request for proposals were published under the Mission: (1) GCLP Lab and TRC (2) Medical Devices and Diagnostics and Med-Tech Facility (3) Biosimilar product development, shared facilities for Biotherapeutics development and novel cell line development.

Dengue and Chikungunya TRC

5. Activities under progress:

- Request for proposals for establishing clinical trial network.
- Screening and shortlisting under already published RFP's and REOI's.

WAY FORWARD

During its seven years of existence, BIRAC has built a momentum and created a critical mass of startups and bio-incubation facilities reflecting on the maturation of nascent biotech startup ecosystem. This is expected to grow four to five folds in next 5 years putting onus on central bodies like DBT & BIRAC to respond to and lead this growth change.

As we move on, BIRAC's endeavor would be to scale biotech innovations and facilitate commercialization of innovative products and technologies developed by startups, SMEs & large industries. **#BiosciencestoBioeconomy, #PowertoTransformLives, #VigyanSeVikas, #InnovateforExcellence** are the key words that reflect the momentum and would drive us further.