birac
Ignite Innovate Incubate

BIRAC Innovators

Nurturing the Opportunities

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Foreword

As we accelerate our innovation ecosystem, the risks associated with taking an idea to the final destination as a product or a service is amplified by many kinds of hurdles including, technical challenges, funding and navigating a regulatory maze. Taken together, these challenges look insurmountable, however examples are abounding of scientific enterprises where, despite such challenges, innovative products do finally reach the market and have impact regionally, nationally and globally. Successes in developing medicinal drugs, high quality crops and medical technologies is testament to the spirit of human ingenuity.

BIRAC's mandate of building the Indian biotech ecosystem is grounded in enabling and empowering innovators through inculcating the culture of nurturing and openness. The success of biotech product innovation needs targeted support. Nurturing risky projects and handholding them through the uncertain phase are crucial for moving innovation forward.

The elements of nurturing that BIRAC extends includes not just funding but also mentorship and providing access to several networks, which help the biotech enterprise.

The 4th Compendium showcases the breadth of innovative projects that BIRAC has supported stretch from healthcare including medtech, agribiotech, industrial biotech, bioinformatics. The detailed analysis also provides a window to sub-areas that the projects fall into, such as vaccines, biosimilars and drug development.

Each project supported by BIRAC is a risky innovation that needs focused support. Each represents an innovation opportunity for solving a problem that affects us. This year, for the Compendium, we received a very good response from our Innovators. As you can see, each project involves a team. Our focus at BIRAC has been two pronged, support to the innovation and importantly support to the Innovator and the team. These are the people driving innovations and who are the nation's changemakers. BIRAC will continue to focus on nurturing these changemakers.

BIRAC continues to seek feedback from our innovators and endeavour to refine itself and its programmes for greater societal impact in India and beyond.

Prof. K. Vijay Raghavan
Secretary DBT and Chairman BIRAC

Preface

BIRAC, a Public Sector Undertaking set-up under the aegis of Department of Biotechnology, Ministry of Science & Technology, Government of India, has completed 3 years of its journey nurturing and promoting the start-up ecosystem across the country. During these 3 years BIRAC has amplified its activities strategically focusing on fueling the innovation pipeline with seed fund and nurturing young entrepreneurs to take their ideas and discovery to PoC through BIG. The early and late stage funding under SBIRI and BIPP and the validation of Academic research leads through CRS have resulted not only in increased Industry-Academic partnership but also in deliveryof new products, technologies and intellectual property.

BIRAC's focus on Social Innovation through SPARSH aims at investing in ideas that find innovative solutions to Society's most pressing social problem.

As in the earlier three years, this year also BIRAC presents the 4th Innovators Compendium highlighting the details of the Innovation supported by BIRAC. The innovations are at different stages of the value chain and each innovation listsout not only the innovative element but the future plans and risks envisaged.

We hope that this Compendium will showcase our Innovators and their path breaking innovations. We wish our Innovators great success in their journey ahead and good luck in scaling greater heights.

(Renu Swarup)
Senior Adviser, DBT and MD, BIRAC

About BIRAC

Biotechnology Industry Research Assistance Council (BIRAC) is a not-for-profit Section 8, Schedule B, Public Sector Enterprise, set up by Department of Biotechnology (DBT), Government of India as an Interface Agency to strengthen and empower the emerging Biotech enterprise to undertake strategic research and innovation, addressing nationally relevant product development needs.

BIRAC is a new industry-academia interface and implements its mandate through a wide range of impact initiatives, be it providing access to risk capital through targeted funding, technology transfer, IP management and handholding schemes that help bring innovation excellence to the biotech firms and make them globally competitive. In its three years of existence, BIRAC has initiated several schemes, networks and platforms that help to bridge the existing gaps in the industry-academia Innovation research and facilitate novel, high quality affordable products development through cutting edge technologies. BIRAC has initiated partnerships with several national and global partners to collaborate and deliver the salient features of its mandate.

Vision

"To Stimulate, foster and enhance the strategic research and innovation capabilities of the Indian biotech industry, particularly start-ups and SME's, for creation of affordable products addressing the needs of the largest section of society"

Key Strategies

- Foster innovation and entrepreneurship
- Promote affordable innovation in key social sectors
- Empowerment of start-ups & small and medium enterprises
- Contribute through partners for capability enhancement and diffusion of innovation
- Enable commercialization of discovery
- Ensure global competitiveness of Indian enterprises

BIRAC's Core Values

- Integrity
- Transparency
- Team work
- Excellence
- Commitment

BIRAC's aim is to play a transformative and catalytic role in building a US$ 100 billion Indian bioeconomy. We believe that the agents of change for building the Indian bioeconomy would be biotech start-ups & SMEs & hence our focus is on raising their capabilities

Thinking Aloud Nurturing Opportunities

Introduction

BIRAC was set up as a not for profit (Section 8) public sector unit to empower and enable the Indian biotechnology innovation ecosystem. Since its inception, BIRAC has continued to focus on creating a nurturing environment for a number of biotech innovations that are taking shape across the country with the sole intention of making high quality and affordable products in India, thus providing a strong base for 'Make in India'as well as 'Innovate in India'.

The elements of nurturing

The nurturing environment being laid by BIRAC involves giving access to funding, expertise, networks and attempt to bring a positive change in the culture of innovation in India.

Nurturing through Funding

Each of BIRAC's flagship programmes starting from early stage support through Biotechnology Ignition Grant (BIG), social innovation (SPARSH), programmes that support validation and scale-up such as Small Business innovation Research Initiative (SBIRI), Contract Research Scheme (CRS) and Biotech Industry Partnership Programme (BIPP) and our support for incubation through Bioincubation Support (BIS) focus on extending a nurturing environment to biotech innovation through a combination of R&D capital, securing intellectual capital and hand-holding by linking supported organisations to experts and other important agencies that help the startups and SMEs in furthering their enterprise and grow.

BIRACs fund support for nurturing extends from seemingly nascent ideas to innovations that are at the doorstep of commercialisation. BIRACs focus on nurturing begins with first identifying very nascent ideas that, if nurtured well, have the magnitude of impact in scale that is both national and global. In addition these nascent ideas have ingrained public good. This is the basis of our early stage support- be it through BIG, SPARSH or the newly launched BIRAC-SRISTI partnership through Gandhian Young Technological Awards.

Through the programme on Bioincubation Support (BIS), BIRAC has focused on creating spaces, for biotech enterprise to securely grow during their early startup years and through University Innovation Cluster(UIC), BIRAC is attempting to build pre-incubation for ideas at the university levels.

Nurturing of Bio-innovations, through programmes such as SBIRI and BIPP, also extends to innovations that have crossed the stage-gate of proof of concept and are ready to move into the risky domains of validation, clinical trials and scale-up.

Several of BIRAC's new programmes such as partnership with Bill & Melinda Gates Foundation (BMGF) and Department of Electronics & IT (DeitY) combine philosophy of nurturing of innovations through funding both at early stage as well late stage development.

Nurturing through expertise and mentorship

The nurturing of bio-innovations by BIRAC extends beyond direct R&D capital injection. BIRAC and its programme implementing partners hand-hold the R&D of innovations through connecting entrepreneurs, startups and SMEs with a diverse array of experts who then provide guidance, both technical and business, to innovations as it journeys through the product development pipeline. The DBT and BIRAC have a network of experts numbering around 500 who contribute their expertise towards propelling the innovative projects ahead. BIG implementing partners (FITT at IIT Delhi, C-CAMP Bangalore, IKP Knowledge Park at Hyderabad, NCL Venture Center at Pune and KIIT-TBI at Bhubaneswar) handhold individual entrepreneurs and startups. BIRAC also draws upon expertise from wide array of network partners.

BIRAC also holds regular workshops in several areas of the biotech enterprise such as grant writing, IP, regulatory and hands-on training.

Nurturing through providing access to networks

An important way that BIRAC nurtures Indian bio-innovations is through creation of networks and opportunities for innovators to connect, brainstorm and find opportunities for collaborations. BIRAC regularly holds platform meetings such as the Innovator Meet and the Foundation Day. Besides BIRAC helps biotech innovators to participate in several other platform meetings- both nationally as well as globally such as University of Cambridge's Ignite programme, Bangalore INDIA BIO, BioAsia, BIO-US, Biotech Japan to name a few. BIRAC also connect innovators to other relevant agencies and recommends innovators to be part of technology delegations for showcasing India's growing biotech prowess as well as allow Indian biotech innovators connect with their global counterparts.

Nurturing a culture of doing innovations

One of the crucial focus that BIRAC aims at is bringing a new way of doing innovation in the country. Programmes such as BIG and SPARSH encourage individuals including faculty, students (BTech, postgraduates and PhDs) to test their ideas that have potential for commericialisation. Programmes such as CRS as well as BIPP and SBIRI encourage partnerships between academia and industry as well as industry-industry and break down R&D silos. These are important aspects of creating an innovation ecosystem which go beyond funding support.

The BIRAC Compendium & the Analyses

The BIRAC Compendium showcases several of the innovations from all programmes that BIRAC is nurturing to move them forward in the innovation pipeline.

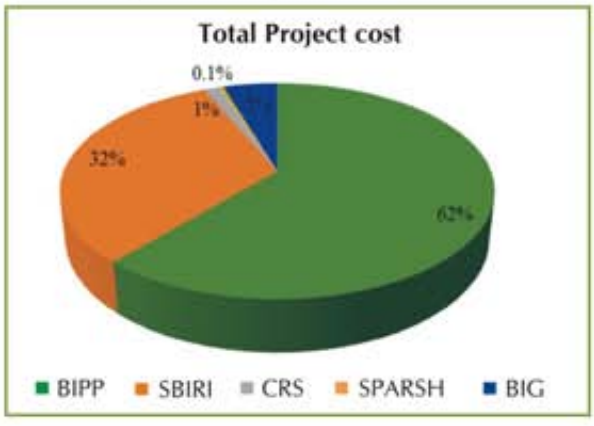
As it can be seen, BIRAC extends support to bio-innovations in all areas of biotechnology- from drugs, biopharma, stemcells, bioagri, industrial biotech and bioinformatics. It can also be seen that BIRAC's footprint covers all across India and the major biotech hubs Bangalore and Hyderabad lead in terms of having the maximum number of BIRAC supported enterprises.

The extent of expansion of BIRAC's activity can been judged from the fact that the number of projects that BIRAC has funded is now 509 with total funding of INR 1442 crores. The themewise analysis provides the details of areas of funding- interestingly the number of projects in medical technologies (devices & diagnoses) is the highest (perhaps influenced by early stage funding by BIG & SPARSH). Healthcare including devices and diagnostics receives close to 60% of funding- mirroring the way the Indian industry is evolving wherein 60% of the industry is healthcare including biopharma, vaccines, medical technologies.

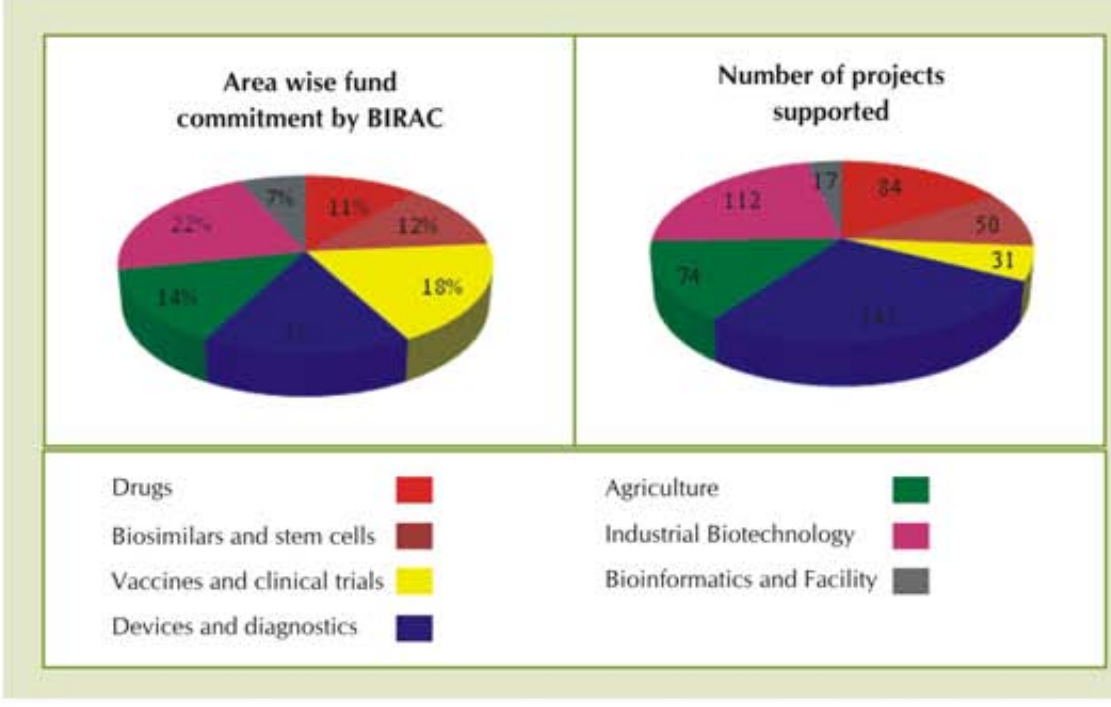
Another data nugget that need to be highlighted is the number of collaborations- an area where BIRAC's role in nurturing a cultural change was alluded to in the preceding sections- is 115. It has seen a significant jump over the years.

Focused Funding for Affordable Product Development

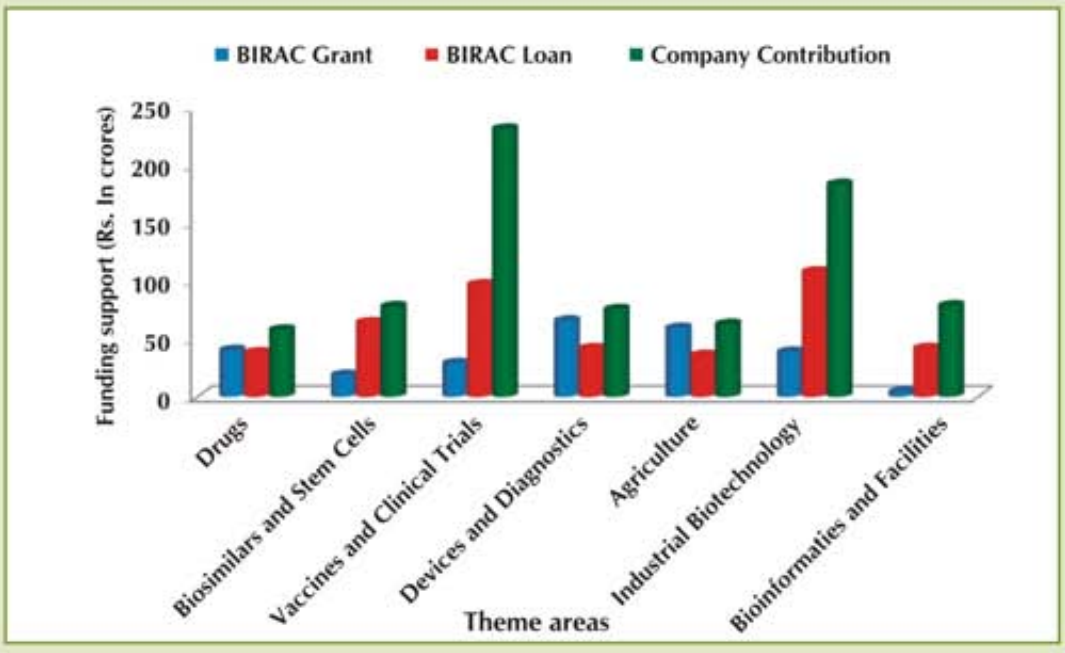
BIRAC supports affordable product development by empowering and enabling Indian biotech innovation ecosystem. To encourage start ups and SMEs to take roots and bring affordable products to the market, BIRAC is funding the entire span of biotech arena through its pioneering schemes such as Biotechnology Ignition Grant (BIG), Small Business Innovation Research Initiative (SBIRI), Biotechnology Industry Partnership Programme (BIPP), Contract Research Scheme (CRS) and Social Innovation programme for Products: Affordable & Relevant to Societal Health (SPARSH). The funding support provided by BIRAC through these schemes to the biotech sector is approximately Rs. 677 crores with a commitment of Rs. 765 crores from the private sector.



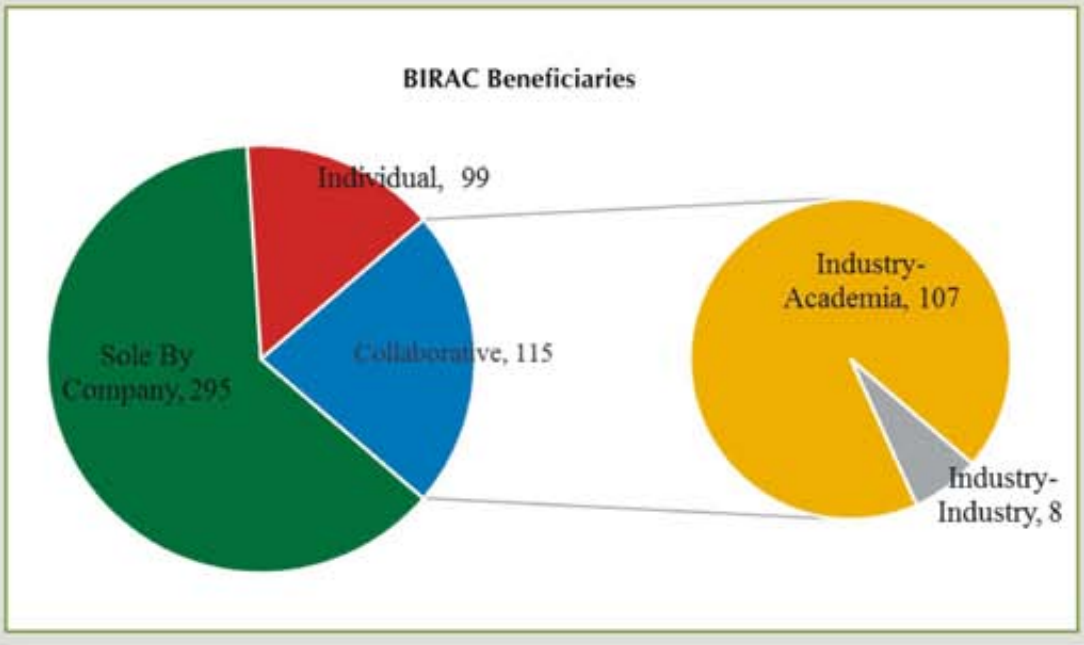
The seven major theme areas supported by BIRAC through BIG, SBIRI, BIPP, CRS and SPARSH schemes include Drugs (including Drug Delivery), Bio-similar (including Stem Cells), Vaccines & clinical trials, Devices & Diagnostics, Agriculture (including Aqua culture and Veterinary Sciences), Industrial Biotechnology (including secondary agriculture) and Bioinformatics & Facilities. BIRAC, till date, has supported 296 companies, 88 academic institutes and 100 entrepreneurs for a total of 509 projects.



Maximum number of projects have been supported in the area of Devices and Diagnostics followed by Industrial Biotechnology. However, the funds committed by BIRAC is more for Industrial Biotechnology as this sector promotes the setting up of pilot plants or production at commercial scale. Most of the proposals are for indigenous manufacturing with a view to provide import substitution and is in line with the "Make in India" concept. Out of the 7 theme areas, contribution from the companies is more in vaccines & clinical trials for promoting their local innovation. The high risk involved in the vaccine development and trials is being shared by BIRAC for nationally important projects.

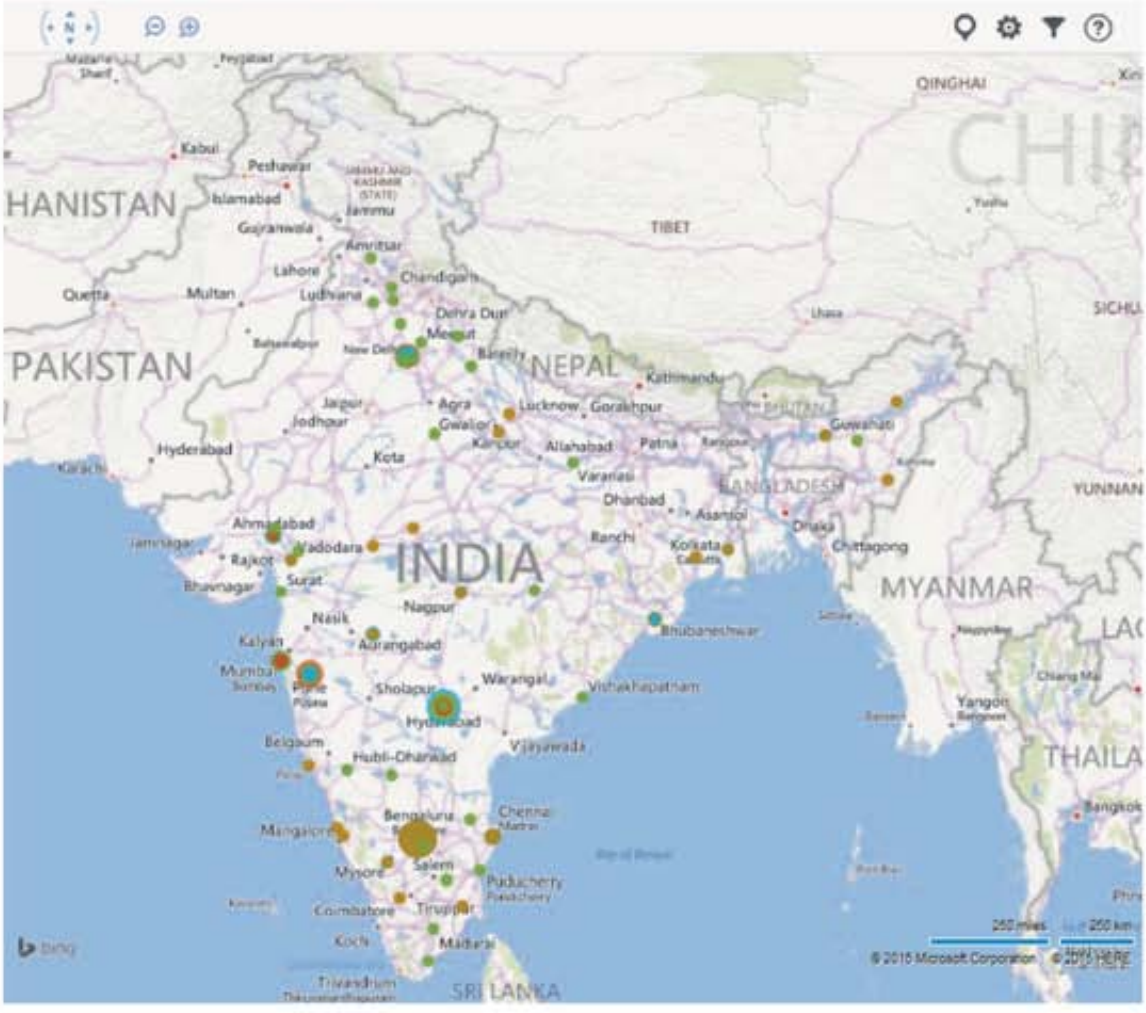


BIRAC's innovation funding schemes encourage collaboration between two important stakeholders of biotech ecosystem i.e. industry and academia and provide a conducive environment for collaborative R&D. Out of all the projects supported, industry has been instrumental in taking forward 295 technologies/products through their own efforts as well as using viability funding from BIRAC. An early stage grant has been provided to 99 individuals for promoting entrepreneurship in biotechnology to help bridge the gap between idea and innovation. BIRAC has been actively involved in promoting collaborations and has supported 115 collaborative projects till date out of which 107 projects had Industry-Academia collaborations and 8 projects had Industry –Industry collaboration.



These projects have delivered 23 affordable products/technologies and 19 early stage technologies in addition to generating 45 intellectual property and five facilities.

BIRAC's presence in India



BIRAC has been actively engaged in supporting projects all over the country. However, maximum number of BIRAC supported enterprises are in Hyderabad and Bangalore, which are the major hubs for biotechnology in India. This is closely followed by Pune, Delhi and Mumbai. BIRAC's presence is slowly increasing in the north-eastern part of India as well.

Assessing the impact

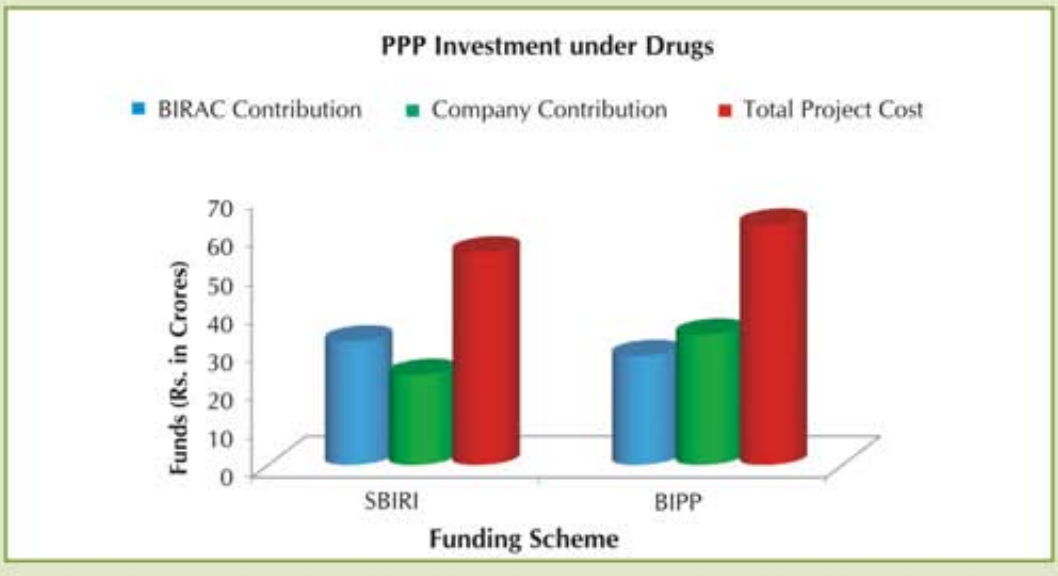
New start-ups supported and scaled up	• 50
Small and medium enterprises strengthened	• 150
Early Stage Technologies	• 19
Affordable products/Technologies developed	• 23
IP generated	• 45
Investments made on innovation and discovery research	• Rs. 1450 crores

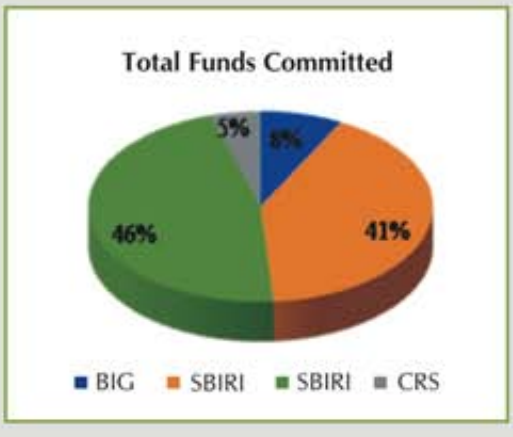
Theme wise assessment

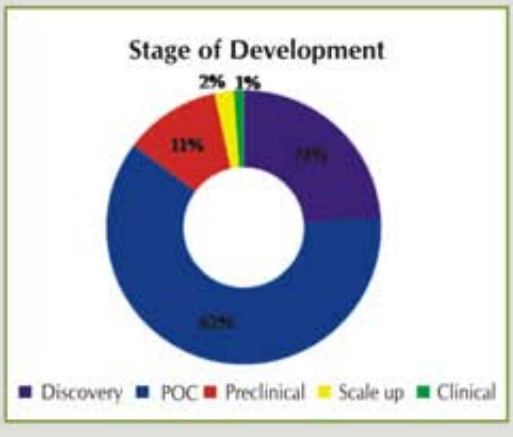
Drugs including Drug Delivery

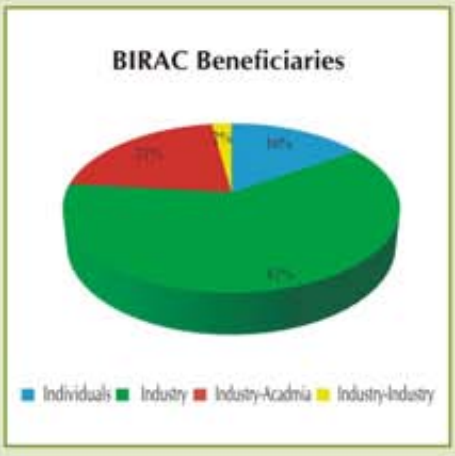
BIRAC supported projects for drug development, drug delivery and for the development of platform technologies in this sector. BIRAC's funding to Drugs sector focuses on development and validation of affordable technologies and products with a view to reduce their R & B cost, increase their availability and accessibility to the society. The projects supported under drugs mainly deals with the indications such as cancer, infectious diseases, inflammation and diabetes. Many projects accomplished the objectives successfully and are ready to go to the next stage. Discovery and development of c-Met kinase inhibitors, clinical investigation of Galnobax® for the treatment of diabetic foot ulcer and novel inhibitors of fatty acid biosynthesis for the treatment of drug resistant *S. aureus* bacterial infections are some of the projects having potential to meet the objectives and to provide successful outcomes.

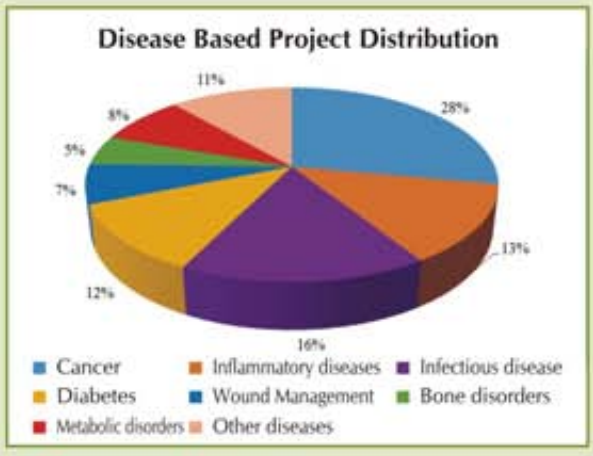
Total PPP investment under this area amounts to Rs. 134 crores wherein BIRAC has invested Rs. 77 crores for supporting 84 innovative projects. These 84 projects engaged 40 companies, 15 start-ups, 15 entrepreneurs and 20 academic institutes. Till date, a total of 3 products/technologies/PoC and 8 intellectual properties have been generated from this sector.

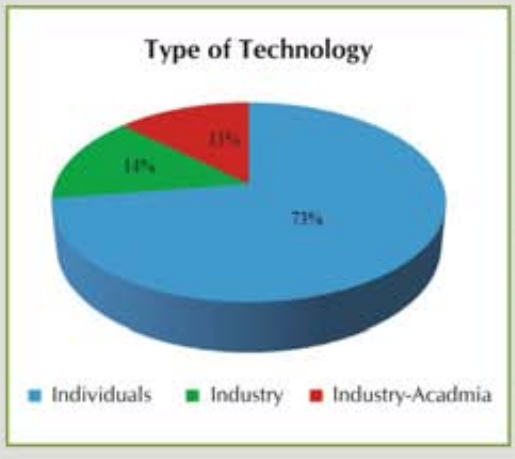












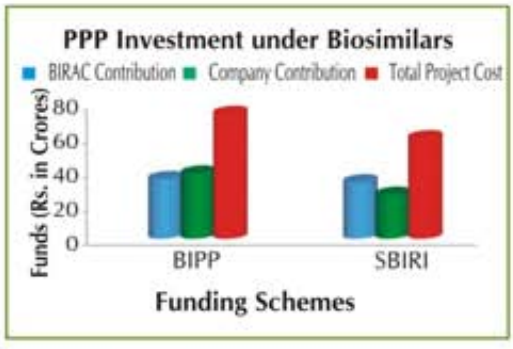
Analysis:

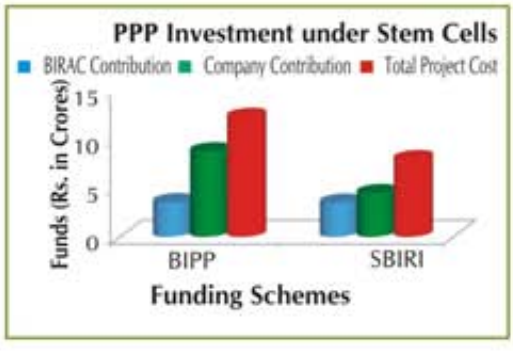
- BIRAC contribution is slightly more in SBIRI compared to BIPP whereas company contribution is more in BIPP indicating enabling role of BIRAC in catalyzing small business innovation and company interest in development in this area.
- Many of the projects are for developing proof of concept followed by discovery.
- Collaborations are not that evident and may be encouraged for successful outcomes in this area
- Maximum number of projects have been supported in the area of cancer followed by infectious, inflammatory diseases and diabetes.
- Drug delivery and development of platform technologies are also taking some share of funding in addition to drug development.

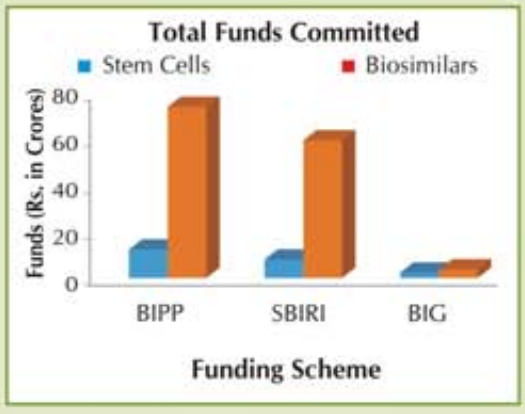
Bio-similar and Stem Cells

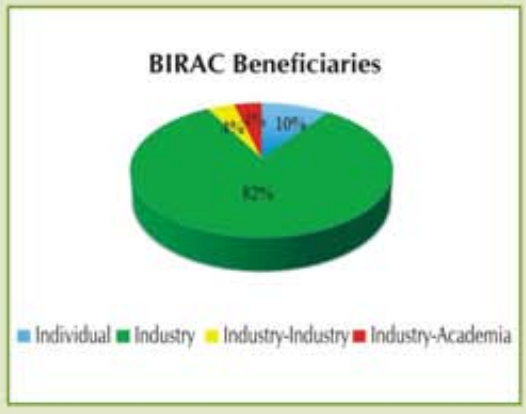
Bio-similar currently available in the market are not affordable for a large segment of population in India. BIRAC has supported a total of 50 projects, for developing novel biologicals and for the process development of existing products in this area for increasing the present market share/output of bio-similar in the country. The projects supported in bio-similar address diseases like cancer, diabetes, inflammatory diseases, alzheimers and platform technologies for producing monoclonal antibodies. In the area of Stem cells, diseases such as liver cirrhosis, diabetes, osteoarthritis were targeted and preparation of stem cell banks has also been funded.

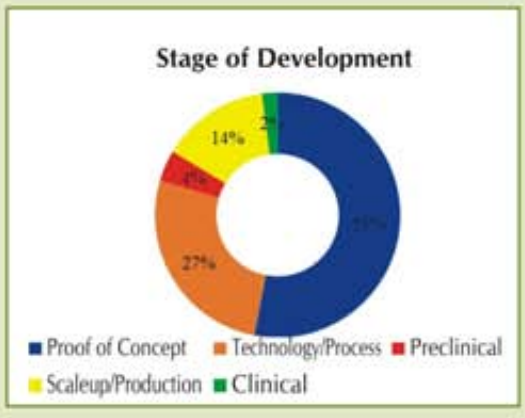
Total PPP investment under this area amounts to Rs. 160 crores wherein BIRAC has invested Rs. 82 crores for supporting 50 innovative projects. These 50 projects engaged 29 companies, 7 start-up, 5 entrepreneur and 4 academic institutes. Till date, a total of 5 products/technologies/PoC and three Intellectual properties has been generated in this sector.









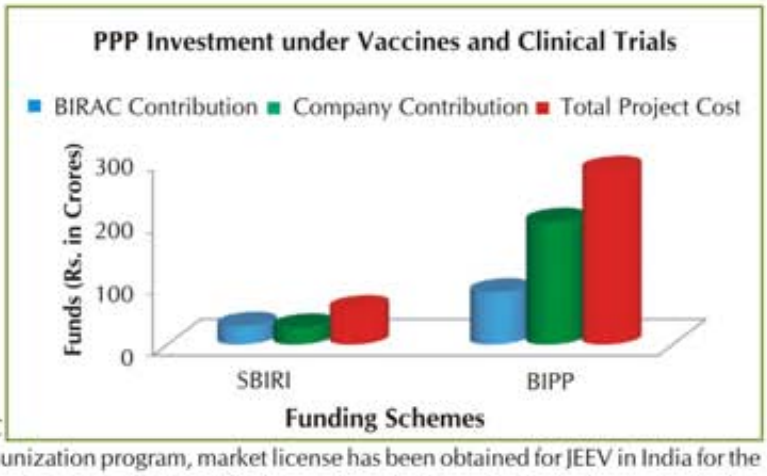


Analysis:

- Contribution from Industries and BIRAC is almost equal for projects under Bio-similar area whereas Industry is contributing more in the case of stem cells.
- Industry alone is pursuing maximum number of projects in this area without any collaboration
- Maximum number of projects funded are at Proof of Concept stage followed by technology / process development
- Collaborations (either industry-industry or industry-academia) may be encouraged for successful and timely outputs.

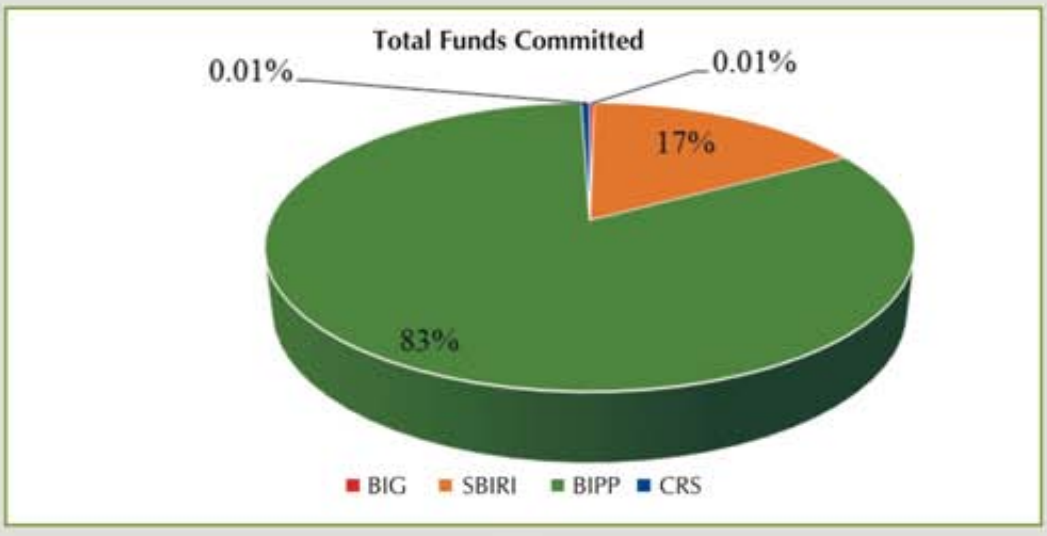
Vaccines & Clinical Trials

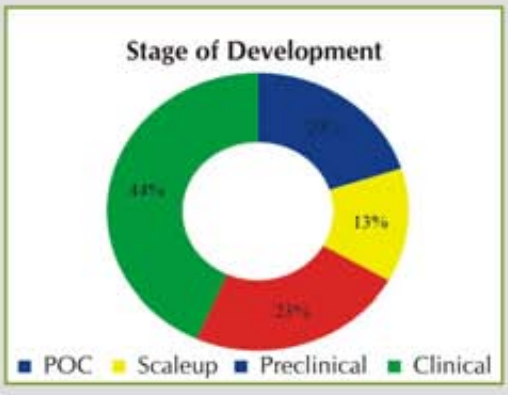
Vaccine development has played an important role in combating infectious diseases. By realizing this, BIRAC has supported a total of 30 projects in the area of Vaccine development and clinical trials encompassing diabetes, diarrhoea (Rotavirus), cervical cancer (HPV), pneumococcal vaccine, influenza, vaccines for cattle diseases, rabies and meningitis.

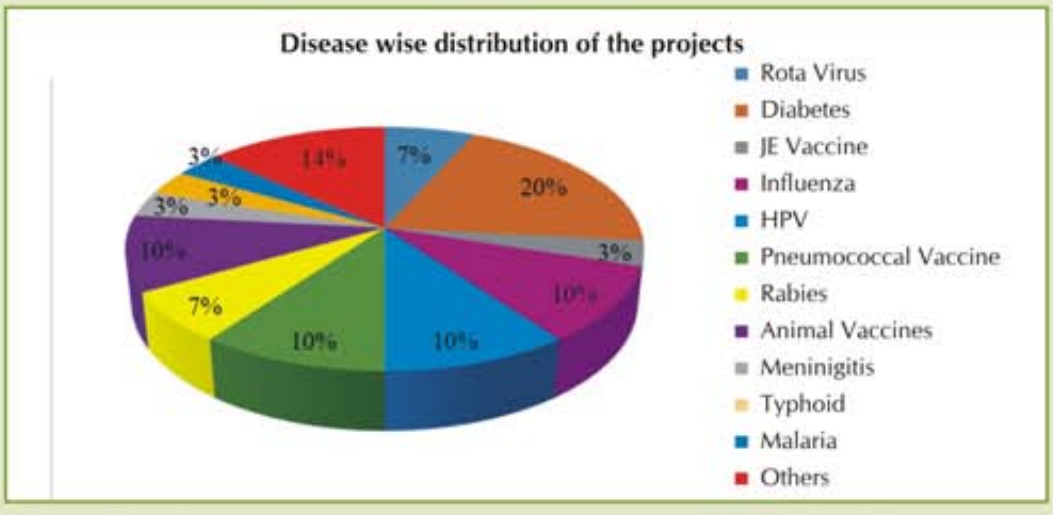


Rotavirus vaccine (ROTAVAC), JE vaccine (JEEV) and H1N1 pandemic influenza vaccine (Pandyflu) have resulted from BIRAC Government of India in National Immunization program, market license has been obtained for JEEV in India for the age group of >1 year to < 3years and a total of 1,18,480 doses of Pandyflu vaccine have been supplied to Government of India in the year 2011.

Total PPP investment under this area amounts to Rs. 355 crores wherein BIRAC has invested Rs. 117 crores by supporting 31 innovative projects. These 31 projects engaged 30 companies, one start-up, one entrepreneur and 6 academic institutes. Till date, a total of 3 products/technologies/PoC and 2 Intellectual property have been generated in this sector.

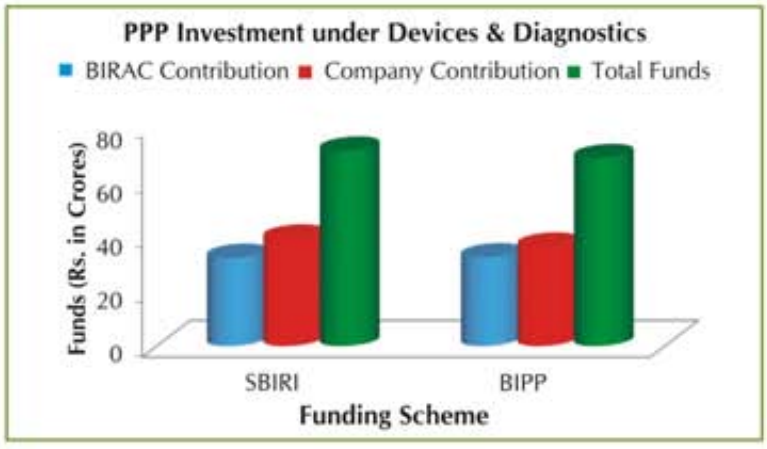






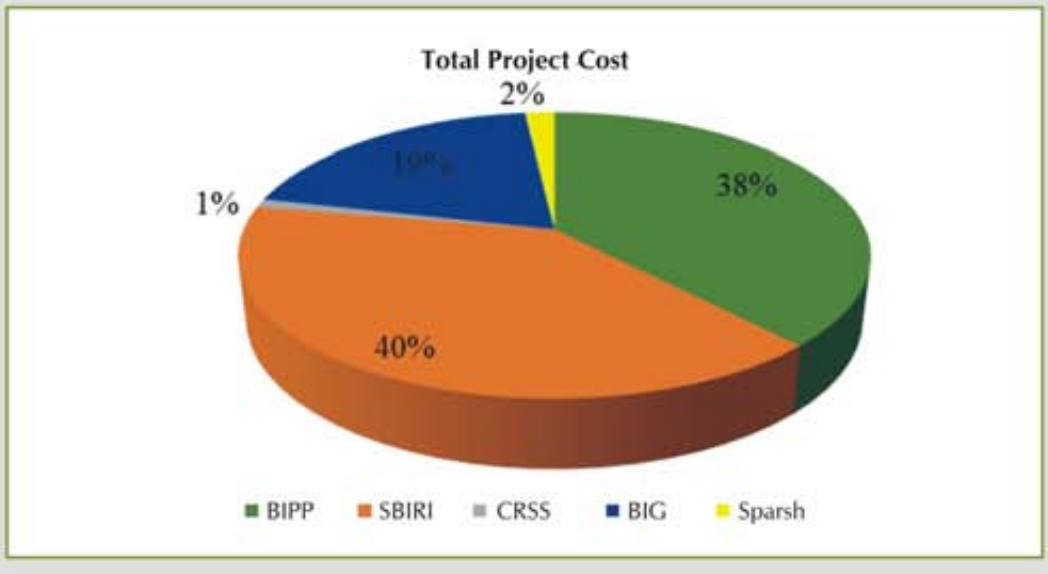
- Industry Contribution is more in the projects supported under Vaccines and Clinical Trials to promote Indian innovation.
- Few of the projects are at developing proof of concept while others are at preclinical or scale-up stage.
- In most of the cases, Industry is taking the projects forward. Collaborations may be encouraged in clinical research.
- There is a good spread of projects among different indications although diabetes, pneumococcal, HPV, influenza and animal vaccines are at the top of the list.

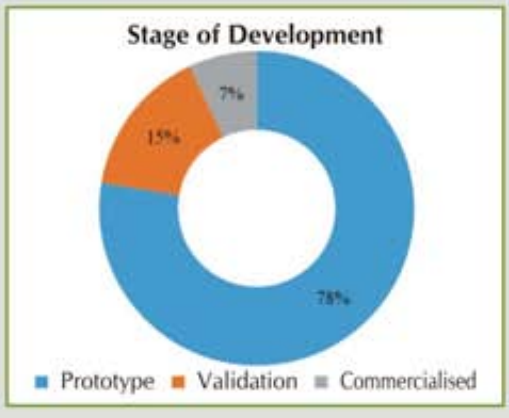
Devices and Diagnostics:

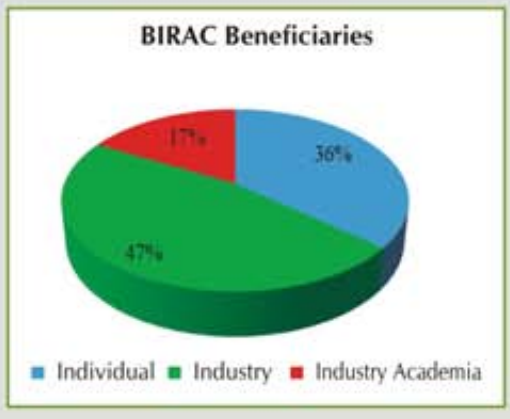


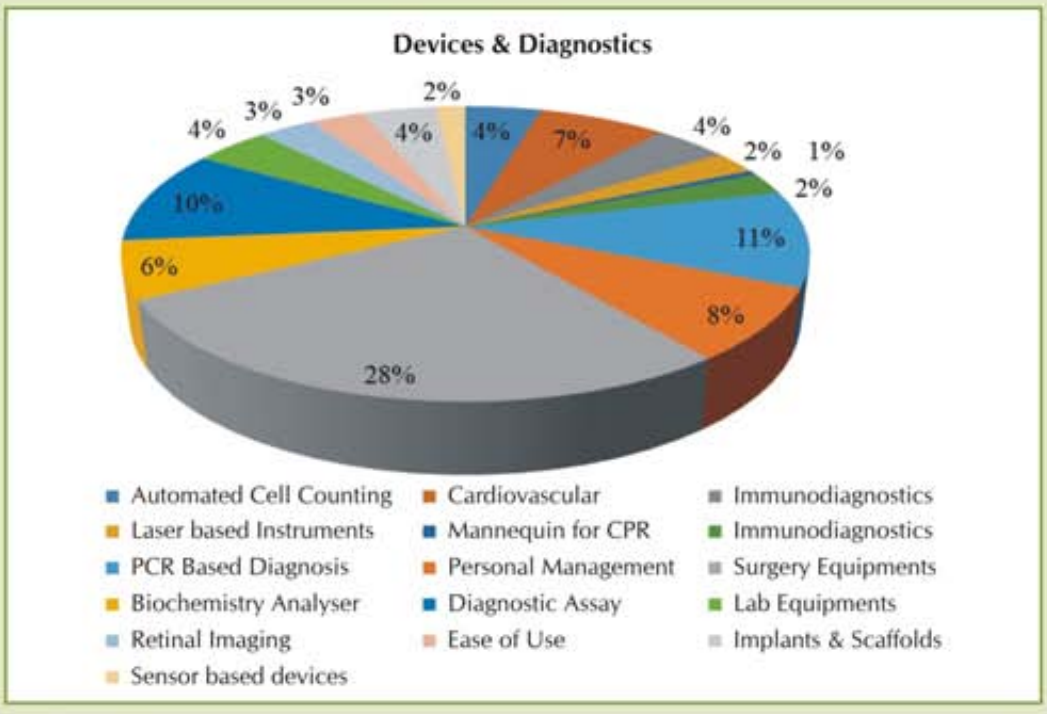
Devices and Diagnostics area, which is considered as a low hanging fruit, has great potential for the innovators and entrepreneurs. This is an area which has shown tremendous growth in past 3-4 years. Accordingly, the budget committed by BIRAC for this sector has increased by roughly 50% compared to last year and diagnostics has fetched more budget compared to the devices. Many of young entrepreneurs and SMEs are showing interest to venture into this area considering the low gestation period. BIRAC funding has already delivered 7 products (including Diagnostic kits) which are ready for commercialization and many more are in the pipeline.

Total PPP investment under this area amounts to Rs. 180 crores wherein BIRAC has invested Rs. 106 crores for supporting 141 innovative projects. These projects engaged 61 companies, 37 start-ups, 51 entrepreneurs and 33 academic institutes. Till date, a total of 14 products/technologies/PoC and 11 intellectual properties have been generated in this sector.









Analysis:

- Industry contribution is slightly more compared to BIRAC in both SBIRI and BIPP schemes because of low gestation periods
- Many of the projects are in prototype development stage followed by validation
- Either individuals or industry are pursuing the projects alone though there are few industry-academia collaborative projects
- Though surgery related devices grabbed maximum share followed by diagnostic assays, there is a good distribution of projects across all main areas

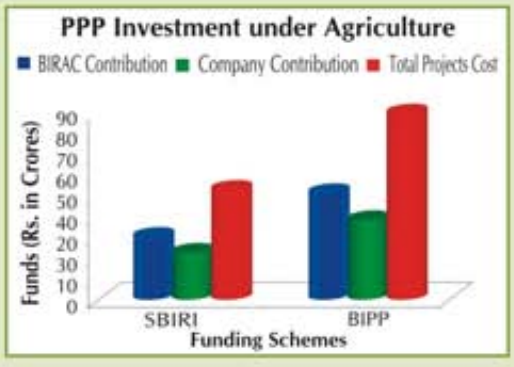
Agriculture (including Aqua culture and Veterinary Sciences)

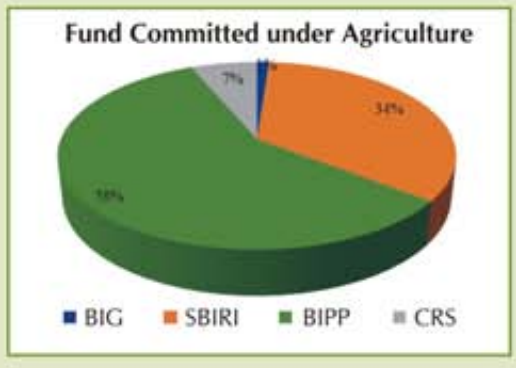
In India, Agricultural biotechnology is still in its early stages of development both scientifically and commercially. The coordination between R&D and commercial success is still evolving. Through its various schemes BIRAC is making an effort to encourage agricultural biotechnology as a promising business field by funding projects for advance research and commercialization. BIRAC is supporting the key areas of agriculture i.e. Marker assisted Selection, Transgenics, RNAi and Soil Health Management to bolster innovation and product development. At the same time, BIRAC is providing nurturing and mentorship to the supported projects to deliver tangible achievements like Hybrid vigour, yield improvement, salt tolerance, engineered viral resistance and robust bio-pesticide development.

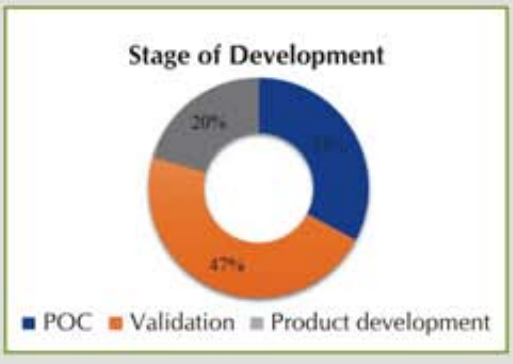
Total PPP investment under this area amounts to Rs. 155 crores wherein BIRAC has invested Rs. 94 crores for supporting 74 innovative projects. These 74 projects engaged 44 companies, 2 start-ups, 2 entrepreneur and 19 academic institutes. Till date, a total of 2 products/technologies/PoC and 4 intellectual properties have been generated in this sector.

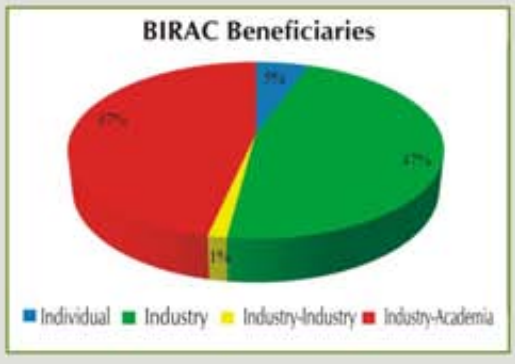
The technology development in progress are:

- Development of biotic stress resistance in rice through molecular breeding
- Successful field trials and bio-safety studies on genetically engineered *Brassica juncea* leading to increased mustard productivity
- Development of nutritionally improved mustard having low erucic acid and low glucosinolate
- Engineered viral resistance in tomato



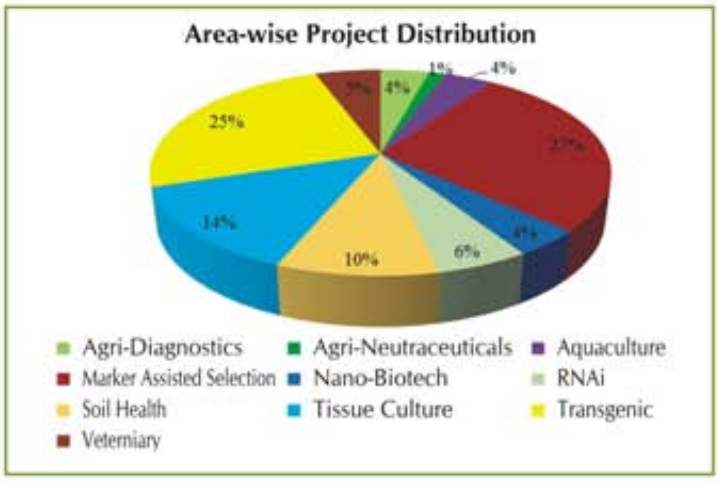






Analysis:

- The development of proof of concept for the use of inorganic and polymer nano-composites for micronutrient & pesticide delivery has been a successful outcome in this area
- Maximum funds have been disbursed under BIPP as compared to other schemes wherein BIRAC contribution is more compared to Industry
- Most of the projects supported are high risk projects as they fall under validation and PoC development and significantly less number of projects are under product development stage due to long periods of technology incubation
- Industry-academia collaborations are evident in this sector where robust technology development is possible. The next step in this direction may be the development of Consortia Type models to gain from each other's strength
- Marker assisted selection & transgenics followed by tissue culture & soil health management have taken maximum share of projects
- Futuristic Technologies like Agri-neutraceuticals, Agri nano-biotechniogy and Agri diagnostics need to be encouraged further.
- Both Industry and Academia have equally benefited in agriculture sector, however, Agri-Entrepreneurship needs further nurturing
- Linking of Global players to Indian industry, in accordance to the national needs, may be considered for technology advancements
- Availability of vertical funding to the agriculture industry may be increased.



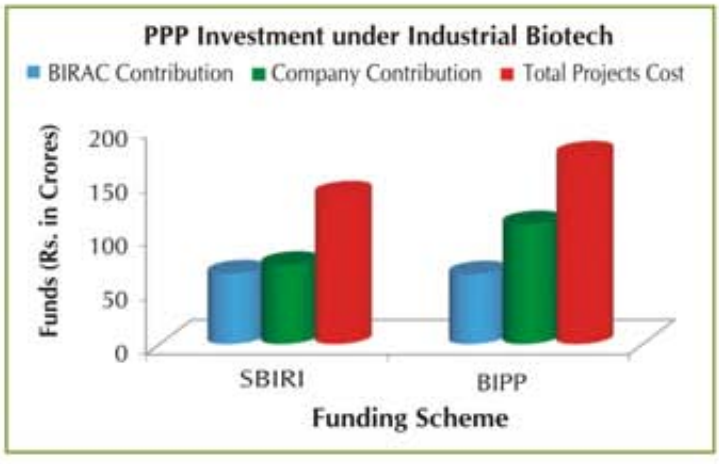
Industrial Biotechnology (including secondary agriculture)

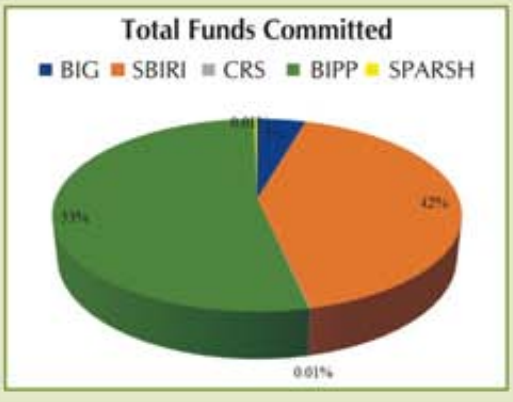
Industrial Biotechnology involves the use and application of biotechnology for the sustainable production of materials, chemicals and fuels. In spite of being in nascent stage, development of this sector will help in achieving a positive impact for the growth of economy, society and environment. Efficiency gains that can be made from current applications are only the tip of the iceberg.

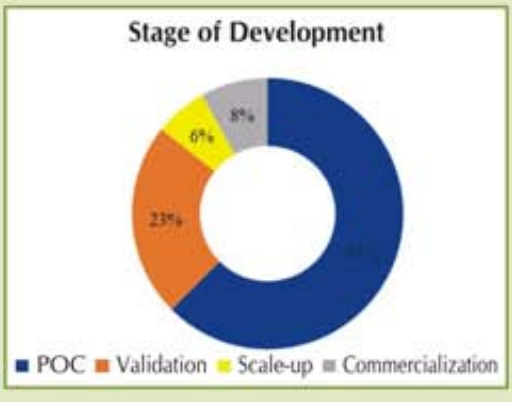
Suite of technologies and processes that are being investigated by BIRAC beneficiaries for commercial use include development of biofuels, speciality chemicals, industrial enzymes, secondary agriculture, nutraceuticals, bioremediation and many other fine chemicals.

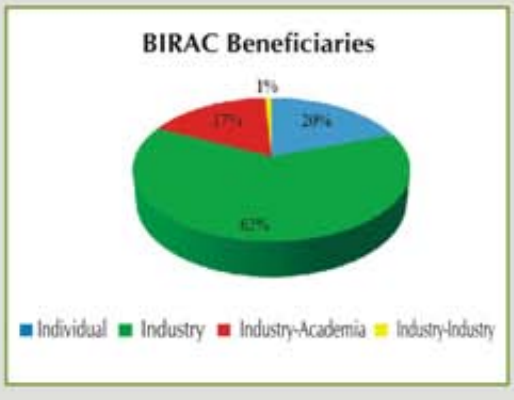
Total PPP investment under this area amounts to Rs. 329 crores wherein BIRAC has invested Rs. 146 crores for supporting 112 innovative projects. These 112 projects engaged 69 companies, 4 start-ups, 21 entrepreneurs and 20 academic institutes. Till date, a total of 12 products/technologies/PoC and 13 intellectual properties have been generated in this sector.

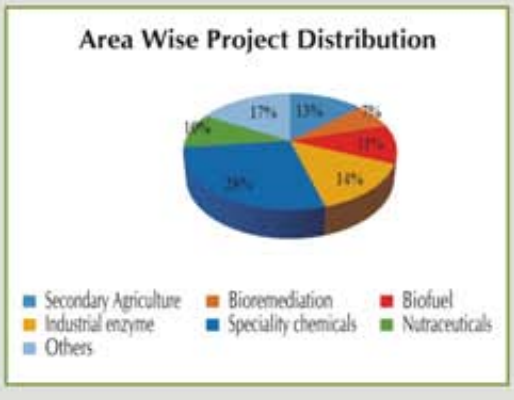
"NEMA POWER" for management of root grubs in areca nut has been developed and a production plant for commercial production of Dextranase has been established from this area. Many others are in the advanced stages of technology development - Green process for the production of Pneumocandin B0, conversion of Benzaldehyde to Phenyl-acetyl-carbinol and platform for economical production of effervescent granules.





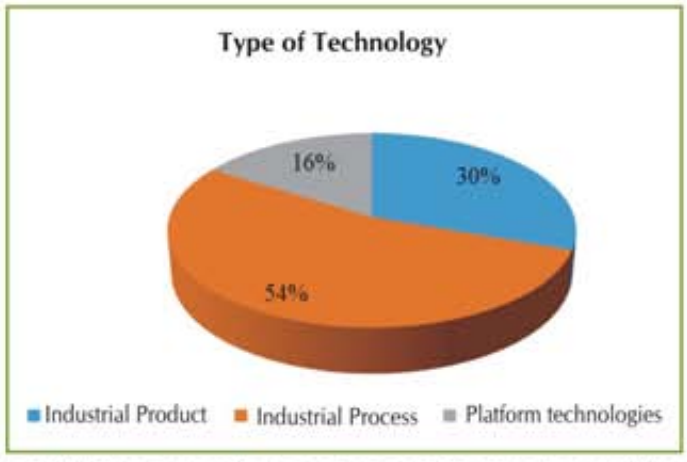






Analysis:

- Investment by BIRAC is almost similar for projects supported under BIPP and SBIRI. The industry has heavily invested in large scale projects under BIPP.
- A positive trend has been observed for development of indigenous product and processes by entrepreneurs and start-ups but more encouragement is needed for promoting the lab scale technologies for industrial validation through CRS scheme.
- Maximum number of projects have been supported for development of PoC followed by validation. These include high risk proposals which were funded with a restricted scope in order to gain more confidence on the novel idea being proposed.
- Majority of the beneficiaries for the projects under this sector are industries only. PPP needs to be encouraged
- Maximum number of projects have been supported for technology development of speciality chemicals including import substitutes.
- BIRAC needs to consider building a national enterprise through sustained support to this sector. This sector can grow with intensive research and technological support which may be provided by BIRAC

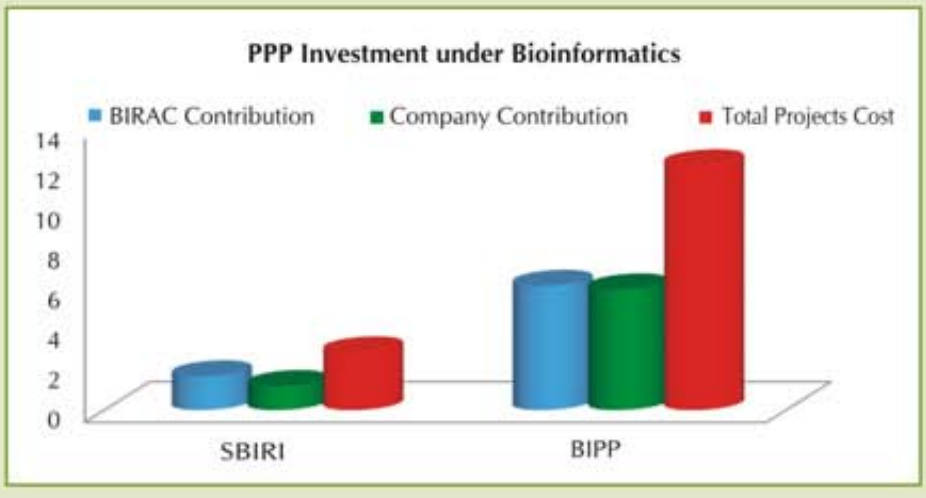


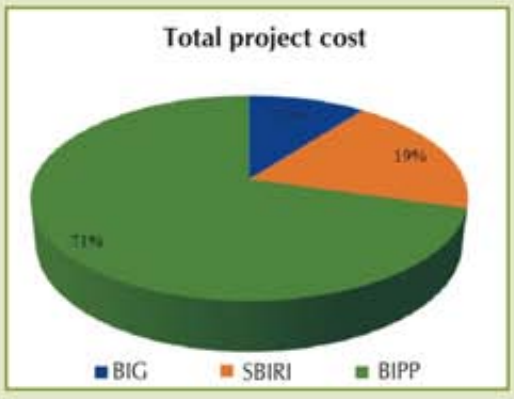
Bioinformatics & Facilities

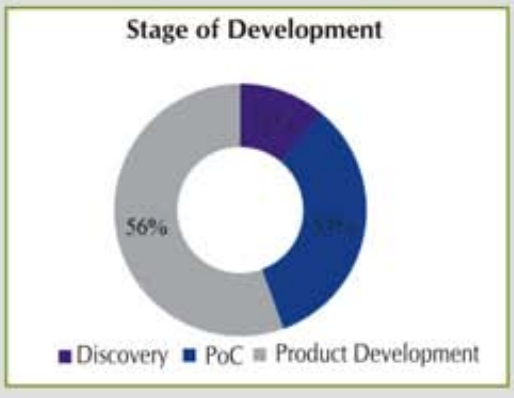
Important key areas that have been supported by BIRAC under Bioinformatics are In-Silico platform development, tool development and computational infrastructure development. A Hepatotoxicity Prediction Platform (Heptox) which can be used by the pharma and biotech industries to test their lead compounds for in-silico toxicity studies has been developed. A comprehensive NGS data analysis suite i.e. SanGeniX for seamless analysis of NGS data is in validation phase.

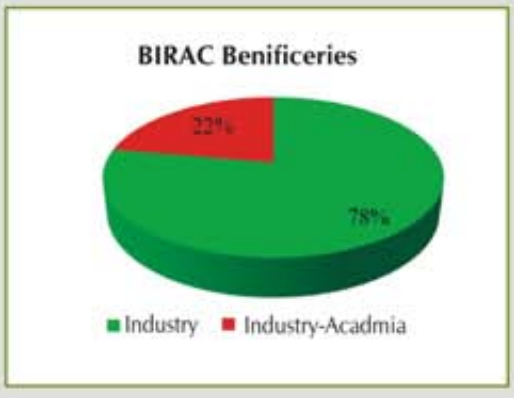
BIRAC supports 'Make in India' vision by promoting infrastructure development. The projects that have been supported by BIRAC include development of facility for production of immunoglobulin, Serum Albumin & Factor VIII. Another facility having BSL 1-3 services for microbial antigen and antibody production has also been developed.

Total PPP investment under this area amounts to Rs. 123 crores wherein BIRAC has invested Rs. 45 crores for supporting 17 innovative projects. These projects engaged 12 companies, 3 start-ups and 3 academic institutes. Till date, a total of 3 products/technologies/PoC, 4 intellectual properties and 5 facilities have been developed in this sector. The protein characterization facility is the service facility which is having differential cost pricing for Academia & Industry. Rest of the three are self use facilities to promote in-house R&D capabilities of the company.









Analysis:

- BIPP provided maximum funding for bioinformatics followed by SBIRI.
- Major share of funding in bio-informatics is going towards product development followed by PoC.
- Few of the projects from this area involved Industry-academia collaborations though many are pursued by industry alone
- Industry is contributing more to facility projects compared to BIRAC

Innovation Profiles

BIRAC Innovators

Healthcare Therapeutics

September 2015

Anuya Nisal - IKP

Intended First Product :
Osteoconductive Bone Graft Substitute kit
Tentative product name :
Biolmed BGS

The Innovation

Osteoconductive bone graft substitutes

Brief Description

BiolMed Innovations is focused on development of 3D osteoconductive bone graft substitute based on silk fibroin protein. The novel scaffold is biocompatible, has excellent mechanical properties and degradation resistance with appropriate porosity.

Stage of Development

Discovery

Innovative Element

Two different types of polymers - naturally occurring polymers and synthetic polymers have been used in the production of composite materials for use as bone graft substitutes. Our technology involves fusing the silk fibroin micro-particles using dilute Regenerated Silk FIbroin solutions.

Market Potential

In India unavailability or unaffordability of existing synthetic bone graft substitutes is high. Considerable demand for these replacement procedures cannot be met solely by using donor material such as auto-grafts, allografts and xenografts. There is a need for the development of synthetic bone graft substitutes based on a variety of different materials such as metals, ceramics, polymers and their composites by combining with growth factors and cell therapies.

National/ Societal Relevance

Autologous grafts, in spite of their limitations like donor site morbidity, limited supply are the golden standards in India. Commercial products are either unavailable or unaffordable. BiolMed technology has the potential to be customized for Indian doctors

Project Deliverables

Progress vis-a vis objectives - Developed and patented a novel processing protocol that enables preparation of three dimensional scaffolds of silk fibroin with controlled pore size and distribution, excellent mechanical properties and improved degradation resistance.

Technology/Product developed - Preliminary work has demonstrated the feasibility of preparation of 3D porous silk fibroin scaffolds by fusing together SF particles using dilute SF solutions.

IP generated/Potential for IP generation - Three Patent Disclosures have been filed from National Chemical Laboratory.

Resources generated - One Project Assistant is hired.

Plans to take innovation further

We will identify and engage with suitable marketing partners to promote and sell our product in the local and global market.

Risks Envisaged

The challenge here is to evaluate the scaffold for cell culture and evaluation of scaffold in animal trials.

Team Members

Anuya Nisal
Project Co-ordinator
Premnath Venugopalan
Ashish Lele

Contact

Anuya Nisal
H 106, Polymer and Advanced Materials Laboratory, National Chemical laboratory, Homi Bhabha Road Pashan, Pune 411008

Apcegen Technologies

The Innovation

Generation of Proof-of-Concept for Animal Studies of PEG conjugated fully human Fab Antibody Fragment expressed in *E. coli* for the treatment of Rheumatoid Arthritis

Brief Description

TNF-alpha is a pro-inflammatory cytokine implicated in the pathogenesis of various immunological diseases including rheumatoid arthritis. Neutralizing TNF-alpha, using biological agents, such as mAbs and Fab, will be an effective treatment strategy in RA.

Stage of Development

Proof-of-Concept

Innovative Element

Apcegen has utilized advance molecular technologies to engineer its fully human Fab Antibody fragment with site specific PEGylation. For this purpose. Apcegen has done mutations in the Fab sequence without compromising its functionality. Further, Apcegen has cloned this fragment into an indigenously developed high expression vector under a strong promoter control containing Lac operon and SD sequences for the periplasmic expression of the desired Fab. The SD sequences are also custom optimized to achieve the balanced expression of both vL and vH. The Fab is produced in *E. coli* which makes it extremely cost-effective.

Market Potential

As India is gearing up for biosimilar versions of Enbrel, Humira and Remicade, we see huge market for our PEG-Fab as it will be very cost effective, with improved efficacy and lesser side effects.

National/ Societal Relevance

Rheumatoid Arthritis primarily affects joints, however it also affects other organs in 15-25% of individuals. Since the cost of the currently available and recently launched biosimilar is extremely high, the major population is still not able to afford the targeted medication. We expect our drug candidate to be priced at least 1/10th of the currently available drug price.

Project Deliverables

Progress vis-a vis objectives - A PoC to manufacture PEG-hFab has been established and validated.

Technology/Product developed - Under development

IP generated/Potential for IP generation - In-process

Resources generated - One of the Angel group has approved our project to fund. Couple of Venture capital firms have shown interest to fund this project. Three scientists have been trained.

Plans to take innovation further

We are exploring options.

Risks Envisaged

Risk is limited as the basic POC is established and the manufacturing process is also scaled-up to 3L fermentors. The Drug has already been tested using *in vitro* cell based model with comparative studies with commercially available anti-TNF biologics.

Team Members

Ashutosh Vyas (PC)
Aashish Kumar Joshi
Sandeep Shandilya

Contact

Apcegen Technologies
F3/F6, SIDBI Innovation and Incubation Center, Indian Institute of Technology Kanpur, Uttar Pradesh-208016

Arjuna Natural Extracts Ltd.

The Innovation

Detailed Chemical Profiling and PreClinical Evaluation of US patented Anti-diabetic Plant Extract.

Brief Description

Arjuna Natural Extracts Ltd standardized the extraction process, phytochemically profiled the standardized active fraction using modern separation and analytical techniques, extracted on commercial scale and standardized batches of US patented anti-diabetic plant extract.

Stage of Development

Proof-of-Concept

Innovative Element

The extract from plant Costus pictus has potent anti-diabetic activity and regenerates pancreatic islet cells as proven by animal studies. The proposed project will elucidate the mechanism by which Costus pictus extract imparts the anti-diabetic effect and helps in the process of developing a cheap and acceptable anti-diabetic drug which will also have a possible capacity to regenerate pancreatic islet cells.

Market Potential

The preliminary research done with the anti-diabetic plant, Costus pictus, has given positive results and the IPR developed has been patented by ANEL. There is a tremendous market demand for a safe and effective natural anti-diabetic drug. India is having a huge diabetic population which looks forward to an anti-diabetic drug of natural origin. It is envisaged that the anti-diabetic drug from Costus pictus will benefit both Type I and Type II diabetic patients.

National/ Societal Relevance

Diabetes is a pandemic disease and one of the major causes of premature deaths. It is rapidly emerging as a major health concern in India, because of its chronic nature, severity of its complications and means required to control diabetes is a costly disease, not only for the affected individual and his/ her family, but also for the health authorities. Control of diabetes will be cheaper and more acceptable for the masses if suitable natural remedies are made available.

Project Deliverables

Progress vis-a vis objectives - Plant collection, taxonomic identification and Pharmaco epidemiological studies were completed. Various phytochemicals were identified and standardized along with the extraction procedure. Anti-diabetic efficacy of the developed extract was completed in rats. Acute toxicity study of the extract was completed. The extraction procedure was scaled up to pilot and commercial scale. Detailed toxicity study was completed. Efficacy study in Type 2 diabetes animal model is ongoing.

Technology/Product developed - Anti-diabetic herbal extract is going through final levels of efficacy evaluation.

IP generated/Potential for IP generation - Patent application has been filed.

Resources generated - LC-MS/MS, ICP-MS, GC-MS, preparative HPLC etc have been installed.

Plans to take innovation further

The anti-diabetic herbal extract from Costus pictus will be taken up for commercialization.

Risks Envisaged

Efficacy evaluation in diabetic patients has not been done. It will be important to make therapeutic claims.

Team Members

Benny Antony
Project Co-ordinator
Merina Benny
Binu T. Kuruvilla
Nishant Kumar Gupta

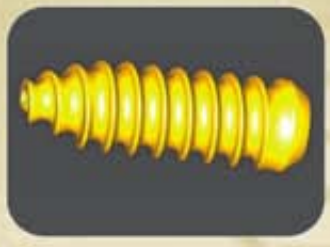
Contact

Arjuna Natural Extracts Ltd.
Bank Road, Aluva,
Kerala
India-683101

Ashish K Lele-IKP

The Innovation

Bioabsorbable implants based on Polylactic Acid (PLLA)



Brief Description

We propose to demonstrate a proof-of-concept for biodegradable trauma fixation products In particular as first illustration as ACL screws for anterior cruciate ligament surgery based on very high Molecular weight, biomedical quality and highly stereo specific.

Stage of Development

Proof-of-Concept

Innovative Element

Process innovations for making high molecular weight (MW) bio-absorbable grade PLLA to enable development of affordable implants. Currently there are no Indian manufacturers despite the clear need. Orthocrafts will be the first start-up to make biomedical grade PLLA in India.

Market Potential

Trauma fixation devices market was valued at USD4.4 billion in 2009 and is expected to reach USD6.6 billion in 2016, with a compound annual growth rate (CAGR) of 6. The major driver for this market will be biodegradable implants. Currently Indian orthopaedic market for trauma devices screws, pins, plates etc is pegged at USD 75 million & INR 4.4 billion. Fast growth is observed in Indian market due to efforts made by Indian government towards improving healthcare coverage across the country and improving regulations for the quality of medical devices. One more reason for the rapid growth in market is new material innovation and new products emerging from these materials.

National/ Societal Relevance

Currently bio-absorbable implants are made available in India by few foreign players. These implants are available at a very high cost restricting them to reach to the vast rural population of India. Another hurdle in making these implants locally is unavailability of medical grade polymers used to manufacture implants. At Orthocrafts, we will not only develop the indigenous process to make bioabsorbable polymers locally but also will manufacture the products using these materials. The design of the products will be suitable for Indian population.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - We plan to file IP for composites, blends of PLLA synthesized and downstream applications developed using the same.

Resources generated - We have created a start-up christened as Orthocrafts Innovations Pvt. Ltd to drive the activity. The focus of Orthocrafts Innovations is to develop affordable bio-absorbable implants for Indian as well as foreign markets. Currently Orthocrafts has employed 2 engineers.

Plans to take innovation further

We plant to identify and engage with suitable partners to conduct clinical trials of the product and later on, market them in India. We are also planning to collaborate with suitable funding agency to take this innovation to market.

Risks Envisaged

Development of facility suitable for manufacturing of implants. Acceptance of product by market.

Team Members

Ashish K Lele
Project Co-ordinator
Piyush V Joshi
Karan Dikshit
V Premnath

Contact

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Dr Homi Bhabha Road,
Pune-411008

B. Mohana Subramanian-CCAMP

The Innovation

Novel Therapeutic interventions against fatal canine viral pathogenesis

Brief Description

Development of a novel therapeutic biosimilar for canine parvoviral enteritis. The therapeutic is a recombinant fusion protein that targets the viral receptor and neutralizes the virus.

Stage of Development

Proof-of-Concept

Innovative Element

In this project alternative method of passive therapy against canine parvoviral pathogenesis is being developed. The therapeutic is a recombinant fusion protein that targets the viral receptor and neutralizes the virus. Bio-similar approach to treat any animal disease is a novel concept.

Market Potential

The disease is prevalent worldwide and every pup needs to be vaccinated against the disease. Vaccine failure against the disease is common and the clinician does not have any choice but to provide the supportive therapy. CPV hyper immune plasma is used to provide passive therapy. However, usage of the plasma for treatment is very limited due to the high cost. As the immune plasma is produced by immunizing experimental dogs, availability of the immune plasma may not be adequately meeting the market demand. The current product can fill this gap.

National/ Societal Relevance

The immune plasma is imported and poses the danger of bringing exotic pathogens in a naive population. Availability of the immune plasma is limited in India and cost of the imported plasma is high. The current product will improve the treatment options in India for a lesser cost.

Project Deliverables

Progress vis-a vis objectives - Insect cells expressing recombinant Virus Like Particles (VLP) of Canine Parvovirus (CPV) was developed. CPV immune Chicken IgY and IgY formulation was developed. Development of candidate recombinant bio-similar is under progress.

Technology/Product developed - A prototype LFA kit was developed.

IP generated/Potential for IP generation - None so far.

Resources generated - Two research fellows were appointed for the project.

Plans to take innovation further - The candidate bio-therapeutics will be evaluated in a clinical trial using further funding or collaboration with potential investors.

Risks Envisaged

Regulatory clearance requires large scale clinical trials which involve high investment.

Team Members

B. Mohana Subramanian
Project Co-ordinator

Sathish Kota

V. A. Srinivasan

Contact

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IInd floor, CUL Building,
TANUVAS,
Madhavaram Milk Colony,
Chennai 600051

Bakul Finechem Research Centre

The Innovation

Development of Affordable Semi-synthetic Artemisinin for the Treatment of Malaria

Brief Description

Artemisinin based combination therapies (ACTs) are the current WHO recommended drug of choice for the treatment of malaria and may be used for chloroquine-resistant malaria. Artemisinin, the key ingredient of ACTs, is isolated from plants in a long 14 months' time period. Our approach is to develop an affordable alternative.

Stage of Development

Discovery

Innovative Element

This proposal aims to provide a steady and cost effective supply of artemisinin. We will achieve this by the implementation of an already proven yeast-based fermentation coupled with synthetic chemical process to produce semi synthetic artemisinin. This process will not only ensure an abundant and timely supply of artemisinin, but also be more economical than the current plant-based extraction strategy and ultimately lowering the price of ACTs.

Market Potential

Based on seasonal variations in crop yields, the current supply of Artemisinin with a price of USD250-USD1000/kg is not sufficient to meet global demand of ~200 MT/year. The fermentation-based process will provide a stable price and consistent amounts of key intermediates of Artemisinin.

National/ Societal Relevance

In years with low crop yield, the price of artemisinin is 3-4 times higher so that patients, most of whom earn less than a dollar a day, cannot afford the medication. Hence, the alternatives to produce artemesinin, as proposed by us, have high national/societal relevance.

Project Deliverables

Progress vis-a vis objectives - Currently chemical process development from fermentation derived intermediates to Artemisinin is being undertaken.

Technology/Product developed - Fermentation in yeast for the production of key intermediates has already been validated and adequate quantities of amorphadiene and artemisinic acid have been produced.

IP generated/Potential for IP generation - Development of a novel synthetic process could potentially generate an IP.

Resources generated - NA

Plans to take innovation further

Partnership with USA-based non-profit Zagaya to ensure supply of adequate quantities of fermentation-derived intermediates when the process is taken to commercial scale. Further, the company is in talks with pharmaceutical companies in India who formulate Artemisinic-based therapies.

Risks Envisaged

None

Artemisinin Production

Team Members

Chinmay Majmudar
Project Co-ordinator

Madhumita Talpade, Krishnaprasad

Contact

Bakul Finechem Research Centre
Sterling Centre
A.B Road Mumbai
MAHARASHTRA
India-400018

BHAVANI PV - CCAMP

The Innovation

PentaFluVac, an indigenous replication-incompetent viral vaccine for avian, swine and human influenza

Brief Description

The ongoing global public health burden caused by seasonal influenza and the potential global effect of a severe pandemic create an urgent need for a novel highly effective vaccine that can be manufactured rapidly in a cost-effective way.

Stage of Development

Proof-of-Concept

Innovative Element

The proposed PentaFluVac is a game-changing vaccine designed to mimic the wild viral strain in terms of structure and antigen yet non-infective. The novelty of the vaccine lies in the strategy of development of live attenuated strains with structure highly similar to their respective wild strains and the strategy of making the vaccine strains replication-incompetent. This will be first of its kind of cell-culture based vaccine, in being structurally intact. Also, for manufacturing, the proposed vaccine is rapid as the virus back bone for replication-incompetent vaccine strain will be ever ready and adapted to cell lines which are a pre-requisite for response during outbreaks.

Market Potential

Currently, in India, influenza vaccine market has been played majorly by two international companies namely GlaxoSmith Kline and Sanofi Pasteur that have invested on local manufacturing companies like Shanta Biotech and Serum Institute of India for manufacture and distribution of their flu vaccines within the country. Majority of these vaccines are monovalent and are administered against H1N1 infections only. In such a global condition, our proposed vaccine formulation i.e. PentaFluVac will be highly promising as it comprises of the major ancestral and highly pathogenic strains of influenza in attenuated form.

National/ Societal Relevance

The proposed vaccine formulation comprising of attenuated influenza strain in replication-incompetent form, is for intranasal administration in human population. The resultant vaccine strain will be replication-incompetent, yet mimic wild influenza virus strain in structure. Due to this structural mimicking, the vaccine formulation will evoke a highly promising, protective immune response in the host.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - None so far.

Resources generated - A private limited company, Pentavalent Bio Sciences has been incorporated.

Plans to take innovation further

Further studies will be conducted after generating PoC

Risks Envisaged

High cost Involved in R&D and clinical trials. Long Gestation Period for development of vaccine. Diverse Genetic pool for clinical trials. Preliminary evaluation of the proposed vaccine for its efficacy as seasonal and/or pandemic vaccine. Obtaining necessary approvals at different stages for further vaccine development and market launch.

Team Members

BHAVANI PV
Project Co-ordinator

SOUMYA PAUL

Contact

BHAVANI PV
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VIJAYA NAGAR
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MYSORE - 570017

Biozone Research Technologies Pvt. Ltd.

The Innovation

Novel quorum sensing inhibitors against biofilm forming bacteria

Brief Description

This project is aimed at discovering novel quorum sensing inhibitors from plants and an innovative approach of finding analogs of AHL signal molecules to block the Lux R receptor by in silico approach.

Stage of Development

Validation

Innovative Element

The anti QS compounds isolated would not have biocidal activity, a property that could increase the technological applications of these molecules as antibiofilm agents in industry and medicine by diminishing the emergence of resistance by natural selection. Moreover, the screening of analogs of the AHL signal molecules can be considered novel as it leads to a proper control of the biofilm forming bacteria without killing it and will yield a better governance of the problem.

Market Potential

Antibiofilm agents have been considered a promising strategy for the development of novel therapeutics for the control of bacterial proliferation for a long time. However, despite the increasing knowledge on biofilms, no antibiofilm products are on the market yet. Herbal antibiofilm molecules are one of the newly identified strategies that may have a promising future in the market.

National/ Societal Relevance

The societal importance from a public health perspective is the role of the biofilm in antimicrobial drug resistance. Biofilm forming bacteria poses threats by being prevalent. With regard to drinking water, biofilm is an especially critical issue, since once anchored to a surface, biofilm microorganism can carry out a variety of detrimental reactions and actually interfere with the water treatment process. The bacterial community traps nutrients, microbes, worms and viruses to form an almost impenetrable material. Hence, there is an unmet need for a remedy to this universal problem.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives

Technology/Product developed - Under development.

IP generated/Potential for IP generation - No IP has been generated so far and there is potential to generate IP.

Resources generated - A researcher is employed to carry out the project work.

Plans to take innovation further

Targeting the water purification industry for coating the membrane filters in the purification systems and also application in various pipelines and other industrial and medical instruments where water flow is constant and a threat of biofilm formation is more.

Risks Envisaged

None

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Sundar

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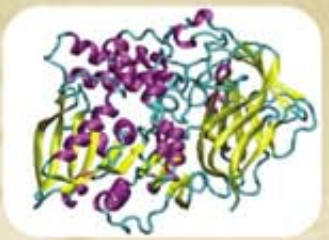
Cellzyme Biotech



The Innovation

Green Manufacturing of Cephalosporin Antibiotics Using Recombinant Deacetylase

Brief Description

Developing a cost-effective technology for the green manufacturing of antibiotics using a proprietary enzyme. A novel enzyme will be developed using recombinant DNA technology.

Stage of Development

Proof-of-Concept

Innovative Element

Large scale manufacturing of API for antibiotics was performed under extreme pH conditions, involving large volume of organic solvents and cooling the reaction mixture to -45°C. Using the proposed product, the manufacturing can be performed at milder operating conditions with improved yield.

Market Potential

The green chemistry represents a market opportunity that will grow from USD2.8 billion in 2011 to USD98.5 billion by 2020. The global sales of drugs that could potentially use the proposed product for manufacturing is valued around USD1.3 billion in 2012.

National/ Societal Relevance

The sustainable technology addresses India's commitment to the development of pharmaceutical processes with higher efficiency and minimal waste. The proposed technology will open up a new market with import substitution potential.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Potential for IP generation is high.

Resources generated - Four scientific staff were employed.

Plans to take innovation further

Industries involved in the manufacturing of API for antibiotics have been contacted. The product will be made available for trials. Based on the feedback of large scale trials, technology transfer or setting up a manufacturing plant for the finished product is envisaged.

Risks Envisaged

Changing technology landscape and implementation of the process requires regulatory approvals.

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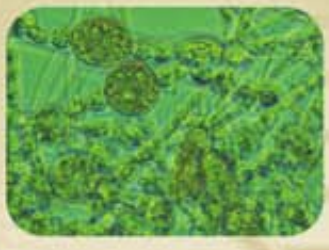
Chaitali Surve - KIIT

The Innovation

Design and evaluation of novel formulations of some anti- cancer drugs for metronomic chemotherapy



Brief Description

The aim is to formulate active and/or passive nano-targeted, orally disintegrating tablet of anti-cancer agents for improved bio-availability, site specificity, reduced toxicity and patient compliant metronomic cancer chemotherapy.

Stage of Development

Proof-of-Concept

Innovative Element

Metronomic chemotherapy is suggested to be a better alternative to the rising problems as it is repetitive, comprises of low dose oral chemotherapy designed to minimize toxicity. Especially in patients suffering from head and neck cancer or geriatric/pediatric cancer patients who often suffer from difficulty and pain during swallowing conventional tablets, patient compliance and adherence to dosage regimen is compromised. Targeted chemotherapy is associated with less toxicity, increased efficacy and also reduction in dose.

Market Potential

Targeted therapies are currently the focus of anti-cancer drug development. The currently available targeted therapies e.g. monoclonal antibodies are expensive and lack patient compliance due to intravenous administration, therefore there is a need for targeted, oral, less toxic and highly effective patient compliant formulation.

National/ Societal Relevance

The development of metronomic anti-cancer therapies is an approach designed to maintain a stable disease situation for advanced cancer patients and is a good alternative which involves minimal daily oral dose and reduced cost, toxicity, hospital visits.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives

Technology/Product developed - Under development.

IP generated/Potential for IP generation - The proposed formulation has the scope of being patented for method of preparation and formulation aspects.

Resources generated - Employment has been generated for two people.

Plans to take innovation further

Discussions are ongoing with few market players for co-development options. Also, planning is in progress to incorporate a Private Limited Company.

Risks Envisaged

As the proposed formulations are lipid based, variation in source of lipids can lead to batch to batch variability with respect to drug loading capability, scalability. Also, extensive animal studies are required to validate the PoC which will require a lot of funding.

Team Members

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Geniron Biolabs Pvt. Ltd.

The Innovation

Bicistronic self replicating DNA vaccine for rabies and immunocontraception in stray dogs

Brief Description

Geniron's synthetic DNA vaccines consist of DNA plasmids encoded to produce one or more antigens associated with a target pathogen e.g. bacteria, virus or cancer. Our focus is to develop next generation vaccines for Rabies, Mastitis, FMDV and Brucella.

Stage of Development

Proof-of-Concept

Innovative Element

To address the mentioned problem Geniron Team is working on combined immune-contraceptive and Rabies DNA vaccine for dogs which will be delivered through Electroporation technique. Conventional rabies vaccines can deliver the antigenic mass, however, they are poor in providing long lasting immunity due to the poor elicitation of cell mediated immunity (CMI) and humoral response. Our vaccine candidate will provide long lasting immunity against both rabies and contraceptive antigens.

Market Potential

Today the World Dog Population is more than 600 million of which 400 million are stray dogs and India accounts for 40 million of them. The target market is categorized into stray and pet dogs.

National/ Societal Relevance

WHO recommends the dog population management and annual rabies vaccination as the major activities to be initiated/ strengthened in the Member Countries for rabies control and dog bites. Today almost all countries in the world spend a fortune for rabies control operations. Yet with the huge numbers of owned and un-owned dogs in the developing countries like India, the surgical sterilization Animal birth control and vaccination programs currently available, are not enough. Rabies has been identified as one of the major causes of human death due to infectious diseases, with an estimated global mortality of humans is about 55,000 per year due to rabies and 22,000 in India alone.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - DNA vaccine technology platform.

IP generated/Potential for IP generation - In Process of Filing

Resources generated - 4 people got employed and established in-house R&D unit.

Plans to take innovation further

Planning to apply for further funding for translating the lab research to Clinic.

Risks Envisaged

Down-stream process development for Plasmid DNA fermentation

Team Members

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Imgenex India Pvt. Ltd.

The Innovation

Bio-Process Development for Production of Biosimilar Trastuzumab - Second Phase

Brief Description

The goal of the present study is to optimize the bioprocess to obtain more than 2 gram per litre biosimilar Trastuzumab by improving the culture condition through use of alternate tangential flow, ATF system.

Stage of Development

Proof-of-Concept

Innovative Element

Two prong approach to enhance the yield of biomolecule. 1. Development of an improved mammalian expression vector by incorporating matrix attachment elements MAR and WPRE for better integration and post translational regulation, respectively and 2. Increase the production quantity by enhancing the cell density using an improved bioprocess by use of an ATF device. Combination of a plasmid vector containing MAR and WPRE elements and usage of ATF to support cell growth to extreme concentrations thereby increasing volumetric productivity may be considered as innovative steps.

Market Potential

The oncology market in India is expected to reach nearly Rs 3,831 crore by 2017. The worldwide market of Herceptin in 2012 was 6.28 billion USD and is predicted to cross ~8.0 billion USD by 2018. In India alone, the market would be at least more than 10 million US dollars per year. This is based on Reditux, a generic Rituxan, sales figure by Dr. Reddy's Laboratories.

National/ Societal Relevance

Incidents of breast cancer in India are rising with almost 75,000 new cases every year and every 13 minutes, breast cancer claims a life in India. One of the most effective drugs in the treatment of breast cancer is Tratstuzumab or Herceptin, which reduces the risk of a relapse by 50 per cent in case of women with a fast-growing type of tumor. Herceptin is an expensive drug and can cost up to Rs 1.5 lakh every month, which is beyond the reach of most of the patients in India. Even in the western countries, this is an expensive drug. Our goal is to develop a high-expresser mammalian cell line that can reduce the production cost and thereby cutting the final cost to the patients. Targeting HER2+ tumors with Trastuzumab in the adjuvant setting should prevent a significant number of women from recurrence events.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - None

Resources generated - Two people are being trained in upstream and downstream process development activities. A special facility has been created to carry out the experiment related to this project.

Plans to take innovation further

Once the molecule passes through pre clinical toxicology tests, the organization will apply to DCGI to conduct clinical trials. For clinical trials, the organization will look for industrial partners.

Risks Envisaged

The real bottle neck many researchers face is that of increasing productive cell mass in the fermentor.

Team Members

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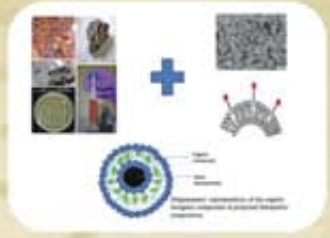
Milind K Choudhari - Venture Centre



The Innovation

A novel organic and inorganic nano-formulation for rapid wound healing and control of infection

Brief Description

An affordable wound dressing for primary and critical wound care. The technology is a Novel nano-formulation for wound care. The nano-formulation has both, prevention of infection as well as wound healing properties.

Stage of Development

Proof-of-Concept

Innovative Element

The novelty element is the nano formulation. It's a novel mixture of organic and inorganic components. It's the first time that such a formulation is being deviced which will change the complete approach of wound care medicine.

Market Potential

The formulation can be used in bandages, sutures and creams thereby catering to complete range of wound care products. If the clinical trials are successful the anticipated potential is 10-15% of total wound care market in India and abroad. Indian Healthcare sector is expected to create an additional opportunity of ~ USD 40 billion in next 4 years. Wound-Care segment is a significant part of Medical consumables. Advanced wound care AWC is still a very small segment of Indian wound care market as TWC has a dominant share. Growth in top-tier hospitals and health insurance is acting as enabler for AWC products usage. Looking at the constantly growing market our formulation has ample space to establish and capture the market eventually.

National/ Societal Relevance

One of the component is a complex organic mixture containing more than 25 active antibacterial compounds which is ethno pharmacologically very well practiced in India for wound care. This work will provide a strong scientific proof towards the efficacy of this medicine as a modern day drug.

Project Deliverables

Progress vis-a vis objectives - Design and development of Liposome nano-formulation with Propolis and silver nano particles. Synthesis by reverse micelle chemistry.

Technology/Product developed - In Process of developing technology

IP generated/Potential for IP generation - Provisional Indian patent application 3373/MUM/2014, An organic and inorganic nano-formulation for rapid wound healing and control of infection

Resources generated - One project fellow and one consultant hired.

Plans to take innovation further

Innovation will be presented on platforms in order to attract funding to carry out clinical trials. With successful trial, efforts will be taken towards marketing.

Risks Envisaged

Still under POC, Market resilience.

Team Members

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Mousumi Mondal - CCAMP

The Innovation

Development of economically viable synergistic nutraceutical formulations with Cordyceps and male silkworm larvae for disorders related to pancreas, kidney, liver, impotency etc. by culturing Cordyceps on silkworm in an artificial environment

Brief Description

The project entitled relates to the cultivation of expensive & rare medicinal mushrooms, Cordyceps in an artificial environment mimicking the Himalayan environment.

Stage of Development

Validation

Innovative Element

Innovation lies in the step that we provide synergistic benefits of both, the cordyceps as well as the silkworm larvae/pupae, by growing the medicinal mushrooms on silkworm larvae/pupae, thus incorporating 1-DNJ & GABA from silkworm along with bioactives such as Cordycepin, Cordycepic acid, Penostatin & Beuvericin from Cordyceps.

Market Potential

The price of natural Cordyceps has skyrocketed due to difficulties in finding & harvesting these mushrooms, longer life-cycle, inconsistent host and requirement of extreme condition for its growth which has made them rare and endangered. Thus, their supply does not meet the demand, leading to its illegal harvesting and bio-prospecting. Cordyceps grown in our artificial environment, on known, consistent hosts would be available at cheaper price to meet the increasing demand. Natural Cordyceps were sold at 1 lakh USD per kg during the year 2013

National/ Societal Relevance

The growth of natural Cordyceps is confined to a very small geographical area, mainly northern Himalayas of India. There are a lot of difficulties in harvesting these mushrooms in extreme conditions like high altitude and low oxygen level, making it scarce. Hence, we have come up with cost effective and short-cycle technology to cultivate Cordyceps in an artificially created environment.

Project Deliverables

Progress vis-a vis objectives - Establishment of artificial environment mimicking natural condition for cultivation of Cordyceps has been completed. Suitable hosts Vegetarian & Non-vegetarian for cultivation of Cordyceps have been identified. Successful cultivation of Cordyceps on the hosts is achieved.

Technology/Product developed - Under development

IP generated/Potential for IP generation - Potential for IP generation related to synergistic formulation of nutraceutical with increased nutritional value and bioactives of both the host and the Cordyceps having potential to prevent various health disorders. Potential for IP generation related to increase in bioactives of Cordycep sp. using various elicitors. Two provisional patents have been filed.

Resources generated - Recruitment of Research assistant and lab assistant. Establishment of Artificial chamber for cultivation of Cordyceps and setting up of facility for scale up. Registration of company is under progress.

Plans to take innovation further

Collaborative research to take the research forward.

Risks Envisaged

Might have problem in acceptance of non-veg source of Cordyceps by vegetarian Indian population. However, we have come up with vegetarian source as substrate which we have used for growing Cordyceps.

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NovaLead Pharma (VLife Sciences Technologies Pvt. Ltd.)

The Innovation

To determine the safety, effective dose and frequency of application of Galnobax TM in 50 subjects during Phase 1 trial in the subjects suffering from diabetic foot ulcers.

Brief Description

Galnobax is a novel formulation of an existing drug with a novel use in treatment of diabetic foot ulcers (DFU). Currently it is undergoing phase I/II clinical trial. Galnobax will be an affordable and easily administrable treatment.

Stage of Development

Validation

Innovative Element

Galnobax would potentially be first small molecule chemical entity drug for DFU. The present DFU treatments are mainly biologics and devices. Use of Galnobax in Diabetic Foot Ulcer (DFU) itself is an innovation, discovered by the company. Additionally, Galnobax is a novel topical gel formulation of an existing intravenous drug.

Market Potential

World over, more than 285 million people suffer from diabetes, expected to rise to 438 million in 2030. About 15% of diabetics suffer from DFU in their lifetime, with 25% of DFUs eventually requiring amputation. Presently, the only approved drug treatment for DFU is a biologic, with a black box warning. DFU is a serious disease with very limited drug options and very high cost of treatment.

National/ Societal Relevance

India has a large 45 million diabetic population and 15% of diabetics lead to diabetic foot ulcers in life time. Majority of limb amputations are due to diabetic ulcers. Galnobax would not require any specialized storage arrangements. It also does not need any hospital setting to administer and could be available in normal pharmacy outlets. Thus Galnobax would not only be quite affordable but also easily administrable and simply available treatment option for the urban as well as the underserved and un-served segments of society.

Project Deliverables

Progress vis-a vis objectives - The program has progressed into clinical trial as per the project objectives.

Technology/Product developed - Galnobax is developed as drug candidate.

IP generated/Potential for IP generation - The patents are filed for Galnobax and are already granted in USA, EU, Japan, India, China, Canada and South Africa.

Resources generated - NA

Plans to take innovation further

The Company plans to explore use of Galnobax in other disease conditions like pressure ulcers, venous leg ulcers and burn wounds.

Risks Envisaged

Efficacy in human population remains as a risk factor.

Team Members

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Panacea Biotec Ltd.

The Innovation

Development of safe and highly efficacious 15-valent Pneumococcal conjugate vaccine against Streptococcus pneumonia infections

Brief Description

Development of an affordable, safe and highly efficacious 15-valent Pneumococcal conjugate vaccine against Streptococcus pneumonia infections.

Stage of Development

Proof-of-Concept

Innovative Element

The development of process aims to obtain the product with the desired specification while maximizing yield at minimal process cost.

Market Potential

Worldwide only one company is engaged in manufacturing 15-valent conjugate vaccine. The development of a cheaper, safe and efficacious vaccine will not only cater to the Indian needs but also of the developing countries, helping India build its leadership in Asia. No company in India at present is manufacturing and helps marketing Pneumococcal conjugate vaccine. Development of indigenous vaccine will definitely provide self reliance and meet the unmet need of such a vaccine in India and other developing countries.

National/ Societal Relevance

The development of cost effective and highly efficacious Pneumococcal conjugate vaccine becomes more essential in view of WHO recommendations for developing countries where mortality among children aged less than 5 years is 50/1000 live births annually. Currently, there is no affordable and indigenous Pneumococcal conjugate vaccine available in India leading to limited usage by mass population for prophylaxis due to high costs of imported vaccines.

Project Deliverables

Progress vis-a vis objectives - To develop fermentation & purification strategies for production of 15 polysaccharides completed. To develop the Conjugation strategies for production of conjugates for 15 serotypes -Completed for 15 serotypes.

Technology/Product developed - Under development

IP generated/Potential for IP generation - 1. 1248/DEL/2010 filed on May 31, 2010. A Novel Fermentation Process for Streptococcus pneumonia. 2. 2069/DEL2010 filed on Aug, 31, 2010. A Novel Process for the purification of Polysaccharide from Streptococcus pneumonia 3. 140/DEL/2011 filed on Jan 20, 2011- Novel Streptococcus pneumonia vaccines.

Resources generated - Company has created a dedicated pneumococcal research group and has already in place manufacturing facility for this vaccine.

Plans to take innovation further

Panacea intends to complete its development and early commercialization of the same on its own.

Risks Envisaged

Being multiple serotype based vaccine, this is one of the most cumbersome vaccine today under development when compared to a mono, di, tri or a tetravalent vaccine. Special challenge posed in developing this vaccine with a large serotype to serotype variation in both polysaccharide yield and in conjugation efficiency. The other critical attributes in development process is developing the methodologies of testing of stability indicating parameters in final multivalent vaccine.

Team Members

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Pandorum Technologies Pvt. Ltd.

The Innovation

Smart drug delivery matrix for oncological applications

Brief Description

Aim is to develop a programmable and responsive hydrogel matrix to load and deliver drug/tracer molecules. The strategy can be used as an in vitro kinase detection system/assays, using enhanced marker, such as, fluorophore release upon kinase mediated activation.

Stage of Development

Proof-of-Concept

Innovative Element

The inventive steps involve a construct that consists of a self-assembling polymer of multiple peptide monomers. Each monomer consists of self-assembly sequence and a kinase substrate sequence. Phosphorylation incorporates negative charges to the matrix and favors increased swelling and hydration, leading to increased dispersion of trapped load molecules. By including KSS specific to kinases with specific or increased activity in a given tumor, the matrix can serve as a platform for kinase dependent tumor specific drug release.

Market Potential

The proposed enzyme responsive hydrogel material can be used as a matrix for drug delivery systems activated by kinases that shows enhanced release specific to cancer. The material can also be used as a carrier for tracers/markers for the non-invasive detection of the kinase activity profile within tumors.

National/ Societal Relevance

Metastatic cancer is currently one of the greatest challenges in cancer therapy. There is a great demand for technologies that can increase the therapeutic index of drugs that would otherwise be too toxic for human treatment. The enzyme responsive material that the company proposes can also find applications in the field of noninvasive diagnostics.

Project Deliverables

Progress vis-a vis objectives - Generation of a custom library of kinase substrate sequences. Computational analyses & macro-molecular simulations to short list kinase sensor sequences. Chemical synthesis of pilot version of peptide building blocks and characterization of intra-molecular interactions hairpin formation. Design of refined sequence library for inter-molecular interaction and assembly to form hydrogel.

Technology/Product developed - A programmable and responsive hydrogel matrix to load and deliver drug/tracer molecules is expected.

IP generated/Potential for IP generation - Upon establishing proof-of-concept. Pandorum innovation is expected to generate intellectual properties in the field of advanced bio-materials.

Resources generated - Training of employees in the aspects of computational biology, bioinformatics and simulation, biochemistry and biomaterial fabrication

Plans to take innovation further

On establishing proof-of-concept and refining prototypes, the company plans to take the innovation smart drug delivery matrix further ahead on its commercial journey by partnering with appropriate commercial entities in the field of drug delivery.

Risks Envisaged

The generated technology, if successful in kinase responsive release of cargo molecules has to undergo strict scrutinization for bio-compatibility, bio-availability and any negative reaction from the metabolized by product in- vivo.

Team Members

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Pratap Narayan Mukhopadhyaya – IKP

The Innovation

Development of a novel fungal biocontrol agent using protoplast fusion technology to target drug resistant gastrointestinal cattle worms responsible for reducing productivity, by an eco-friendly approach

Brief Description

This is a novel product of fungal origin intended to address drug resistance in gastrointestinal nematodes in dairy animals. It has capability of reducing worm burden in the soil and is environment friendly and suitable for sustained use.

Stage of Development

Proof-of-Concept

Innovative Element

An environment friendly fungal spore formulation for control of drug resistant gastrointestinal worms in dairy animals that uses the grazing animal itself as source of dissemination of the active component in the soil which is the source of infection. For this, a gene expression analysis-based nematode trapping fungi identification method has been developed along with a jaggery tablet preparation that effectively functions as a delivery device for the primary formulation as well as secondary animal health supplements.

Market Potential

With over 1000 dairy cooperatives in India, this product has a business potential of 672 billion Rupees per year.

National/ Societal Relevance

The past two decades in veterinary industry has seen the rise in threat of drug resistance in gastrointestinal worms making the entire fraternity look for superior and sustainable alternatives.

Project Deliverables

Progress vis-a vis objectives - Nematode-trapping fungi isolated and identified. Feeding ruminants with the spores and detection of the fungi by way of growing mycelia in the faecal pat completed. RAPD markers were generated to differentiate the isolates from each other at DNA level. A novel delivery device by way of molasses biscuit/tablet was developed. A multivalent formulation of spores has been prepared in (a) gelatin capsules (b) suspension buffer and (c) jaggery tablets. Its efficacy has been established.

Technology/Product developed - A method of preparing superior spore formulation for use in controlling gastrointestinal nematodes in dairy animals using a unique gene expression technology has been developed.

IP generated/Potential for IP generation - A patent titled "Improved delivery device and molecular tool for screening of nematophagous fungi for multi-strain spore formulation" filed.

Resources generated - Manpower trained in fungal biotechnology. An organization by way of Wobble Base Bioresearch Private Limited has been formed.

Plans to take innovation further

Wobble Base Bioresearch Private Limited proposes to forge partnership with prominent dairy cooperatives for three categories of services. These are 1. Dissemination of information about the product by way of regular field extension programs held by all the dairy cooperatives 2. Distribution of the product through the dairy cooperative channels that include among others, its a) animal medicine distribution and b) feed and fodder distribution channel and 3. large scale solid state fermentation of manufacturing the active fungal components at stage II of the partnership.

Risks Envisaged

The risk envisaged are generation of spores in adequate quantity after scaling up the solid state fermentation and availability of molasses powder on a continuous basis that has been optimized as a cheap source of media for solid state fermentation. Acceptance of the novel concept among the less literate farmers is another concern.

Team Members

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Praveen Vemula - CCAMP

The Innovation

Low-Cost Prophylactic Topical Dermal Cream to Prevent Chronic Exposure of Toxic Pesticides

Brief Description

Pesticides when the enter into the body they deactivate acetyl cholinesterase enzyme that leads to severe side effects such as neurological disorders, muscle pain and organ damage. We are developing catalytic nanoparticles that can be used as topical cream.

Stage of Development

Proof-of-Concept

Innovative Element

This is the first ever attempt to develop prophylactic materials to prevent pesticide exposure. All the materials have been certified as generally safe, thus translational hurdles of this technology will be minimal.

Market Potential

263 millions is being exposed to pesticides, in India alone and many millions around the globe. Treatment of chronic exposure of pesticides induced neuro-muscular disorders is huge unmet clinical need thus far; an efficient prophylactic therapeutic system that could reduce pesticide exposure has not been developed. Thus, there exists a huge unmet clinical need and untapped market.

National/ Societal Relevance

We aim to develop low-cost, efficient and protective topical prophylactic cream to prevent agriculture workers from chronic exposure of toxic pesticides. Protection of agriculture and farm workers against chronic exposure to pesticides is imperative due to the high toxicity of pesticides and the contaminant high dermal absorption suffered by agriculture workers.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - By the end of the study, novel IP will be filed

Resources generated - Employed a full-time senior research fellow.

Plans to take innovation further

Post demonstration of this technology in the animal models, IP will be filed and published then we will form a startup and raise more money to evaluate this technology in higher animals.

Risks Envisaged

Do not anticipate any technology related risks.

Team Members

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Shrikant Mishra - KIIT

The Innovation

Recombinant enabling MDR platform

Brief Description

Recombinant master mix fc-lysin where fc sequence is of human igg1 and lysin sequence is of bacteriophage origin In vivo enabling recombinant drug against MDR pathogens MDR strain lysis by amidase, muramidase, glycosidase and endopeptidase activities

Stage of Development

Discovery

Innovative Element

Novel fc-lysine chimeric constructs. Combination of amidase/uramidase/glucosidase/ endopeptidase activity in fc-lysin. Fc constructs for both gram -ve and gram +ve bacteria. Lysine refolding by using trx-chimera, Dimeric lysines, is room temperature product with 2 year shelf life/ lyophilized. Not expected to make MDR/XDR strains resistance to Lysine enzymes. Alternate, non-anti-biotic therapy to MDr/XDR, Non-infringe/non-compete and useful in clinic, USFDA has not approved a Lysine product yet.

Market Potential

MDR related deaths are ~ 440,000 alone. Drug-susceptible TB takes 6-12 months to cure and costs an average of USD17,000 to treat, MDR TB can take up to 24 months to cure and costs an average of USD134,000 to treat. The potential of Fc-lysin drug market is very attractive specifically if Fc-lysin stands an US-FDA trial.

National/ Societal Relevance

The Fc-Lysin can be used as an injectable or a nasal formulation. The drug is to be made against MDR/ XDR TB. Further, the drug being an enzyme will not confer further drug resistance. The clinical trial of the drug should bring to the world a new class of drugs against XDR TB.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Novel fc-lysine chimeric constructs Combination of amidase/muramidase/glucosidase/endopeptidase activity is new. Fc constructs with Fc-lysin enzymes for both gram-ve and gram +ve bacteria are new.

Resources generated - None so far.

Plans to take innovation further

Looking for pre-clinical partners from Bangalore soon.

Risks Envisaged

None so far.

Team Members

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Sun Pharmaceutical Industries Limited

The Innovation

Bevacizumab upto Pre-clinical studies

Brief Description

Bevacizumab is a full-length IgG1κ isotype antibody (93% human, 7% murine sequences) composed of two identical light chains (214 amino acid residues) and two heavy chains (453 residues) with a total molecular weight of 149 kDa. Bevacizumab selectively binds with high affinity to all isoforms of human vascular endothelial growth factor (VEGF) and neutralizes VEGF's biologic activity. Bevacizumab is marketed by Roche under the trade name Avastin ™ which is indicated for the treatment of Metastatic colorectal cancer, Non-squamous non-small cell lung cancer, Glioblastoma and Metastatic renal cell carcinoma with interferon alfa and Cervical Cancer

Innovative Element

Sun Pharmaceutical Industries Limited is developing similar biologic of Recombinant Bevacizumab synthesized in a genetically modified Chinese Hamster Ovary (CHO) cells using chemically defined media which was purified and physico-chemically compared with Avastin™ for the demonstration of Biosimilarity and found similar to the reference product (Avastin™).The cell line is developed using the Proprietary expression vector of Sun Pharma.

Market Potential

The sale of the product in 2014 was USD 7.37 billion in India and abroad. The product recorded a very impressive sales growth in last 5 years. The Product has the potential to grow in the near future.

National/ Societal Relevance

Presently the treatment is too expensive to afford by the common mass. We are trying to develop the product which could be cost effective and affordable by the common mass.

Project Deliverables

Progress vis-a vis objectives - Cell Line developed using the Proprietary expression vector of Sun Pharma. The preliminary characteristics of the cell line have been studied. The lab scale and pilot scale process is developed for the production of the product. The Tumor regression Efficacy of the product is studied in *in vivo* condition. The physico-chemical, biological characterization of the product and the Bio-similarity studies with reference to the innovator's product has been done.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - IP will be generated as the Project progresses

Resources generated - The existing resources of the company are being used.

Plans to take innovation further

Yes

Risks Envisaged

Making the product Biosimilar to the reference drug in terms of Physico-chemical, Biological, PK / PD and Immunogenicity

Team Members

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Tania Paul - Venture Centre

The Innovation

To demonstrate proof-of-concept to develop a novel, cost effective, non-allergic herbal formulation for management of spontaneous bleeding and allied complications in multiple coagulation disorders

Brief Description

The idea is to demonstrate proof-of-concept by a novel formulation for management of spontaneous bleeding and allied complications in coagulation disorders where body fails to clot the blood due to failure related to factors in the plasma.

Stage of Development

Proof-of-Concept

Innovative Element

The concept of formulating a herbal product with dual oral and topical mode of administration to help people with bleeding tendencies like Hemophilia and VWD. It will have minimal side effects such as No allergenicity, No GIT disorders, No seizures. Attributes are ease of administration and Patentable Technology

Market Potential

Reportbuyer.com has added a new market research report on Bleeding Disorders: World Pharmaceutical Industry and Market 2014-2024 which predicts that the world drugs market for preventing haemorrhages will generate USD13.5bn in 2017. Based on this and other financial facts the current technology has a promising potential.

National/ Societal Relevance

People with bleeding disorders face life-long physical, psychological, financial and employment challenges. Deaths per year due to hemophilia are 77000, GIT Bleeding are 10000, Post-partum hemorrhages are 136000, and Intracranial Hemorrhages are 20000.

Project Deliverables

Progress vis-a vis objectives - To organize complete 1st batch of proposed formulation 25 bottles. Quality Control and Standardization of the formulation, to initiate Shelf life study and Efficacy studies in normal and knockout mice, Safety study and initiate Market survey, to initiate IPR and licensing process.

Technology/Product developed - The technology will be developed in any one or more forms like Oral Formulation, Gels, Bandages, and Tissue Adhesives for surgery, Sprays.

IP generated/Potential for IP generation - The Technology developed will be patented

Resources generated - Four manpower employed viz Principal Investigator, Co- Principal Investigator, Project manager and Project Assistant.

Plans to take innovation further

The formulation will be licensed out to manufacturers.

Risks Envisaged

Most of the coagulation disorders are genetic defects and external application or oral administration of an herbal product may not repair the genetic defect but will be helpful to influence the factors indirectly to provide symptomatic relief.

Team Members

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Contact

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Unichem Labs Limited

SRL Suppresses Tumor Growth in Nodscid Mice with HT29 Xenografts

The Innovation

An integrated approach to develop recombinant Sclerotiumrolfsii (SRL) antitumor lectins in *E. coli* as novel targeted anticancer drug and drug delivery system for human colon and breast cancer, providing affordable health care to cancer patients

Brief Description

Sclerotium rolfsii, a soil borne plant pathogenic fungus secrete a developmental-stage specific lectin SRL Swamy et al., 2001, 2004 that has exquisite specificity to TF and its substituted forms Glycoconjugate J, 2011 that are expressed on cancer cells.

Stage of Development

Proof-of-Concept

Innovative Element

The project aims to exploit anti-cancer potential of recombinant *Sclerotium rolfsii* lectins as anti-cancer drugs. Two recombinant fungal lectins from *Sclerotium rolfsii* with similar carbohydrate specificity and cancer cell binding properties are produced and successfully expressed in *E. coli* by the method standardized in our laboratory.

Market Potential

The market for world cancer therapies continues to gain attraction as companies explore advancements and improvements in drug delivery techniques translating to greater market opportunity.

National/ Societal Relevance

Cancer is the second highest killer next only to cardiovascular diseases and accounts for 12% of all the causes of deaths around the globe. The cost of the therapy is also a concern as it may not be affordable by the patients. Keeping these points in mind, we aim to develop recombinant fungal lectins as an anticancer drug for treating colon and breast cancer at an affordable cost.

Project Deliverables

Progress vis-a vis objectives - Research master and working cell banks of the recombinant *E. coli* BL21 strain expressing lectin proteins were prepared and characterized. Shake flask experiments with recombinant *E. coli* for optimum growth and protein expression have been completed. Fermentation process has been developed at 3L scale. Various fermentation process parameters were optimized towards obtaining optimum cell mass and product yield. Downstream process has been developed for getting more than 95 pure recombinant Lectin. Fermentation and downstream processes consistency has been established. Protein of more than 95 purity has been prepared for further characterization studies.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Indian Patent Appln. No-30/MUM/2008 filed on 4th Jan 2008. Indian Patent Appln 350/MUM/2009 filing date June 12, 2009. International patent Publication Number WO 2010/095143 A2 European Patent Application Number 09840273.8-2403/2430041 Filing date 22.02.2010, Title: Cancer cell binding recombinant lectins with antitumor activity and methods of preparation.

Resources generated - Three trained scientists are working on the project. The collaborator has recruited two research fellows for the project.

Plans to take innovation further

Once the proof-of-concept is established as proposed in the project, technology will be taken to preclinical and clinical phases to establish efficacy and to test toxicity.

Risks Envisaged

Probable biological activity of recombinant lectins towards normal cells. Stability and efficacy of recombinant lectins formulations against target cell lines.

Team Members

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Utpal Bora - IKP

The Innovation

Exploring Muga silk fibre as a promising suture material

Brief Description

The project is focussed on developing a standardized reeling and degumming protocol for Muga silk for eventually braiding and swaging them into needles of appropriate size to make a complete surgical suture.

Stage of Development

Proof-of-Concept

Innovative Element

Numerous varieties of wild silks are left unexplored as potential suture materials. These knowledge deficiencies along with the technological gap in degumming and braiding of wild varieties of silk fibers are the major issues that the present innovation addresses by fabricating sutures from Muga Antherea assama , an indigenous silk of Assam.

Market Potential

The global surgical suture industry is estimated to reach 7000 million USD by 2017. Silk being the oldest and most prevalent form of suture used, our product has a huge potential with its unique mechanical and biochemical properties.

National/ Societal Relevance

Very few indigenous suture making companies are present in India and most of the surgical products are imported. Developing sutures using indigenous silk is in line with the Make in India theme and would go a long way in nurturing an ecosystem where surgical products are manufactured and sold indigenously.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Already filed an Indian patent application vide 733/KOL/2013 on developing braided muga sutures.

Resources generated - A total of five manpower have been employed in the project intermittently and as per requirements. Presently two project assistants and one technical assistant are employed.

Plans to take innovation further

The technological knowledge gained from the process can be utilized to fabricate a diverse range of composite sutures comprising of fibers from different wild silks. Based on extensive animal studies the prototype has to be fine tuned to comply with international standards before embarking on human clinical trials.

Risks Envisaged

The degumming of Muga silk is one of the most critical and challenging steps which if not done properly can alter the fate of the product. Although the sutures would be tested extensively in animals its reaction on humans can't be predicted.

Team Members

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Project Co-ordinator

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Yasham P2D Lifesciences Pvt. Ltd.

The Innovation

Tumor Necrosis Factor - alpha (TNFa) inhibiting compound as a first in class drug treatment for neuro-inflammatory diseases

Brief Description

The goal of the proposed project is to develop a tumor necrosis factor alpha (TNFa) inhibiting first in class, orally bio-available anti-neuro inflammatory small molecule PD2015 prototype drug treatment for neuro-cognitive dysfunction.

Stage of Development

Validation

Innovative Element

No anti-TNFa specific, orally bio-available small molecule drug targeting neuro inflammation has actually been systematically developed to treat AD. The proposed thiothalidomide drug candidate addresses a strong unmet medical need and will have a broader application in other non-AD cognitive dysfunction such as Traumatic Brain Injury, Stroke, age-related dementia, vascular dementia, cancer radiation and chemotherapy-induced pathologies, HIV-associated neuro-cognitive disorders etc.

Market Potential

The primary industrial application that we envision intended for our anti-TNFa inhibitor thiothalidomide technology is as a disease-modifying treatment for AD.

National/ Societal Relevance

Alzheimers disease (AD) is a worldwide health crisis that now afflicts around 35.6 million people in the world. Much of the increase will be in developing countries such as India and the AD-associated dementia population will be a significant issue in the years to come in India.

Project Deliverables

Progress vis-a vis objectives - Process chemistry and optimized methods for large scale synthesis of PD2013, PD2015, and PD2016 done. Physico-chemical characterization, formulation development, Rat PK profile and identification of dose range and dosing paradigm for efficacy studies have been done.

Technology/Product developed - Under development

IP generated/Potential for IP generation - P2D has assignment rights to the following three patents, US7, 973,057B2, Pat. Appl.13/153,355 and Pat. Appl. 13/648,625.

Resources generated - Two Masters and two Ph.Ds at Punjab University.

Plans to take innovation further

The next step is to create greater value for this technology by conducting IND-enabling studies and advancing it into human clinical trials for treating a blockbuster disease such as AD.

Risks Envisaged

One risk factor that exists for any thalidomide-based drug technology is the potential teratogenicity associated with these compounds. However, it must be noted that despite its teratogenic activity, the parent molecule thalidomide is actually FDA-approved for human use and has annual sales in excess of USD340 million.

Team Members

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BIRAC Innovators

Healthcare Devices & Diagnostics

September 2015

Agada Medical Technologies

The Innovation

Percutaneous Aortic Valve Technology

Brief Description

PAV implantation is a minimally invasive technique for the treatment of diseased aortic valve. We aim to design a self-expanding PAV comprising of a tissue valve sutured onto a stent frame with a minimum crimp profile to facilitate an easy transfemoral access

Stage of Development

Validation

Innovative Element

Percutaneous aortic valve technology is a minimally invasive procedure to replace the diseased aortic valve without the need for open heart surgery.

Market Potential

An estimated, one million patients worldwide suffer from symptomatic aortic heart valve disease, which results in 200, 000 surgical aortic valve replacements annually worldwide. At the same time, 30% of patients are denied treatment due to prohibitive risk associated with open heart surgery. Once the PAV technology is developed, it has the potential to capture 46% of the current aortic valve market. Moreover, PAV technology, by expanding the treatment to high risk patients who are currently denied surgery, is expected to expand aortic valve market by 30%.

National/ Societal Relevance

This revolutionary technology is first of its kind and will pioneer the development of implantable medical devices in India and ensure country's recognition in an international market. PAV procedure will eliminate the need for major surgery and the associated complications, reduce patients discomfort and recovery time and reduce treatment related costs. The PAV technology has the potential to become an efficient and safe alternative to open heart surgery and hence would become the treatment of choice for patients with diseased aortic valves.

Project Deliverables

Progress vis-a vis objectives

The following activities were completed 1) Design derivation, feasibility and optimization studies through computer simulation 2) Validation of the simulation study 3) Material study 4) Prototype development, fabrication and bench testing

Technology/Product developed - Percutaneous Aortic Valve technology (PAV) to replace diseased heart valve

IP generated/Potential for IP generation- 71/CHE/2014

Resources generated - NA

Plans to take innovation further

We are in the process of prototyping the device and conducting further *in vitro* and *in vivo* testing. Once done, we plan to apply for regulatory approval for human trial

Risks Envisaged

The potential complications to patients associated with PAV are: bleeding during incision at the groin, stent migration leading to occlusion of coronary ostium, dislodgement of calcified plaque during deployment leading to stroke, infection and thrombus formation.

Team Members

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Alfa Corpuscles Pvt. Ltd

The Innovation

Development and Validation of Low Cost Indigenous Single Use Safety Syringe with Passive Spring Actuated Needle Stick Injury and Reuse Prevention Mechanism

Brief Description

Unsafe injection practices including reuse and needlestick injuries, put patients and healthcare workers and population at large, at risk. Alfa Corpuscles has designed and developed a single use safety syringe with passive needle stick Injury and reuse.

Stage of Development

Validation

Innovative Element

Unique 5 part design, no blood spatter due to controlled deployment, usable for hypodermic injection and phlebotomy, can be made in any size, design compliant to all relevant ISO standards for syringes, eco friendly 100 recyclable, no training required and no chance of reuse, pre-filled/ ready to fill syringe variant compatible with existing filling Lines and cartridge load safety syringe for vaccine delivery markedly reduces cold chain burden.

Market Potential

Proposed low cost ready to fill syringe shall provide an excellent opportunity to many commonly used low to medium cost parenteral drug manufacturers to shift to the pre-filled delivery system thereby reducing overall drug cost and injection associated injuries and infections.

National/ Societal Relevance

Various legislations have been passed across the globe including Needle stick safety and Prevention Act in the US and the mandate by the Indian Health Ministry starting April 30, 2009 making it essential for all government health facilities to use Auto-Disable syringes.

Project Deliverables

Progress vis-a vis objectives

Design Iteration and Prototyping, Completed

Technology/Product developed - Our 4th Generation safety syringe would be available at cost comparable to currently used 2nd Generation AD syringes.

IP generated/Potential for IP generation - Developing the three variants of the patented design gives us an incremental innovation on the existing IP of the safety syringe.

Resources generated - Alfa Corpuscles has secured funding from GSBTM to put up its own contribution towards the conduct of this project. The company has also secured a grant from ICMR towards the conduct of a clinical trial on the product developed from this project.

Plans to take innovation further

Alfa Corpuscles is actively seeking partnerships from existing or new Syringe Manufacturers for its Clinical Variant. The company intends to engage Parenteral Drug Manufacturers for the Pre-Filled Variant. The company also has started discussions with Vaccine Manufacturers for the Vaccine Syringe Variant

Risks Envisaged

None

Team Members

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Aman Sharma - Venture Centre

The Innovation

To demonstrate Proof of Concept for a novel, non-invasive exosome -based screening (for early detection) cum diagnostic kit for multiple cancers (using one test) utilizing patient derived biofluids

Brief Description

ExoCan is developing biofluids blood, urine, saliva based, non-expensive early cancer detection cum diagnosis kit. It is a two step test to provide complete molecular information.

Stage of Development

Proof-of-Concept

Innovative Element

The technology is based on nano-scale microparticles present in body fluid of cancer patients/healthy individuals. We are utilizing antibody-free capturing methodology to isolate these vesicles to ensure the purity of the sample for subsequent analysis.

Market Potential

The total cancer diagnosis market is reaching upto 15 Billion USD by 2020. Our technology is eligible to cover the whole spectrum of next generation diagnosis, *in vitro* diagnostics, molecular diagnostics etc in oncology.

National/ Societal Relevance

Early cancer screening is one of the major hurdles in managing cancers globally. Due to rise in number of cancer incidences in India, it is one of the biggest health burden in India. With our technology we aim to cover both early diagnosis sector in addition to providing confirmed cancer patients complete disease diagnosis without multiple pathological /scanning reports, and frequent travel to hospitals.

Project Deliverables

Progress vis-a vis objectives - Setting up of the laboratory and team building is completed.

Technology/Product developed - Under development.

IP generated/Potential for IP generation

Filed one provisional patent, Biofluid based early cancer diagnosis. Two patents are in drafting 1) Chemotherapy platform to remove side effects of drugs and 2) Portable lung cancer detection device

Resources generated - Hired two manpower and established in-house R&D unit.

Plans to take innovation further

Already partnered with two National Research and Academic Institutions in India. MoU signed with one international partner in UK for chemotherapy technology platform

Risks Envisaged

Technology Risks at scaling up

Operational risks due to limited funds

Implementation risks for early screening

Team Members

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Anirudh Chaturvedi - IKP

The Innovation

A perinatal monitoring device

Brief Description

Brun is a feto-maternal wellness tool designed for use by the grassroots level healthcare workers. It is an easy to use device that captures the vital parameters of the mother and child during labour.

Stage of Development

Proof-of-Concept

Innovative Element

Brun uses a plurality of sensors to acquire data on the vital parameters of the mother and child during labour. It automates the collection, processing and most importantly, the interpretation of physiological data.

Market Potential

The Total Addressable Market TAM size for Fetal Monitoring has been pegged at about USD 150 million in India alone and roughly USD 1 billion in the global market. The Serviceable Addressable Market (SAM) of institutions and physicians that would require assistive devices like Brun is roughly USD 80 million in India and USD500 million across low and middle income countries based surveys of key opinion leaders and institutions. Our projected Serviceable Obtainable Market (SOM) based on existing distribution and sales networks and assuming a 10 market capture is roughly USD20 million in India and USD125 million globally by end of year 5 of sales of Brun.

National/ Societal Relevance

Currently, there are over 1 million fetal deaths every year due to stillbirths and a range of avoidable fetal morbidities resulting from preterm births, asphyxia and acidosis. This is compounded by an acute shortage of OB/GYNs 66 and nurses and midwives by 50. Accounting for the clear market and technology limitations viz. skill, resource availability, objective decision making and price, Brun has been designed to utilize clinically proven technologies in an easy to use, cost effective form factor to simplify the process of feto-maternal monitoring.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - The core technology that has been developed and is being tested includes a fetal heart rate, uterine contraction and NIBP measurement system that serves as a platform technology for a portfolio of maternal and child health products

IP generated/Potential for IP generation - All intellectual property generated has been secured via a PCT application and patents in requisite countries are being filed.

Resources generated - We are now a core team of 7 engineers, designers and business analysts working to make Brun a reality. We have raised our seed round of investment through angel investors globally.

Plans to take innovation further

Aim to raise subsequent rounds of funding through grants and investments for global sales and marketing and development of portfolio products in this space. Partnered with some of the top design and manufacturing firms globally to ensure a well engineered, robust and reliable medical device, Made in India.

Risks Envisaged

Time to Market and Fast Followers

Team Members

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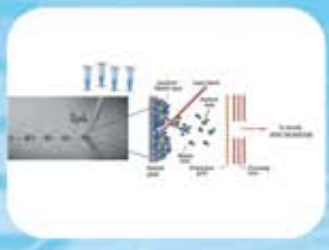

The Innovation

Laser Desorption/Ionization Mass Spectrometric (LDI MS) solutions for High throughput Detection & Analysis of Residual Compounds, Contaminants and Small Molecules in Milk & Dairy Products

Brief Description

Laser desorption ionization mass spectrometry LDI MS enables the direct and rapid analysis of samples from a specialized target plate for the simultaneous determination of multiple pesticide residues from milk and other food samples.

Stage of Development

Proof-of-Concept

Innovative Element

LDI MS offers a reliable, fast and cost efficient alternative for pesticide residue analysis from food. Using LDI MS methods developed for pesticide analysis, large numbers of samples can be analyzed rapidly; about 20 times the throughput at about one fifth of the cost of existing methods. There is no chromatography involved eliminating expensive solvents and maintenance while saving valuable time.

Market Potential

The food analysis market in India presents a huge opportunity and in a crucial component of the multi billion dollar food processing and exports industry. The Indian Milk Industry is the largest in the world. India is also the 4th largest exporter of dairy products. There is a significant growth potential for milk and milk products export from India as there is a worldwide increase in demand for high quality milk.

National/ Societal Relevance

Only a handful of food testing laboratories in India have mass spectrometers that enable them to provide export certification. Expensive existing technologies and lack of trained manpower limit greater penetration. Thus, food analysis solutions are beyond the reach of most customers, and laboratories are inundated with samples during peak export season.

Project Deliverables

Progress vis-a vis objectives - Technology transfer, essential purchases and operational setup have been completed. Preliminary data to meet the first milestones has been acquired.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Technical know how has been sourced from NCL Pune

Resources generated - 2 People are employed in the company currently. A food testing and analysis, R&D laboratory has been set up.

Plans to take innovation further

Interactions with key opinion leaders and partnership with strategic partners to fulfill the supply chain have been initiated.

Risks Envisaged

LDI MS is not a validated and approved analytical method by regulatory agencies as of now. Initial barriers to adaption are expected. The process for regulatory acceptance will take about 2 years. Competitors might come up with alternative technologies as well.

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Cardea Biomedical Technologies Pvt. Ltd

Collabrorator-All India Institute of Medical Sciences

The Innovation

An Innovative, HighEnd, Palm Sized, Single Lead ECG Display Device for Ambulatory and Long term rhythm monitoring and OnTheGo Applications.

Brief Description

Mirhythm is an advanced arrhythmia monitor which captures and displays arrhythmia as it happens in real time on any mobile phone working on Android platform. The hardware is a meticulously designed single lead, locket sized ECG system.

Stage of Development

Commercialization

Innovative Element

miRHYTHM is the only technology available on a Global scale which plot and process ECG data in real-time to detect all kinds of arrhythmia as it happens on a run-of-a-mill smart phone without any dependability on internet.

Market Potential

Globally the market was $14.6 billion in 2010 and is expected to rise upto $ 27.8 billion by 2021.

National/ Societal Relevance

In India approximately 45 million individuals are at a risk of a stroke. In fact, India has created an epidemic rate of CVD, accounting for 60 of the world cardiac diseases. The predilection for heart ailments, coupled with low levels of good cholesterol and traditional cardiovascular risk factors such as obesity and hypertension has made urban India the capital of CVD. India has a population of 20 million obese, projected to rise to 70 million by 2025. 20% of Indians are suffering from hypertension, one of the major causes of Hypertensive Heart Disease. And whats more worrisome is that the incidences of CVDs have gone up considerably for people between the age groups of 25 and 69 to 24.8.

Project Deliverables

Progress vis-a vis objectives - The project has accomplished all the objectives.

Technology/Product developed - A medical grade single lead ECG system for arrhythmia monitoring at home. Development of a mobile app for real time arrhythmia monitoring.

IP generated/Potential for IP generation - US Copyright secured. Indian Patent applied

Resources generated - Manpower - 3

Plans to take innovation further

Commercialization plans by tie-ups.

Risks Envisaged

None at Present.

Team Members

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C-CAMP

Collaborator - Indian Institute of Technology - Madras

The Innovation

Flow Analyzer

Brief Description

The product developed at C-CAMP and IIT-M is a miniature flow analyzer in lab-on-chip form combining principles of optics, flow cytometry, microfluidics device fabrication, optoelectronics, data acquisition and analysis to allow rapid cell analysis.

Stage of Development

Validation

Innovative Element

With affordable instrument as target, we have designed a miniaturized instrument with increased functionality and accurate information using these techniques: Microfluidic device using 2D focusing, Flow monitoring and flow control, Coupled opto-electronic system, Embedded lens fiber, Gated avalanche photodiode for high-sensitivity detection and Gated data analysis

Market Potential

There is a need for portable affordable immune health monitoring device with HIV therapy widely accessible around the world.

National/ Societal Relevance

In order to make frequent immune health monitoring a common practice, there is a need for less expensive, user friendly and portable flow cytometers that can give quantitative measure of immune health.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - An affordable miniature flow analyser is being developed.

IP generated/Potential for IP generation - Provisional and PCT filed. Provisional Application no- 04067/CHE/2011, Date of filing 4th Feb 2012. PCT Application no PCT/IB2013/050871, Date of filing 1st Feb 2013. National filing August/September 2014 - US, EP, South Africa, JP, Vietnam, Nigeria, ARIPO, EURASIA, South Korea, China and India

Resources generated - The project has trained six researchers and allowed microfluidics/fabrication set up establishment

Plans to take innovation further

We plan to take the innovation further for one-laser multiple detection capability.

Risks Envisaged

NA

Team Members

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Croleon Innovation Labs Pvt. Ltd.

The Innovation

Innovative scar-free organ retractor for reduced port laparoscopic surgery

Brief Description

Unmet Clinical Need Organ retraction in laparoscopic surgery is typically carried out through several incisions to accommodate the insertion of multiple 5 to 10 mm diameter trocars.

Stage of Development

Proof-of-Concept

Innovative Element - Less Invasiveness

Less Invasiveness. EndoConnect achieves scar-free and minimally invasive retraction by a unique mechanism that allows the smooth transfer of the suture from outside the patient body to an internal endo-grasper which atraumatically retracts organs.

Market Potential

Worldwide, nearly 8 million laparoscopy procedures are carried out each year where the organ retraction is carried out by 5-8 mm diameter instruments through trocars, held in place by a trained assistant surgeon. At a modest Rs. 400 USD 7 per procedure assuming re-use approximately 100 times of this translates to a net annual worldwide market opportunity of Rs. 320 cr USD50 M . In markets where instruments are not re-used, there may be a total market opportunity in the range Rs. 4000 cr USD 700 M per annum.

National/ Societal Relevance

EndoConnect would enable surgeons to provide the retraction themselves, thus reducing their dependence on assistant surgeons. This would thus enable patients in smaller towns to have access to treatment with minimally invasive surgery, that too at a lower cost.

Project Deliverables

Progress vis-a vis objectives - Currently, we are in the process of setting up the lab and CAD design of the primary component -i.e. the EndoConnect mechanism.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - PCT/IB2014/064772 and 3059/MUM/2013. Other ancillary devices are being developed and IP will be filed subsequently

Resources generated - Manpower Employed: Two engineers have been employed for the purposes of this project.

Plans to take innovation further

Next steps involve refining the proof of concept, carrying out bench tests, clinical trials and eventually, commercialization through international partners.

Risks Envisaged

Technical Risks from an engineering perspective, the ability to miniaturize the EndoConnect mechanism at a usable true-scale would be the biggest challenge. The components are simple enough that it would work as a mechanism, however circumventing the force limitations of the materials may pose a challenge.

Team Members

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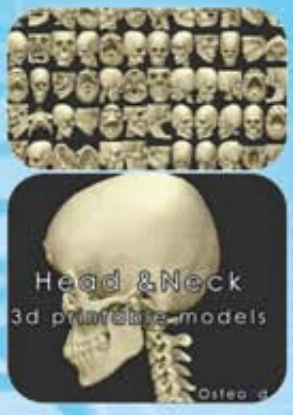
Df3d Creations Pvt. Ltd.



The Innovation

Conversion of CT/MR data to 3d printed models help the surgeons to plan surgery more accurately by means of better implants thereby increasing accuracy & reducing time taken for actual procedure

Brief Description

Conversion of CT/MR data to 3d printed models help the surgeons to plan surgery more accurately by means of better implants thereby increasing accuracy & reducing time taken for actual procedure. This brings down costs, increases throughput & accuracy.

Stage of Development

Proof-of-Concept

Innovative Element

Increase access and reduce costs to enhance the adoption of 3d printing.

Market Potential

5 Million USD in 4 years

National/ Societal Relevance

Reduce the costs for 3d printing and increase the accuracy of surgical procedures.

Project Deliverables

Progress vis-a vis objectives - Cloud based software platform, currently in Design Stage.

Technology/Product developed - Cloud based platform for 3d printing for Medical procedures.

IP generated/Potential for IP generation - Algorithms will be created. Need to evaluate possibilities of IP

Resources generated - Medical Models, SW Development Expertise, Cloud based software application

Plans to take innovation further

Exploring collaboration opportunities with local and international organizations, academia.

Risks Envisaged

Attrition of critical human resources, Performance Issues of 3d model, Funds availability

Team Members

Nachiketha Someshwara
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Himaja Kanampalli
Aaanchal Gowardhan
Vishakha Vaibhav

Contact

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Dinesh B R - IKP

The Innovation

Fetal Electrocardiogram and Uterine Activity signal extraction from Maternal Electrocardiogram eliminating the need for the use of conventional transducers

Brief Description

Existing cardiotocographs use ultrasound signals bounced off the fetus to calculate the fetal heart rate using Doppler shifted frequencies. Uterine activity is sensed with pressure transducers. Care givers monitor a trend chart to correlate fetal heart rate

Stage of Development

Proof-of-Concept

Innovative Element

Conventional sensors used to acquire maternal ECG are not discriminative between maternal and fetal ZECG.

- The signal processing amplifiers will be redesigned to accommodate the new ECG sensors which produce a smaller overall signal amplitude but with a higher signal-to-noise ratio.
- The adaptive filters/algorithms will reliably separate fetal components from maternal ECG.
- The user interface will be simplistic so that even semi-trained care givers such as midwives can use the device with ease

Market Potential

This project will simplify vital signs monitoring of FHR, Uterine activity UA or Electrohysterogram EHG , fECG & mECG by just using a single maternal ECG cable strapped to abdomen & acquiring clean low noise abdominal signals to enable separation & extraction of all other embedded signals. The processed FHR & EHG can be graphically plotted on a strip chart also.

National/ Societal Relevance

The current range of fetal monitoring devices prevailing in the market is complex, expensive & overloaded with non-essential features. The penetration into different tiers is very poor. The importance of data driven diagnoses & objectivity is spread thin. This project is looking at circumventing the listed drawbacks with technical innovation & market understanding.

Project Deliverables

Progress vis-a vis objectives - The proof of concept development was met.

Technology/Product developed - The Alpha & Beta prototype of "Transducerless electronic fetal monitoring device" is working as an ideal development platform to verify and validate key performance benchmarks as well as iterate the separation algorithms.

IP generated/Potential for IP generation - Provisional IP 289/CHE/2015 filed

Resources generated - Pradin technologies which is a private limited startup company resulted.

Plans to take innovation further

We have plans to collaborate with a leading US university to develop low noise sensors that is initially developed for EEG monitoring to customize for use in fetal ECG.

Risks Envisaged

Collection of actual raw abdominal signal data from pregnant mothers before & during labor for algorithm evaluation. External clinical trials at identified hospitals to validate comparisons between sensors based output with the said project output.

Team Members

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G.M. Biotech (Diagnorite Innovative Healthcare Pvt. Ltd.)

The Innovation

Development of Diagnostic Reagents for Acute Myocardial Infarction

Brief Description

Novel animal free reagents for earliest detection of AMI have been develop. A novel instrument free sensitive and affordable blood test format for any healthcare setup has also been develop. Both technologies can be extended for other diseases as well.

Stage of Development

Proof-of-Concept

Innovative Element

The new are animal free and and antibody free, but still they have the sensitivity level of the current antibody based reagents. Apart from that, the recombinant nature of some of the reagents allows to construct a novel instrument free format, that can be practiced in any setup by any healthcare worker. The novel reagents and the novel format also contribute to the affordability factor.

Market Potential

Since heart attack can affect anybody in any country, product can be useful for anybody. So there is a huge market potential.

National/ Societal Relevance

Currently heart attack is detected through machines like ECG, which also fails in 50 percent of the cases. An easy biochemical test is required to detect heart attack as early as possible. Our kit detects heart attack as early as 1 hr after the onset. Therefore, kit can potentially save a lot of lives.

Project Deliverables

Progress vis-a vis objectives - This proved the concept that non-antibody reagents can be developed by exploiting protein -protein interaction.

Technology/Product developed - Animal free, antibody free reagents that can detect early cardiac marker H-FABP.

IP generated/Potential for IP generation - Filing of IPs for novel reagents and novel instrument free formats is under process

Resources generated - A good research and development facility was created, G.M. Biotech partnership firm graduated to DiagnoRite Innovative Healthcare Pvt.Ltd. and two technicians were appointed.

Plans to take innovation further

Looking for other venture fundings for manufacturing and beyond.

Risks Envisaged

Funding in healthcare ventures, especially where products are perishable reagents, are becoming risky as the entire incubation period becomes 5-7 years. Regulatory obstacles are there.

Team Members

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Girish Vilas Arabale - Venture Centre

The Innovation

A Novel Pocket Scanner based on Raman Spectroscopy for the Analysis of Food, Water, and Agricultural Products.

Brief Description

Development of a unique portable instrument based on Raman spectroscopy for the effective automated analysis of soil. The instrument will be interfaced with a number of sensors such as GPS, humidity, moisture, temperature for digital soil mapping.

Stage of Development

Proof-of-Concept

Innovative Element

Enriched quantitative information about soil including microbial content along with environmental parameters for better crop productivity & management. Automated analysis delivery on the mobile devices.

Market Potential

No such product/analysis services exist in the market which provides high quality soil data & information.

National/ Societal Relevance

Rich data comprising soil contamination, soil biota and their diversity, soil stability, soil carbon pools, soil erosion, salinization, etc. are of utmost important to understand better crop productivity and nutrient management, climate change, natural and man-made hazard prevention, food and feed health as well as food security, and bio-energy production. More importantly it will help policymakers to implement the effective policies of mass-impact.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - There is potential for IP generation.

Resources generated - A new startup working with two employees.

Plans to take innovation further

Commercialization.

Risks Envisaged

Lack of hardware interfacing facilities. No prototyping facilities existed. Miniaturization of the tools would be a substantial challenge.

Team Members

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I4Vision Diagnostics

The Innovation

Personal Ophthalmic Diagnostic System (PODS)

Brief Description

PODS is a smart-phone based device and the software app. It can do an early detection of eye conditions which is not possible to do otherwise.

Stage of Development

Validation

Innovative Element

Cloud & Smart phone based Subjective unsupervised/personal testing. Able to effectively detect successive degeneration over time very effective for early detection/signs of multiple eye conditions. Relative Alternate Image Neutralization RAIN Test a sensitive objective test to detect very early visual distortion in comparison to each eye. Relative innovative Tele Eye Screening Tool iTEST to detect very early visual dysfunction over a period of time temporal.

Market Potential

The global eye-care market which is estimated at 75 billion is severely limited by in-accessibility and extremely high cost of diagnostic equipments like retinal cameras. Hence, there exists market potential for the device.

National/ Societal Relevance

About 90 of 285 million visually impaired people live in developing countries with diabetic retinopathy, cataract, glaucoma, cornea problems, refractive errors constitute 90 of blindnesss. 80% of all visual impairment can be avoided or cured. Key disablers include being oblivious to the need for regular eye check-ups and lack of access to affordable preventive screening. Only around 7-10 % of people at various stages of blindness are screened and treated.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - 3D printing for attachment to smart phone and android based apps for series of subjective tests.

IP generated/Potential for IP generation - Already filed two patent applications. Potential for three more patents.

Resources generated - Enterprise created and employed two people.

Plans to take innovation further

Clinical trials and commercialization

Risks Envisaged

Competition for developing similar device. Lack of acceptance of device by health professionals

Team Members

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Indio Labs Pvt. Ltd.

The Innovation

Novel, Percutaneous Soft Tissue Biopsy System with assisted Hemostasis

Brief Description

The company as developed a novel semi-automated platform device, seamlessly integrating two unique technologies. BioScoop is a novel needle designed to pierce through sample soft tissue with a single needle.

Stage of Development

Validation.

Innovative Element

Integration of the tissue piercing and sample cutting functions into a single needle which is the core of the technology platform and has been specifically designed to provide high quality samples for definitive diagnosis. To improve the safety profile and provide confidence to the physicians, integration of a concurrent hemostatic agent delivery system into the device to allow instantaneous, on-site hemostasis has been done. To provide a cost-effective solution, the company has encased the needle in a disposable unit that is packaged as a complete sterile kit for patients, with all the components required for the procedure.

Market Potential

Globally, around 500 000 000 people are chronically infected with hepatitis B virus HBV or hepatitis C virus HCV 1. More than 1 million people die each year from disease caused by hepatitis B & C2. About 1 in 10 people are affected by liver disease and will potentially require a definitive diagnosis over the next 5-20 years depending on the severity of their disease. Given a 4 carrier rate of undiagnosed viral hepatitis alone in India, a target patient population of 50-150 million customers globally is estimated.

National/ Societal Relevance

These value propositions align well with the Global Health Strategies of affordability and big impact providing improved access to care and bringing effective diagnostic solutions to patients in secondary care setting.

Project Deliverables

Progress vis-a vis objectives - On schedule with the device development objectives as well as preclinical objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - In the process of filing the IP generated in the mechanism of biopsy device.

Resources generated - Trained the manpower and now will start new programs in developing new biopsy configurations.

Plans to take innovation further

Plan to launch the device in June of 2016. Later, in a years time, will go for international and make staggered launch in Asian countries

Risks Envisaged

There may be a minor risk of embolization of the hemostatic agent which are being delivered inside the biopsy track, however, work is needed on the amount and particle size of agent to be delivered so as to mitigate the risk.

Team Members

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InDNA Research Labs Pvt. Ltd.

The Innovation

To demonstrate proof-of-concept for an automated clinical analysis and annotation pipeline for NGS based somatic cancer genomic test for diagnosis, prognosis and personalized therapy.

Brief Description

The product is a clinical NGS data analysis and interpretation pipeline called OncoNGx Genomic Workbench. Initially focus is on somatic cancer panels. The pipeline will be hosted on Amazon cloud AWS and can be accessed through any browser.

Stage of Development

Proof-of-Concept.

Innovative Element

Two key elements: a. Workflow integration and validation, and b. Annotation data integration that helps in the development of a clinical report.

Market Potential

Plan to offer the pipeline as a Software-as-a-service (Saas) model to Hospitals and Diagnostic Labs who are interested in using NGS for Dx or prognostic market testing. Provide NGS data analysis and annotation service to markets abroad

National/ Societal Relevance

Current portfolio of DNA-based diagnostic tests for cancer in India is very limited. The greatest benefit of OncoNGx is to routine clinical testing as it enables comprehensive multi-gene panel sequencing in a single test. The clinical use of NGS is very limited in India this is partly in view of its demand in terms of base depth and coverage, as well as solving computational and interpretation challenge. Our OncoNGx Genomic Workbench will empower oncologists to make more informed medical decisions sooner. Also, this platform can be extended to cover non-cancer disease panels in future.

Project Deliverables

Progress vis-a vis objectives - Almost on track with our milestone schedule.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - None. IP is more of a business IP and converting it to a patent is hard.

Resources generated - One PhD in Molecular Biology for annotation, two bioinformatics programmers and one s/w developer .

Plans to take innovation further

partnership with Prashanti Cancer Mission, a public charitable trust in Pune which focuses on the treatment of Breast cancer patients. Along with Prashanti, raising fund of around Rs 35 Lakhs to help sequence and analyze around 100 triple-negative breast cancer patients. Tata trusts are in the process of evaluating the proposal.

Risks Envisaged

Genomics and NGS data analysis is currently evolving at very rapid pace. Additional resources and efforts may be required (mostly after this POC) to integrate with new algorithms and annotation data sources as new discoveries are published.

Team Members

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Invivo D Solutions Pvt. Ltd.

The Innovation

Industrial application of a novel cancer drug screening method

Brief Description

The goal is to develop an anti-cancer drug screening platform using the genetically well-characterized model organism, namely, the fruit fly, Drosophila. The technology is based on the fact that cancer-inducing genes are conserved between human and Drosophila.

Stage of Development

Proof-of-Concept.

Innovative Element

This technology represents introduction of an in vivo assay at a very early stage of the drug screening pipeline, complementing the cell-culture based assays used to screen anti-cancer drug. Further, it is low cost, fast and reliable target-specific which is expected to reduce late-stage attrition of lead molecules in cancer drug screen. Further, the model is immensely flexible; the tumors could be genetically manipulated to suit their human equivalent thereby enhancing the reliability of the lead molecules.

Market Potential

The technology platform will be of interest to all drug discovery companies dealing with identification of lead molecules for anti-cancer drug discovery.

National/ Societal Relevance

The platform offers opportunities for reducing both the cost and time of cancer drug discovery. Further the Drosophila model can also be exploited for creation of in vivo models for screening human cancer making the platform versatile for cancer drug screen.

Project Deliverables

Progress vis-a vis objectives

Generated multiple, novel as well as genetically well-characterized tumor models in Drosophila. Screened a library of anti-Wnt compounds that validates the model of in vivo anti-cancer drug screen

Technology/Product developed - Twelve models of Drosophila epithelial tumors that can be screened for anti-cancer drug screens

IP generated/Potential for IP generation - InvivoD is a spin off research carried out at IIT Kanpur. Activities of the InvivoD entailed use of the IP generated at IITK which have been filed for Indian Patent 899/DEL/2013 dated 25th March 2013 and besides a PTC 1265/DEL/2013 dated April 30, 2014

Resources generated - We have impacted the career opportunities of Scientists in our program.

Plans to take innovation further

Look forward to undertake projects that may solve drug screening challenges using the Drosophila model besides transferring the technology to the Industry.

Risks Envisaged

The major challenge is obtaining industrial interface for the technology.

Team Members

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Karthik Chethan Venkateshan - CCAMP

The Innovation

3D printer filaments that are biomaterial-based and eco-friendly

Brief Description

The technology focuses on developing 3D printable bio-based filament prototypes wherein the formulation and processing characteristics will be optimized for 3D printing specifications.

Stage of Development

Proof-of-Concept.

Innovative Element

Currently, the requirement of bio-based, biodegradable and economical materials for developing 3D printable filaments is unmet. The technology aims at meeting this requirement by replacing the existing synthetic 3D printable filaments with bio-based materials and also in finding pertinent biomedical applications for bio-based 3D printed products.

Market Potential

The goal is to develop novel bio-based materials and target the material and filament requirement in the global 3D printing industry. The aim is to find potential 3D printing industries and entrepreneurs who are interested in novel, bio-based and economical materials for niche applications using 3D printed products.

National/ Societal Relevance

A substantial requirement for developing custom-made printers in accommodating printing of novel bio-based filaments will arise. Hence, this project has the potential to create an opening in the business area of bio-based 3D printers.

Project Deliverables

Progress vis-a vis objectives - Two bio-based formulations have been developed and optimized for material and processing parameters. A fused deposition modeling 3D printer has been optimized for various extrusion and printing parameters in printing with bio-based filaments.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - An application for provisional patent will be submitted at the earliest.

Resources generated - One employee with M.Tech in Biotechnology has been trained in this particular technology.

Plans to take innovation further

Aim is to find potential 3D printing partners industries and entrepreneurs who are interested in using novel, bio-based and economical materials for niche applications using 3D printed products.

Risks Envisaged

There is a possibility that the bio-based filaments developed may not be significantly economical in relation to the cost of the existing material.

Team Members

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Luna Goswami - KIIT

The Innovation

Development of De-metalizer Kit from Biopolymers for Efficient Removal of Heavy Metal Ions from Contaminated Water Especially of the Mining Areas

Brief Description

The product is a polyanion developed from polysaccharide. A monomer was grafted onto the polysaccharide. The technology we would like to represent as tea-kit technology.

Stage of Development

Discovery/ Proof-of-Concept

Innovative Element

The concept is unique in terms of launching a kit made from ecofriendly material for removal of soluble heavy metal ions particularly Pb II from the contaminated water. The other innovative element is the tea-kit technology that is being intended to develop.

Market Potential

The market potential of the product is immense since this is going to be the first one to be used exclusively for removal of Pb II from water.

National/ Societal Relevance

Waste water treatment and recycling of water is going to be the major technology in the coming decades and thus from that point of view the concept of the project is very timely as the simple, innovative technology that is being proposed to develop could be used both in the domestic as well as larger scale of water treatment.

Project Deliverables

Progress vis-a vis objectives - Adsorption experiments in orbital shaker using model waste water with known concentration of lead ions and process optimization is being done.

Technology/Product developed - Under development

IP generated/Potential for IP generation - Not yet

Resources generated - Manpower hired and getting trained, Instrument purchase is in process

Plans to take innovation further

Under process

Risks Envisaged

At this moment, no risk has been envisaged since the technology is very mild and ecofriendly.

Team Members

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One Consultant

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Mother Diagnostic Systems Pvt Ltd

The Innovation

Design second stage of prototype for Low cost, low dosage Digital X-Ray using TDI sensor

Brief Description

The product is C-ARM based Diagnostic X-Ray that costs around 10% of current cost and provides twice the normal resolution with patient dosage of just 30-40 of conventional digital X-Ray.

Stage of Development

Proof-of-Concept.

Innovative Element

Different sensor and Customized collimator, using C-ARM for diagnostic X-ray and synchronizing X-ray generator with X-ray sensor

Market Potential

In India 90 of X-ray systems are film based. So, there is huge scope to convert them to Digital. which is a low cost system

National/ Societal Relevance

India has one of the largest film X-Ray systems. If the digital X-Ray system cost is lowered. It would lower cost on film, developing and disposing. So, healthcare cost can also be lowered.

Project Deliverables

Progress vis-a vis objectives

Dosage, image quality, robustness and long term serviceability are expected to be delivered.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Two provisional patents filed. One complete patent filed.

Resources generated - X-Ray laboratory and team.

Plans to take innovation further

Talks with University of Texas are under way to commercialize the product

Risks Envisaged

Fund shortage

Team Members

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Nachiket Deval- CCAMP

The Innovation

Novel and effective way to reduce the risk of ventilator associated pneumonia

Brief Description

Ventilator Associated Pneumonia VAP is a fatal hospital acquired infection of the lungs caused in patients on mechanical ventilation for more than 48 hrs in the ICU. It is estimated that 31 or close to 6 lakh of these patients annually, develop VAP while on ventilator. The said innovation addresses this problem.

Stage of Development

Proof-of-Concept.

Innovative Element

It can be applied over any existing endotracheal tube without extubating or removing the patient off the ventilation and will have Increased efficiency, reduce dependence & chances of cross infection, avoid pooling of secretions and will record the data on quantity and quality of secretions for earlier diagnosis of any complication

Market Potential

Cumulatively VAP causes an additional economic burden of INR 3,000 crores to patients, their families and the healthcare system as a whole.

National/ Societal Relevance

Studies indicate the average incidence of Ventilator Associated Pneumonia is around 30, which implies that over 1 in 3 intubated patients, develops VAP, with a high mortality rate ranging from 20 to 76. VAP also leads to a loss of 42 lakh ICU days annually considering an additional 5-7 day ICU stay due to VAP, across different hospitals in the country, which could be used to cater to other critical patients.

Project Deliverables

Progress vis-a vis objectives - Design realization and creation of solution mockups, Feedback For mockups and creation of market requirement document MRD and Creation of functional prototype and validation are Completed

Technology/Product developed - Under development

IP generated/Potential for IP generation -

PCT filed vide International Application No. PCT/US2015/045064
US patent filed, U.S. Patent Application No.: 14/826,114

Resources generated - Coeo labs Pvt. Ltd. registered as a private limited firm. Three additional personnel employed with expertise in electronic design, mechanical engineering and product design. Seed funding has been raised.

Plans to take innovation further

Currently in collaboration with St. Johns medical college and hospital, Bangalore for clinical validation, feedback and observational study. Initial engagement with TUV for regulatory approval

Risks Envisaged

Clinical evaluation and sterilization requirements are the envisaged risks with regards to product development. Already in talks with UL and TUV to mitigate these risks.

Team Members

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Nayam Innovations Pvt. Ltd.

The Innovation

ISITE Intra-Ocular Lens for spectacle free vision

Brief Description

Developing a prototype of the implant.

Stage of Development

Proof-of-Concept.

Innovative Element

The only IOL which can be customized to patients eyes after the surgery to give him spectacle free vision. The innovation is in IOL materials, adjusting instrumentation and manufacturing methods.

Market Potential

India does about 6.5 million cataract surgeries annually, about 25 of the global volumes. The number of cataract surgeries per 100,000 population is at par with US and European countries. Globally the IOL market is about USD 4 billion INR 24,000 Cr.

National/ Societal Relevance

To maximize the ability of cataract patients to regain their work and role in society, our goal is to provide spectacle-free vision to millions of these patients

Project Deliverables

Progress vis-a vis objectives - Developing a matrix with acceptable optical properties is completed and the progress on other objectives is as per timelines.

Technology/Product developed - ISITE Intraocular lens for spectacle free vision after cataract surgery

IP generated/Potential for IP generation - About 15 patents would be generated with global FTO

Resources generated - Created a polymer lab and an optics lab with advanced chemistry and optical characterization facility. Hired PhD staff for research activities. Additional funding of INR 85 lakh received from Villgro and Venture Center

Plans to take innovation further

India does about 6.5 million cataract surgeries annually. The top 7 hospitals including Aravind Eye Care, Sankara Eye, HV Desai Eye Hospital, LVPEI account for nearly 20 of these surgeries. Planning to approach once the PoC is developed.

Risks Envisaged

Technology and market risks

Team Members

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Panacea Medical Technologies Pvt Ltd

The Innovation

Development of digital imaging detector for medical diagnostic imaging system (digital radiography).

Brief Description

Digital Radiography is a significant milestone in Radiology. A radiography is a very useful and critical tool for diagnosis in the hand of a doctor.

Stage of Development

Proof-of-Concept.

Innovative Element

The project aims at acquiring serial rad images with high data streaming by which dose to the patient can be reduced and the X-ray will be fired in pulse Fluro mode. Parallel computing of the images from the detector, wide dynamic range usability, signal-to-noise-ratio SNR improvement and low cost is the innovation of this design.

Market Potential

In India 90 of X-ray systems are film based. So, there is huge scope to convert them to Digital. With our low cost system, it is easy to convert them to digital.

National/ Societal Relevance

The quantum of X-ray images taken is very large i.e. annually 144 million X-ray/radiography attempts. This volume can be converted to digital to reduce the dose to the patients and save the environment from harmful chemical disposal after film processing. Digital Radiograph also enables tele-medicine to reach timely medical assistance to the population in far flung and difficult to reach areas of our country.

Project Deliverables

Progress vis-a vis objectives - The project is progressing well as per the objectives.

Technology/Product developed - Under development

IP generated/Potential for IP generation - There is a good scope for IP generation

Resources generated - Panacea is a technology based company and has a team of talented, dedicated and inspired engineers.

Plans to take innovation further

Plans to complete the project and after clearing regulatory approvals, manufacture the detector for self-consumption in all imaging applications and also make the detector available for other X ray equipment manufacturers.

Risks Envisaged

Fund shortage

Team Members

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Pankaj Parashar- FITT

The Innovation

Scintilla - a portable urine protein analyzer device for Mass Healthcare

Brief Description

The Product - Scintilla is a point of care, portable, instantaneous urine protein analyzer. This device would help millions of patients world over to instantaneously check and monitor their urine protein estimation

Stage of Development

Proof-of-Concept.

Innovative Element

The device Scintilla does not work on the conventional DIP - STRIPS based biochemistry, and smartphone or other methods of reading those changes. Different Biochemical methods have been utilized to design an altogether new and innovative opto-electronic system to read the biochemical changes. The test is reliable, rapid and very cost effective.

Market Potential

The device would become indispensable world over and doctors can get an instant screening test done and can save a lot of valuable time.

National/ Societal Relevance

The device caters to the larger National/ Societal need of disseminating the healthcare to the remotest of the villages and the people in the bottom of the pyramid. The device is so simple, convenient and automated that even a less educated ASHA Worker can perform a spot test for a pregnant woman at her doorstep in the remotest village. The test on our device would cost not more than Rs. 10/-.

Project Deliverables

Progress vis-a vis objectives - The project is progressing well as per the objectives

Technology/Product developed - An Opto-electronic medical device based on an innovative application of a novel technology is being created for the World.

IP generated/Potential for IP generation - Patent filed and the Patent Application number is 2478/MUM/2015

Resources generated - A company M/s Cutting Edge Medical Devices Pvt. Ltd. has been incorporated along with a team of five Electronics, Biomedical Engineers and Biotechnologists. We provided a good learning experience in the Summer Internship to 5 Undergraduate Engineers doing their B.Tech

Plans to take innovation further

Planning to take innovation further after establishing PoC

Risks Envisaged

Lack of adequate funds at strategic times will delay the project.

Team Members

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Raghabendra Samantaray- KIIT

The Innovation

Optically tuneable nano bio-sensor for detecting the efficacy of mosquitocidal repellants

Brief Description

It is vital to find out technological expertise to detect the efficacy of mosquitocidal repellents, and hence qualify the available commercial products. Hybrid nano biocomposite is a viable option in this regard.

Stage of Development

Discovery

Innovative Element

The advantages of hybrid biomaterials are diverse. It allows optimal control over the sequence and length of polymers that changes the scattering behavior, and thereby the optical properties. Doping these materials with optically sensitive quantum dots would make these composites more stimuli responsive, the ligand-receptor interactions.

Market Potential

High national and international potential

National/ Societal Relevance

NA

Project Deliverables

Progress vis-a vis objectives - In progress

Technology/Product developed - Under development.

IP generated/Potential for IP generation - In progress

Resources generated - Project is at Initial stage

Plans to take innovation further

In progress

Risks Envisaged

None

Team Members

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Ravi Bhogu - IKP

The Innovation

Remote Cardiac Monitoring and Real-Time Outpatient Cardiac Telemetry

Brief Description

SMART MCT is a heart disease management platform for physicians which empowers them to better diagnose the cardiac ailments and properly tailor therapy for their ailing patients cost-effectively.

Stage of Development

Proof-of-Concept.

Innovative Element

Wearable having no wires yet sensing 3-lead-ECG for 7-days due to cutting-edge breathable materials thereby drastically improving patient-compliance and diagnostic-yield. In addition, we have an innovative rental service delivery model that aggressively lowers cost per patient. The wearable consists of largely reuseable components and a few disposable components where costs can be drastically lowered by reusing components. This model reduces dependence on already overburdened physicians thus not only catering to a larger number of patients but also does so cost-effectively.

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. The ECG telemetry market is expected to reach USD 1.25 billion by 2015, due to aging population and increasing incidence of cardiovascular diseases. Our total addressable market is about USD 1 billion in India and USD 4 billion worldwide. We initially target about USD 100 million in India based on the estimated patients managed by cardiologists, electrophysiologists and cardiac surgeons.

National/ Societal Relevance

Cardiovascular diseases are the leading cause of mortality in the adult population and this trend is seen globally including the low and middle-income countries. Furthermore, south Asians including Indians from the subcontinent have a high prevalence of coronary risk factors, and have ischemic heart disease at an earlier age than in developed countries. By the end of this decade, 60% of the world's heart diseases are expected to occur in India.

Project Deliverables

Progress vis-a vis objectives - On Time

Technology/Product developed - Under development

IP generated/Potential for IP generation - None

Resources generated - None

Plans to take innovation further

NA

Risks Envisaged

NA

Team Members

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Robust Herbals Pvt. Ltd.

The Innovation

Development of Long Circulating Biodegradable Nano particle MRI Contrast Agents Based on Hydroxypropyl-beta-Cyclodextrin

Brief Description

MRI contrast agents have extensive applications in diagnostics, MR based angiography, cancer staging, and for monitoring cancer therapy. MR based angiography has tremendous potential in diagnosing cardiac diseases.

Stage of Development

Discovery/Proof-of-Concept

Innovative Element

All FDA approved MRI contrast agents are based on small molecules hence resulting in a rapid clearance profile making them ineffective for MR angiography. This also results in a requirement of a high dose of the contrast agent for effective imaging. Nanogad has various advantages over traditional contrast agents such as long-circulating properties, rod-like morphology, higher Gd loading, bio-compatible and biodegradable materials hence making them an attractive blood pool contrast agents. The project involves synthesis of a library of agents based on the Nanogad concept that will be evaluated in animal models for their efficiency as blood pool contrast agents. At the end of the study, we will identify the optimal candidate for commercialization as the Nanogad blood pool contrast agent.

Market Potential

The global market for imaging contrast agents is projected to exceed $15 Billion by 2017

National/ Societal Relevance

First Indigenous Blood Pool MRI/MRA Contrasting agent

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - IP to be filed on completion of this work

Resources generated - Initiated new enterprising sector specialized in Molecular imaging and Diagnostic Reagents and hired two research associates.

Plans to take innovation further

Planning to take the technology further after developing PoC.

Risks Envisaged

The primary challenge for this project is the absence of a GMP method for production of the Nanogad materials. However, the development of a GMP process after the identification of the optimal candidate can potentially overcome this challenge.

Team Members

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Sachin dubey-CCAMP

The Innovation

A simple platform based novel, rapid and color changing one-time and reusable nanofiber strips for selective detection of Enterohaemorrhagic *Escherichia coli*

Brief Description

A platform technology for rapid and specific detection of *E.coli* O157:H7 in water and Urine, called as Ecosense, with a strip & solution format designs and colorimetric readout and is extremely easy to use like a pregnancy strip.

Stage of Development

Validation

Innovative Element

The strip is very low cost and specific to the pathogen being tested. It also proposes to determine the antibiotic that is working against the pathogen in 1/24th time of culture.

Market Potential

The Global diagnostic market is estimated at 47 Billion $ with Indian market pegged at 2.5 Billion$. The water testing market is 2.7 Billion $ with maximum growth rate observed in the Asia Pacific region. Globally 760000 children die due to diarrhoea and 8.3 millions are hospitalised because of Urinary Tract Infection.

National/ Societal Relevance

Ecosense holds great importance especially in low resource settings which are devoid of doctors and laboratories for testing the infection. In Urban scenarios a quick result helps in managing the heavy load of patients where follow up is always a problem.

Project Deliverables

Progress vis-a vis objectives - Successfully demonstrated 1st milestone.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Expect to file IP after completing the objectives.

Resources generated - Converted individual to Company. Two trainees have been trained. Antimicrobial testing has been done for institutes like NCL, Pune. Two people work full time in the company.

Plans to take innovation further

We are in process of raising a follow on funding on the project. We are also collaborating with Scientists from UMass, Amherst, USA for further explorations.

Risks Envisaged

We believe that replacing or substituting an already established method like culture with innovative products like ours could be a challenge. Since this also boasts of being trained manpower free, there could be adoption issue as well.

Team Members

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Sai Siva Gorthi- CCAMP

The Innovation

Hand-held Imaging Flow Cytometer for Quantitative Diagnosis of Malaria

Brief Description

In this project, we are developing an imaging based affordable point-of-care diagnostic device, which can fully-automate the complete work flow of conventional clinical microscopy.

Stage of Development

Validation

Innovative Element

In contrast to most of the previous efforts which have focused on portability alone, in this work we are developing microfluidics based Lab-on-Chips to fully automate the sample preparation needed for subsequent microscopic analysis of biological cells. In addition, our handheld device would perform automated cytometric analysis, and display the quantitative results on its screen thereby totally eliminating the need for having a skilled personnel as well as laboratory resources to conduct these diagnostics.

Market Potential

The proposed diagnostic technology based on optofluidic Imaging has the potential to revolutionize the healthcare system in India.

National/ Societal Relevance

Our approach combines system-level synergistic integration of various technologies like microfluidics, optics/microscopy, electronics and image/signal processing together to help in realizing handheld/miniaturized instrument that completely automates various steps involved in performing diagnostics at the point-of-care.

Project Deliverables

Progress vis-a vis objectives - The project is progressing well as per the objectives.

Technology/Product developed - We have developed an imaging based malaria diagnostic device which fully automates the conventional microscopy based analysis the gold standard method of malaria detection.

IP generated/Potential for IP generation - We had filed both International PCT Europe and Indian Patent Applications.

Resources generated - A competent technical team of four to five members is formed. Also, by advancing the technology and prototype-demo, been able to attract and identify three other potential partners for the company which we are planning to startup soon.

Plans to take innovation further

NA

Risks Envisaged

None

Team Members

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Science for Society

The Innovation

Electricity Free Baby Incubator

Brief Description

BabyCare+ is the Electricity Free Baby Incubator. It is a baby care unit that creates ideal artificial atmosphere for neonatal baby to save it from hypothermia, a major reason attributed for 4million neonatal deaths per year.

Stage of Development

Proof-of-Concept

Innovative Element

BabyCare+ is the first electricity free baby incubator that maintains all three desired parameters of temperature, humidity and oxygen level. It uses a novel technology of Heat Humidity Buffer. Box- H2B2 which is a thermal-chemical battery that can be recharged once in a day by hot water, an easy source at household level. H2B2 does not require any sensors, electronic controllers, making it almost maintenance free.

Market Potential

BabyCare+ is useful technology for 30 million pregnancies occurring annually in India.The project is also scalable to other developing countries and bottom of pyramid population across the globe.

National/ Societal Relevance

The holistic objective of current project is to meet 4th Millennium Development Goal that is to reduce child mortality, to provide appropriate technology at affordable cost that works free of electricity and to provide best ambiance in terms of oxygen level, humidity and temperature for baby.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Not applied yet.

Resources generated -
Five researchers were employed and Heat and fluid flow lab was created.

Plans to take innovation further

Partnership with local hospitals for testing and piloting, partnership with Government for policy interventions and partnership with Manufacturer for fabrication

Risks Envisaged

The suggestion to include transport of new born baby and to provide other standard medical assemblies to the system were incorporated already.

Team Members

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SciGenom Labs Pvt. Ltd.

The Innovation

Development of Single Tube Multi Gene Onco Diagnostic Tests for use with Next Generation Sequencing Platforms

Brief Description

Cancer mortality rate in India is expected to cross 1.2 million per year mark by 2020. Genetic mutations have been shown to impact cancer in various ways. Identifying these mutations is important for prevention, improved disease management and effect

Stage of Development

Proof-of-Concept

Innovative Element

Our project is to develop a multi-gene kit that will utilize Next Generation Sequencing technologies to test for cancer mutations in tumour samples.

Market Potential

The mutation status information will help clinicians to take the most appropriate decision on therapy with good prognostic and predictive value.

National/ Societal Relevance

Current tests for cancer mutations have several limitations-mainly cost and time constraints. These tests are done on one gene at a time, mostly using Sanger sequencing technology and at times, only a small portion of a gene. These single gene assays take 6-8 weeks to complete. Our kit will be designed to test 100+ cancer genes in parallel in a single-tube reaction in less than a week at an affordable cost.

Project Deliverables

Progress vis-a vis objectives - The following activities are completed - Gene list & initial probe design & Probe testing and variant calling algorithm development

Technology/Product developed - Under development

IP generated/Potential for IP generation - NIL

Resources generated - Two Research Associates, one Bioinformatic Scientist and one Bioinformatic analyst.

Plans to take innovation further

A very user friendly Software development that can be operated even without expertise

Risks Envisaged

None as of now.

Team Members

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Aswathy

Devika

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Dr. Beena PS

Shantani Proteome Analytics Pvt. Ltd.

The Innovation

Development of a point-of-care diagnostic tool for pre-eclampsia screening

Brief Description

Pre-eclampsia diagnosis is currently based on blood pressure and proteinuria measurement. However, these methods have limitations due to atypical presentation in pre-eclampsia. The Company is currently developing a point-of-care diagnostic tool for pre-eclampsia screening

Stage of Development

Proof-of-Concept

Innovative Element

In recent years bio-markers based screening is gaining grounds for pre-eclampsia diagnosis. The current screening methods are expensive and can be tested only in specialized laboratories. The kit under development will be affordable, quantitative and can be used in a point-of-care setting to reach the rural and semi-urban population.

Market Potential

Pre-eclampsia is one of the major causes of mortality in women. There is a huge unmet need for the diagnostic tests for pre-eclampsia. Currently, there are no kits available for pre-eclampsia diagnosis in India. Around 20 of pregnant women present with elevated blood pressure and will be the target population for pre-eclampsia screening using this kit.

National/ Societal Relevance

Pre-eclampsia and eclampsia are the top two causes of mortality among pregnant woman in rural India accounting to 44.9% and 19.2% of total maternal death respectively. The incidence of pre-eclampsia and eclampsia is 4.6 in all deliveries in India and neo natal mortality is as high as 43 out of 1000 live child births. Currently, there are no specific treatments for PE except delivery of the fetus and placenta. Incorrect diagnosis of pre-eclampsia also leads to unwanted pre-term delivery. A diagnostic test that is affordable goes a long way in screening for pre-eclampsia and also in helps in management and treatment of pre-eclampsia.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - None

IP generated/Potential for IP generation - None

Resources generated - A full time Research associate is involved in the project who got trained in several techniques involved in the development of the kit.

Plans to take innovation further

After the successful validation of the kit, funds will be raised from venture capitalists, private investors or through government grants for taking this product to the market.

Risks Envisaged

Quantification of biomarkers using the mobile platform remains to be tested. However, many inexpensive commercial readers are also available that can be customized specifically for the kit being developed

Team Members

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Shilps Sciences Pvt. Ltd.

The Innovation

Atomic Force Probing of cells for clinical and pharmaceutical applications

Brief Description

We are developing an AFM and associated microfluidic device for detection of metastatic potential in cancer cells. The AFM can measure mechanical properties of cells at the nanometer scale and this can be used as mechanical biomarker.

Stage of Development

Proof-of-Concept

Innovative Element

Use of AFM in diagnostics has the potential to bring a new class of biomarkers - mechanical biomarkers. This has implications in cancer metastasis. Our AFM design integrates several innovations to make it suitable for cell analysis and at a price point suitable for India. Our microfluidic method of cell encapsulation and dispensing is new.

Market Potential

AFM for R&D - 20 to 50 Cr. annual market. AFM for diagnostics, India - 250 to 500 Cr/year based on cancer imaging market. Microfluidics for cell analysis, International - 250 to 500 Cr/year as a fraction of world single cell analysis market

National/ Societal Relevance

Potential to bring lower cost diagnostics for cancer. Pharma and biotech companies and R&D groups can benefit from the novel products. High tech indigenous products saves valuable foreign exchange.

Project Deliverables

Progress vis-a vis objectives -
Instrument designs are ready and fabrication design is in progress. Prototyping & initial testing has been done for microfluidic devices.

Technology/Product developed -
Under development.

IP generated/Potential for IP generation - Two patent filings - one national and one PCT.

Resources generated - An Engineering team, lab setup, raised minor capital and brought in some client projects.

Plans to take innovation further

Awaiting results of some collaborative testing for taking further steps.

Risks Envisaged

Investment to bring more skills into company, slower testing and adoption of technology.

Team Members

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Skin Curate Research Private Limited

The Innovation

Multispectral Optical Imaging and Computing Technologies for Realtime In situ Functional Characterization and Monitoring of Cutaneous Wound Healing Progression

Brief Description

This technology is a hardware software co-designed smartphone app for real time, noninvasive and functional diagnosis for monitoring of skin cutaneous wounds healing dynamics using optical imaging, artificial intelligence and cloud computing technologies.

Stage of Development

Discovery

Innovative Element

It is envisioned as a smartphone assisted cloud based computational imaging technology capable of delivering real time in situ functional characterization through high-throughput machine learning of tissue photon interaction signatures during optical multispectral imaging of skin lesions.

Market Potential

Dermatological diseases or pathological abnormalities affecting the cutaneous tissues including acute and chronic wounds are prevalent in the world and chronically affects the psychological health of 30-50% of all children and adolescent population in low and middle income countries. The wound care market is valued at $ 4.6 billion in 2016 of which $ 1.6 billion is the market share alone for wound care devices projected at a compounded annual growth of 5%.

National/ Societal Relevance

This technology would enable 23,000 currently unequipped primary healthcare centers in India along with providing patient-comfort centric and affordable wound care to 5.7 million affected people who can join the interim workforce to contribute effectively to a tune of Rs. 400 billion in terms of our gross domestic national income.

Project Deliverables

Progress vis-a vis objectives - The project is progressing well as per the objectives

Technology/Product developed - Under development.

IP generated/Potential for IP generation - There is a potential for IP generation.

Resources generated - Research Engineers, Technology business incubation and core innovation build-up for high-precision healthcare devices manufacture.

Plans to take innovation further

Clinical trials with select partner hospitals to proceed for BIS certification of the device followed by multi-national release of the device and clinical trials for obtaining CE and FDA approvals in Europe and USA. On completion of these stages, the product is envisaged for global release.

Risks Envisaged

Failure to integrate the multi-spectral illumination system, imaging sensor and control circuitry for simultaneous acquisition of image sequences, Lack of precision and overload of computational algorithms and soft-wares can lead to loss of real-time performance during joint learning of multi-spectral optical imaging signatures and failure to induce acute and chronic wounds in guinea pig during experimental validation.

Team Members

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Sujay Shad- FITT

The Innovation

Mechanical Heart Valve Fixation System: An improved design for superior cardiac performance

Brief Description

We are designing an improved mechanical heart valve. These valves are meant to replace native heart valves damaged by infections, ageing, and other conditions.

Stage of Development

Proof-of-Concept

Innovative Element

The valve is expected to be more space efficient. It is also expected to have a 35 to 115 effective orifice area increase. Increase in effective orifice area would be more in smaller sized valves and less in larger sized ones, hence the improvements would be most pronounced in pediatric heart valves. Improved effective orifice area will lead to improved hemodynamic function. Other benefits could be: possibility of reduced infective complications, reduced risk of Para prosthetic leaks, stable fixation speedier healing, reduced suturing time. Probable and not implausible benefits: Reduced need for anticoagulation, simpler manufacturing process

Market Potential

Considering that almost 2/3 of heart valves are mechanical and a further 2/3 are in the aortic position we expect the global market for our device to lie between 750 million and $1.15 billion by the above two estimates.

National/ Societal Relevance

A universal problem is being addressed for its solutions.

Project Deliverables

Progress vis-a vis objectives - Halfway to the second milestone by creating a design iteration and its CFD.

Technology/Product developed - Under development

IP generated/Potential for IP generation - Indian patent priority number IN2006KO00815, surgical fastening device.

Resources generated - Presently have two engineering undergraduates and a medical undergraduate working part time on this project.

Plans to take innovation further

Initial discussions with a non-government funding agency and with overseas researchers/research institutions to undertake various parts of the next stage forward is being initiated.

Risks Envisaged

We could fail to get a satisfactory CFD lab functioning. (This could be circumvented by sending our two students to learn the software in a four day workshop in Netherlands). The design could be faulty, will know only after the trials.

Team Members

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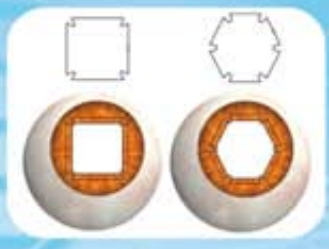

The Innovation

Pupil Expansion Devices and Delivery System

Brief Description

The simple single plane design of the Bhattacharjee ring redefines the way pupil is expanded during cataract surgery in eyes which do not dilate with medications.

Stage of Development

Commercialization

Innovative Element

The different way in which the pupil margin engaging part of the device engages the pupil margin, is the inventive step. The pupil margin straddles across the plane of the device whereas in all prior devices a part of the device straddles across the plane of the pupil margin.

Market Potential

The need for a safe & effective pupil wxpansion device cataract is the leading cause of reversible blindness and visual impairment worldwide and the need for cataract surgery is projected to rapidly grow in the next 10 years.

National/ Societal Relevance

The present standard of care is the Malyugin Ring which costs about 100 USD. This is an additional cost to the patient, Government & health care system. The Bhattacharjee rings having a simpler design can be machine produced. This would reduce production times and costs translating to lesser cost to the patient and the health care system.

Project Deliverables

Progress vis-a vis objectives -
Reports from evaluators obtained and filed. First prototype of truly continuous ring and delivery device is ready

Technology/Product developed - 1st Prototype of Truly continuous Ring and Delivery device

IP generated/Potential for IP generation - Device Providing Enlargement and Preventing Collapse of the Pupil of the Eye - 225/KOL/2013, PCT/IN2013/000457, US National phase 14/379684. National phase application in other countries pending. Pupil Expansion Device: CIP Application USPTO 14/ 628,636 Microsurgical forceps with broad jaws: 245/ KOL/ 2015, USPTO 14/ 686991

Resources generated - Nayan Eye Centre Private Limited, is formed.

Plans to take innovation further

The plan is to make the invention available to cataract surgeons worldwide at an economical price so as to reduce the cost burden on healthcare system.

Risks Envisaged

Inability to secure IP rights in most convention countries due to paucity of personal funds.

Team Members

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Tuscano Equipments Pvt. Ltd.

The Innovation

Imaging device for monitoring breast tissue changes

Brief Description

Computerized breast thermography using IR camera is the visual representation of the distribution of difference in temperature patterns exerted on the skin surface due to the presence or absence of any underlying pathology and the regional vascularization.

Stage of Development

Validation

Innovative Element

It comprises an IR camera, integrated with inbuilt temperature control and monitoring system and with multi-axial rotating arm and positioning set up within a closed chamber. The special design on its top is used as the patient couch for patient positioning. The device is patient friendly Noninvasive, no radiation and no breast compression. Processes images in multiple ways for comparison between normal and abnormal breasts at more than one temperature for better interpretation.

Market Potential

There are only 40-50 mammography units available in the country at government centers and are not sufficient to screen and diagnose the millions of people at risk.

National/ Societal Relevance

Breast cancer, the most common cancer and the second leading cause of death among women worldwide, remains an important public health problem. As per WHO global burden of disease, more than 500,000 women die annually due to breast cancer of which 69% of deaths occur in developing countries. By 2020, one in eight urban Indian women will develop breast cancer in her lifetime as predicted by WHO.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives

Technology/Product developed - Under development.

IP generated/Potential for IP generation - The patent application is submitted for national phase examination, Application number: PCT/IN2012/00078 (http://www.google.com/patents/WO2013080223A2?cl=en)

Resources generated - In addition to the existing team, 5 Installation engineers, 4 application engineers, one lead engineer are appointed. Lab unit built to support development, changes and testing based on the feedback from field.

Plans to take innovation further

Soft-ware based analytic tool

Risks Envisaged

Risk envisaged in the current design is in the temperature control unit which is now operating in the range of 19°C to 30°C. Design changes are in progress to accommodate the temperature range in India.

Team Members

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Vanaja K Gowda - FITT

The Innovation

A Safe And Effective Technology For Treating Musculoskeletal Disorders In Elderly Patients

Brief Description

The technology is aiming at developing a noninvasive and effective method to deliver drug for treating arthritis. It uses a combination of liposomes and iontophoresis to target the drug to required target of action.

Stage of Development

Discovery

Innovative Element

A noninvasive novel technique to transport the drug across the skin barrier.

Market Potential

Safe and patient compliant

National/ Societal Relevance

Effective method which is safe and avoids side effects due to the drug.

Project Deliverables

Progress vis-a vis objectives - Development stage

Technology/Product developed - Under development.

IP generated/Potential for IP generation - Not yet.

Resources generated - One research associate.

Plans to take innovation further

Still under development stage.

Risks Envisaged

None as of now.

Team Members

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Vivekanandan Perumal - FITT

The Innovation

Rapid diagnosis of bacterial gastroenteritis in resource poor-settings

Brief Description

The product is an automated and portable large volume immuno-magnetic capture device that allows specific and rapid capture of the target e.g. Bacteria. Using this method we are able to confirm Vibrio cholera from spiked samples within 5 hours.

Stage of Development

Validation

Innovative Element

This is the first automated and portable large volume immuno-magnetic device. The proposed technology allows isolation of bacteria /other targets from a mixed population. Importantly, the time needed for isolation of bacteria from mixed cultures and biochemical characterization is by passed. The need for skilled microbiologists is also minimized.

Market Potential

We believe that this product once validated in the lab and in pre-clinical testing will have good market potential in both urban and semi-urban settings. The advantages, the proposed method offers over currently used methods include a Rapid turnaround time. The expected turnaround time for the proposed method is about 6 hours

National/ Societal Relevance

The proposed method if validated and successfully demonstrated on clinical samples will make diagnostic options for bacterial gastroenteritis available in semi-urban settings.

Project Deliverables

Progress vis-a vis objectives - The project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - An IP for the said technology had been filed by IIT Delhi prior to BIRAC-BIG funding.

Resources generated - Two M.Tech graduates were employed. The facility was set up to perform all necessary work at FITT, IIT-D.

Plans to take innovation further

Planning to take the innovation forward after validation.

Risks Envisaged

The difficulty in getting clinical microbiologists to adapt a new technique (despite its obvious advantages) may be a challenge as the currently used methods have been in place for about a century without much change.

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Yogesh Subhash Badhe-VENTURE

The Innovation

Direct beta thalassemia carrier detection kit

Brief Description

The proposed Direct beta thalassemia carrier detection kit is unique and quick, does not require any instrument or electricity, hence it is very suitable for field application.

Stage of Development

Proof-of-Conceptz

Innovative Element

The idea is innovative. In beta thalassemia carrier, the RBC will contain excess free alpha and detection of this excess alpha would be a direct measure of beta thalassemia and its carrier. Available methods for the detection of beta Thalassemia carrier are indirect, tedious, and costly, require sophisticated equipment and cannot be used in field.

Market Potential

There are about 240 million carriers of beta thalassemia worldwide and about 30 million beta thalassemia carriers in India alone. Worldwide, 15 million people have beta thalassemia major disorders and 100,000 children with thalassemia major are born every year. Approximately around 65,000 cases of beta thalassemia is registered in India and 9000-10,000 cases being added every year.

National/ Societal Relevance

Management of thalassemia includes regular 3 weekly filtered packed red cell transfusions & chelation therapy for iron overload. Even after this the child cannot survive more than 30 years. Also the cost of treatment of a 4-year-old thalassemia child is around Rs.90, 000-100,000 annually in a private set-up. Stem cell transplantation as a curative treatment, which costs between 6 and 16 lach rupees is out of reach for majority of children. Besides bearing the cost of treatment, the psychological stress to both the patient and the parents/family is phenomenal.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - There is a great scope for the IP generation

Resources generated - One project Assistant and one part time office assistant were employed. Facility for the preparation of kit has been created in this project.

Plans to take innovation further

After the successful development and validation of kit, it will be ready to be put in market.

Risks Envisaged

None foreseen at the moment

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BIRAC Innovators

Agriculture

September 2015

Aditya Biotech Lab and Research Pvt. Ltd

Vegetative Growth studies of elite plants selected at Hardening stage

The Innovation

Identification of DNA markers linked to elite traits in micropropagated banana plants.

Brief Description

Morphological and molecular characterization of off-type bananas generated during *in-vitro* regeneration of banana plants and those observed in farmer's field would generate a detailed account of information on somaclonal variants observed in banana growing regions of Chhattisgarh and MP.

Stage of Development

Discovery Linked Innovation

Innovative Element

Assessment of morpho-physiological descriptors of banana somaclonal variants. Identification of the frequency of occurrence of elite variants and off-types during *in-vitro* regeneration. Genetic variations having significant effect on yield and value related parameters in banana. Development of new banana variety.

Market Potential

Identification of DNA markers linked to traits specific to elite or off-type plants will help in development of new banana varieties having good yield, fruit quality, and tolerance to diseases or abiotic factors specific to Central India including Chhattisgarh.

National/ Societal Relevance

Characterization and identification of high yielding genotypes based on somaclonal variations observed in presently cultivated banana varieties such as Grand Naine would be beneficial for farmers and tissue culture plants producers. Genetic analyses of the desirable traits using the SSR and ISSR markers would ensure genetic fidelity of the planting material.

Project Deliverables

Progress vis-a vis objectives - Detailed account of morphological, physiological and agronomic traits characteristic to common somaclonal variants. Assessment of field performance of elite and off-types plants and evaluation of their effect on overall yield. Information on correlation of various elite and off-types characters observed with yield related parameters in banana. Identification of molecular markers associated to characteristic features of elite banana plants

Technology/Product developed - Identification of molecular markers associated characteristic features of off-types and elite banana plants observed during micro-propagation

IP generated/Potential for IP generation - NIL

Resources generated

PCR, UV Spectrophotometer, -20°C deep freezer, Water purification system, Refrigerated centrifuge and Gel electrophoresis units with power pack . Two SRF were employed under this project

Plans to take innovation further

Sequencing of PCR product and identified SNPs between off-types and elite banana plants

Risks Envisaged

Nil

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Amity Institute of Microbial Technology

The Innovation

Interaction of Nano-embedded *Piriformospora indica* with the plant of medicinal importance, *Brasicca oleracea var.* Botrytis (Broccoli)

Brief Description

P.indica is a multi-functional fungus which helps as plant growth promoter, biofertilizer, metabolic regulator and bio-herbicide.

Stage of Development

Proof-of-Concept

Innovative Element

Preliminary work on interaction of nano-particle embedded *P.indica* biomass on Broccoli has shown better growth promotional property as compared to control *P.indica* without nano material as tested in our laboratory. Novelty of the present work is the field trial on treatment of Broccoli with nano-embedded fungal biomass to promote plant growth and value addition. Use of nano-embedded fungal biomass as bio-fertilizer and plant promoter is not reported till date.

Market Potential

Enhanced crop yield and value addition to the medicinally important plants in a cost effective manner promises to fetch better market price for the product.

National/ Societal Relevance

India is a developing country whose of economy is based on agriculture. Development of eco-friendly technology, as proposed, would help in improving the yield and income of the farmers.

Project Deliverables

Progress vis-a vis objectives

Selection of suitable nano-particle embedded fungal biomass based on its biological efficiency. Liquid formulation of the nano-embedded fungal biomass. Effect of liquid formulation on *Brassica oleracea var.* botrytis Broccoli in green house and field conditions. Yield and value addition to Broccoli treated with nano-particle embedded fungal biomass in comparison to native fungal biomass.

Technology/Product developed - Development of ZnO-embedded *Piriformospora indica* for higher plant productivity and value addition

IP generated/Potential for IP generation - NA

Resources Generated - Two JRF, one field labour, one project co-ordinator and one team lead.

Plans to take innovation further

Experimentation shall be carried out from seedling to the maturity level. Assessment of the impact of nanoparticles embedded fungus on sulforaphane, one of the important active ingredient found in Broccoli. Technology will be transferred from lab to field

Risks Envisaged

Nil

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Beej Sheetal Seeds Pvt. Ltd.

Collaborator-International Centre for Genetic Engineering & Biotechnology

Transgenic onion development using marker gene

The Innovation

Development of Herbicide & Stress tolerant transgenic Onion

Brief Description

Transgenic onion has been developed for Herbicide and stress tolerance using Rye grass mutant EPSPS gene and plant helicase gene in tropical onion.

Stage of Development

Validation.

Innovative Element

Developing transgenic onion for two important traits i.e. drought and herbicide tolerance is one of the important & promising approaches. Use of plant helicase gene for drought stress tolerance and increased yield is additional benefit.

Market Potential

Hybrid onion seeds are available in the market with high yielding and quality characters. However there is no variety or hybrid available for addressing drought tolerance and weed management. Both the traits proposed are of great importance to address the problem of weed management as well as for drought tolerance. To increase the productivity of transgenic onion with these traits would be of great demand. The proposed transgenic onion trait is important for India and globally in onion growing countries.

National/ Societal Relevance

Onion is an important crop for every kitchen of India and around the world. Due to weed emergence and saline soils the productivity is low. Hence the onion hybrids with herbicide tolerance will be important for rainy season crop & stress tolerance will enhance productivity during various stresses like salinity.

Project Deliverables

Progress vis-a vis objectives - Transgenic onion event with both herbicide & stress tolerance have been developed and are in final stages of selection

Technology/Product developed - Agrobacterium mediated onion plant transformation has been standardized. Transgenic onion developed for stress tolerance and for herbicide & stress tolerance together

IP generated/Potential for IP generation - There is scope for IP generation.

Resources generated

Three scientists have been trained and absorbed by company for further research projects. Plant transformation facilities added with new instruments.

Plans to take innovation further

Validated technology will be made available for out licensing

Risks Envisaged

Deployment risks associated with genetically modified crops

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Central Rice Research Institute

Collaborator - Xcelris Labs Ltd

The Innovation

Association mapping of genes/QTLs for yield under reproductive stage drought stress in rice *(Oryza sativa L.)*

Brief Description

Two drought tolerant varieties, Sahbhagi Dhan and Vandana have been released by CRRI for the drought prone areas of the country. Three genotypes, Mahulata, Brahamnnaki and Salkain have been registered for drought tolerance.

Stage of Development

Validation

Innovative Element

Genome-wide association mapping is a novel approach and powerful strategy for identifying genes underlying quantitative traits plants by capturing natural variation and it overcomes the limitations of the biparental QTL mapping by taking advantage of evolutionary conservation of haplotype blocks carrying multiple alleles by use of genetic diversity in diverse germplasm. An extra advantage of the GWAS mapping is the homozygous nature of most rice varieties, which makes it possible to employ genotype or sequence once and phenotype many times. Once the lines are genomically characterized, the genetic data can be reused many times across different phenotypes and environments.

Market Potential

Rice genotypes identified as promising in terms yield under drought stress in the project can be directly used as varieties for drought affected areas of India. These varieties would be used by seed companies and government agencies for benefit of farmers and improving yield potential of drought affected areas and generate additional revenues.

National/ Societal Relevance

Some of promising rice genotypes identified in the project would be useful for pre-breeding, marker-assisted-breeding and gene/ allele mining programs for developing high yielding varieties, suitable for drought affected areas of the country. This would increase rice yield, thereby increasing income, social and economic status of the small and marginal farmers of the drought affected areas.

Project Deliverables

Progress vis-a vis objectives - About 400 rice genotypes having different levels of tolerance/ susceptibility to drought at vegetative stage were sown in rain-out shelter (ROS) and normal conditions during kharif, 2015 for initial screening for grain yield at reproductive-stage drought stress.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - NA

Resources generated - The SRF and RA will be trained to handle drought screening experiments and also data analysis related structure and NGS. The facilities like Rain Out Shelter (ROS) for drought screening under control conditions and computing system for handling NGS data will be created.

Plans to take innovation further

Fine mapping, cloning and transgenic plant development. Variety development tolerant to drought through molecular breeding approach

Risks Envisaged

Cyclone usually occurs in the month of October in Odisha which may affect the drought screening experiments.

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Directorate of Oilseeds Research

Collaborator-Xcelris Genomics

Castor 6K SNP chip

The Innovation

Discovery of genome-wide SNPs and its use in developing a reference linkage map and association analysis in castor

Brief Description

Basic genomic information and tools are being generated for castor. A 6K SNP genotyping array is developed and validated. Construction of a reference linkage map and identification of SNPs linked to Fusarium wilt resistance are in progress.

Stage of Development

Discovery

Innovative Element

The genomic information and tools being developed in this project viz., SNP database, genotyping system, molecular marker based linkage map and marker-trait associations were hitherto not available for castor crop.

Market Potential

Castor is an economically important oilseed crop in India earning about Rs. 4,000 crores through the export of castor oil and its products. This crop is the only source of an unusual fatty acid, ricinoleic acid. The castor oil and its products have numerous industrial uses including biofuel hence, the demand for castor oil is ever increasing globally. Current productivity levels in castor are inadequate to meet the requirement, which underscores the need for breeding high yielding cultivars with better adaptability. Availability of genomic knowledge and tools would facilitate the castor breeders in effective cultivar development.

National/ Societal Relevance

India occupies the first position in the world in terms of area and production of castor. Castor is mostly grown in marginal lands contributing significantly to the livelihoods of the resource poor farmers in India.

Project Deliverables

Progress vis-a vis objectives - Genome-wide SNPs were discovered by resequencing of 12 diverse castor genotypes. A 6K SNP genotyping array was developed and validated by genotyping over 300 castor germplasm accessions. A mapping population of 230 recombinant inbred lines was developed.

Technology/Product developed - A database of genome-wide SNPs discovered by sequencing of 12 diverse genotypes and a 6K SNP genotyping array.

IP generated/Potential for IP generation - SNP genotyping array, markers linked to Fusarium wilt resistance have potential for IP generation.

Resources generated - Two research fellows were employed in the project. A high-throughput genotyping facility with liquid handling system for DNA extraction & PCR setup and Fluorescence plate reader for SNP genotyping was established at Indian Institute of Oilseeds Research.

Plans to take innovation further

The possibility of providing SNP genotyping services to castor researchers is being explored. The linkage map will be used for locating useful agronomic genes/genomic regions in castor. The marker linked to Fusarium wilt resistance will be further validated and ultimately integrated in to regular breeding programmes.

Risks Envisaged

None as of now

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Indo American Hybrid Seeds

The Innovation

Marker assisted gene pyramiding of blast and bacterial blight resistance genes into CMS & maintainer lines of rice

Brief Description

The bacterial blight BB and blast are major threats to rice and effective control of these two diseases would increase and stabilize the threshold production. The resistances mediated by specific genes are usually broad spectrum and durability.

Stage of Development

Validation.

Innovative Element

Phenotyping is vital along with genotypic selection. Therefore, adopting selective Phenotyping with specific pathogen races to understand the pathogenicity followed by genotyping with locus specific markers in advanced back cross generations is being carried out.

Market Potential

The developed bacterial blight and blast resistant hybrids will have the market share of more than 1000 tonne

National/ Societal Relevance

Suitable to disease endemic areas. Higher yield under disease endemic areas and less plant protection sprays

Project Deliverables

Progress vis-a vis objectives

Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - IP will be generated after lines development

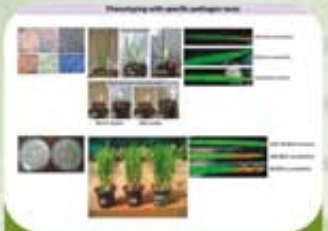
Resources generated - NA

Plans to take innovation further

Staking abiotic stress tolerance genes

Risks Envisaged

Screening with pathogen specific races



Phenotyping with specific pathogen races

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Kaveri Seed Company Ltd.

Disease Screening of BC3F3 Populations against Bacterial Blight at R&D Farm

The Innovation

Development of Biotic stress resistant Rice through conjunct use of Bio- and Hybrid Technologies

Brief Description

Genetically insulate the popular Kaveri rice hybrid by introgression of blb Xa21 and xa13 blast Pi54 resistance genes in female parent and brown plant hopper resistance Bph18 and xa13 genes in restorer parent and to pyramid the resistances in the hybrid using molecular markers.

Stage of Development

Discovery Linked Innovation

Market Potential

Rice being a high volume crop the potential for hybrid rice seed demand is huge.

National/ Societal Relevance

Seed being the repository of genetic potential, contributes to productivity increase there by creating revenue pathways to farmers.

Project Deliverables

Progress vis-a vis objectives - In 48 months time since the project commissioned, the project progress is as per the objectives envisaged

Technology/Product developed - Biotic stress resistance fortified rice hybrids will be developed

IP generated/Potential for IP generation - The hybrid developed will be registered with PPV&FR for propreitariness of the product.

Resources generated - Manpower employed as per the project provision and phenotyping facility for the screening of Brown Plant Hopper and Blast resistance at Kaveri seeds, Hyderabad has been created.

Plans to take innovation further

The improved maintainer lines possessing bacterial blight and blast resistance will twice be backcrossed with the CMS line in order to convert the improved maintainer line s into improved CMS lines.

Risks Envisaged

Conversion of the improved maintainer line into improved CMS line may take 12 to 18 months period.

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Kaveri Seed Company Ltd.

The Innovation

Marker-assisted dissection of genetic basis of yield and improving yield potential under drought stress in Maize

Brief Description

Maize *(Zea mays L.)* is the third most important food crop in India after rice and wheat, and holds the key to the food security of the country. Drought is an important abiotic stress limiting productivity potential of the crop.

Stage of Development

Discovery Linked Innovation

Innovative Element

Molecular markers can be effectively deployed to dissect the genetic basis of yield under drought stress. Marker-assisted selection strategy facilitates fast track breeding to improve per se performance of parental lines and subsequently for developing high yielding maize hybrids.

Market Potential

High yielding hybrids with improved tolerance to biotic and abiotic stress always have great market demand. Since maize being primarily grown under rain fed situations, improved hybrids outperforming the existing, under limitations of moisture stress will carry a very high market potential.

National/ Societal Relevance

Improvement of maize productivity in drought prone regions of national relevance in terms of providing adequate grain to the poor farmers and landless labour who depend on maize farming for their livelihood.

Project Deliverables

Progress vis-a vis objectives - Marker-assisted dissection of genetic basis of yield and drought tolerance has been completed successfully.

Technology/Product developed - Maize hybrids having high yield potential under drought stress will be developed in the project.

IP generated/Potential for IP generation - The hybrids developed will be registered with PPV & FR for propreitariness of the product.

Resources generated - Manpower employed as per the project provision

Plans to take innovation further

NA

Risks Envisaged

Failure to develop competitive hybrids could adversely affect seed business and depends on the product value and performance

Evaluation of germplasm for drought tolerance

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Metahelix Life Sciences Pvt. Ltd.

Cry1Ab events showing resistance to stem and cob borers

The Innovation

Deregulation Trials Phase I of Transgenic Maize Events Expressing Metahelix Synthetic Cry1C, Cry1Ac and Cry1Ab Genes for Tolerance to Stem and Cob Borers

Brief Description

Metahelix has developed transgenic maize events expressing specific insecticidal proteins intended to control Stem and cob borers viz., *Helicoverpa armigera, Chilo partellus* and *Sesamia inferens* .

Stage of Development

Validation.

Innovative Element

The Cry genes used in the project have been codon optimised for better expression in maize plants. The genes have been tested for its expression under the control of different promoters such as Actin , Ubiquitin and Metahelix proprietary Chimeric promoter. These genes have been shown to offer durable resistance across multiple generations against maize stem and cob borers.

Market Potential

Maize is considered as a commercial crop in India and area under maize is increasing every year. The incidence of SCBs is seen in most of the maize growing areas causing extensive damage leading to severe yield loss. The products emanating from this project are expected to have significant market relevance under the circumstances of severe economic damage being caused by SCBs. The maize hybrids resistant to SCBs will be preferred by the farmers as they would also reduce the usage of pesticides thus helping to maintain environmental quality.

National/ Societal Relevance

In India, pesticide usage in maize is going up every year. SCBs are becoming severe pests in maize and leading to huge yield loss. Conventional genetic improvements have only resulted in limited control of SCBs. The transgenic crop resistant to SCBs will result in reducing the pesticide use and a consequent increase in yield due to prevention of loss caused by the insect pests.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Agrobacterium mediated gene transfer method was used to generate transgenic maize events expressing either Cry1Ac or Cry1Ab to impart resistance against the SCBs

IP generated/Potential for IP generation - The genes Cry1Ac and Cry1Ab that were used to generate transgenic maize events may be patented.

Resources generated - A total of 20 members were employed in the project, besides 6 contract labourers. PCR machine, refrigerator autoclave machine, chemicals, plastic wares, stationery materials, IT related equipments and software support were purchased.

Plans to take innovation further

The efficacious events that have been generated are being introgressed into diverse elite genetic backgrounds to determine their performance. Further biosafety and confined field trials needs to be conducted to check their performance under natural environments.

Risks Envisaged

Regulatory moretoriums

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Mother Dairy Fruit and Vegetable Pvt. Ltd.

Collaborator - Centre for Genetic Manipulation of Crop Plants, University of Delhi South Campus

The Innovation

To conduct confined field trials and biosafety studies on genetically engineered *Brassica juncea* (Male sterility and restorer lines as pollination control mechanism) for heterosis breeding and yield improvement

Brief Description

A novel approach, i.e. barnase-barstar system, has been used by the CGMCP, University of Delhi South Campus for pollination control and heterosis breeding in *B. juncea*.

Stage of Development

Validation.

Innovative Element

A new construct using spacer element between the barnase and the bar gene to prevent the leaky expression was used in development of transgenic mustard.

Market Potential

Looking at success story of bt cotton in India, the barnase-barstar system based transgenic hybrids will have vast market potential and will spread faster in the country. About 80 percent of the mustard area is in Rajasthan, Madhya Pradesh, Haryana, Uttar Pradesh and Gujarat. It is estimated that half of the area having irrigation support will adopt mustard hybrids in next 5-7 years. The transgenic hybrids will have a reasonable share in the mustard hybrid market.

National/ Societal Relevance

At present more than half of edible oil requirements of the country is being met through imports. Availability of productive mustard hybrids will help in increasing mustard production and availability of domestic edible oil production. An increase in the yield will improve income of farming communities growing mustard and will reduce country dependence on import of edible oils to meet its growing demand.

Project Deliverables

Progress vis-a vis objectives - Conduction of BRL-II trials for one season and completion of regulatory dossier

Technology/Product developed - NA

IP generated/Potential for IP generation - NIL

Resources generated - Manpower trained to conduct GM trials

Plans to take innovation further

After de-regulation of genes involved in development of DMH-11, it is proposed to develop canola quality mustard hybrid with zero erucic acid and low glucosinolate and high oleic mustard hybrids. Future work will include development of improved hybrids with better agronomic characteristics and resistance to biotic and abiotic stresses.

Risks Envisaged

Regulatory approvals from Central and State Government is critical for taking the innovation further.

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Rajkumar Kishor - IKP

The Innovation

Clonal propagation of elite genotype of orchid hybrids found in Manipur for commercial cultivation

Brief Description

The North-Eastern (NE) Region of India is considered as the cradle of flowering plants and identified as a proverbial treasure house of variety of orchids and there is an urgent need to harness the commercial potential of the horticultural significant orchids of this region for economic upliftment. The elite genotypes of the hybrids may be micro-propagated for production of clones for mass cultivation.

Stage of Development

Discovery

Innovative Element

Development of new hybrids with varied combination of floral traits such as colour, texture, size, fragrance, display

Market Potential

Orchids are unxplored goldmines in India. Once this venture is accelerated and established the momentum, it has the potential to hold both domestic as well as global market.

National/ Societal Relevance

This horticultural crop holds great promise to provide entrepreneurship, jobs and market to many Indians particularly those in NE India and Western Ghats

Project Deliverables

Progress vis-a vis objectives

Elite genotypes have been selected from the amongst F1 generation of hybrids. Micropropagation of the selected elite clones have been subjected using meristem and inflorescence stalk as explants. Fully regenerated plantlets are being obtained. Breeding of secondary hybrids using the above plants as parents and raising of the hybrid seedlings is achieved for hybrids.

Technology/Product developed - Product development includes all the hybrids being produced

IP generated/Potential for IP generation - Filing for Plant Variety Protection of the hybrid orchids is being undertaken with NRC Orchids, Pakyong ICAR

Resources generated

A tissue culture lab has been established. The co-ordinator, one Research Associate, one JRF and one Field cum Lab Assistant are working.

Plans to take innovation further

CDA is executed with Bangalore based company, M/s ATEN for commercial venture

Risks Envisaged

Long juvenile period of the hybrid orchids and lack of funding for scale up

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The Innovation

Upscaling Banana propagation using bioreactors

Brief Description

Bio-reactor Technology proposes to mass produce quality planting material of economically important plants in bio-reactors which provide superior mass balance, higher proliferation rate, improved labour efficiency and as a consequence, the reduced cost

Stage of Development

Validation

Innovative Element

Bio-reactors offer a potential system for large-scale plant propagation as an alternative to the traditional method of multiplication. Utilization of bioreactors for large scale propagation has been attracting interest recently due to scale-up and automation advantages. Plant Bio-reactors also includes low cost production, reliable safety of the product

Market Potential

Market potential is high. Tissue culture companies would take up the technology.

National/ Societal Relevance

Technology can be used for the commercialization of crops other than banana like flower crops, other fruit crops and make large quantity of planting material available for planting which will result in higher production. Per plant cost of the Elakki banana planting material is around Rs 22/- at present. This can be brought down to Rs 10-12.

Project Deliverables

Progress vis-a vis objectives

An eight fold increase in multiplication of banana in temporary immersion bio-reactor has been achieved compared to the conventional method.

Technology/Product developed - Technology for obtaining eight fold increase in multiplication of banana cultivar Neypoovan Elakki Bale which is a poor multiplier has been achieved.

IP generated/Potential for IP generation - Technology for multiplication of banana cultivars in Temporary immersion bio-reactor has great potential for generating IP.

Resources generated

Facility for bio-reactor multiplication of banana is created. Trained manpower is available now for this technology. Enterprise will be created shortly.

Plans to take innovation further

The technology will be commercialized.

Risks Envisaged

Contamination of plants by endophytic microbes which surface during multiplication.

Multiplication of banana plants in large number in temporary immersion bioreactor

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Swasti Agro & Bioproducts Pvt. Ltd.

The Innovation

Novel Chitosan derivative for building SAR in plants: specifically leaf blight of Pomegranate caused by *Xanthomonas sp.*

Brief Description

Developed a process for modification of chitosan (under patenting), which improves the specific biological activity of the material by 100 folds. Modified chitosan builds disease resistance in crops.

Stage of Development

Commercialization

Innovative Element

The technology based on chitosan derivative can be exploited further to built generalized disease resistance in crops and specific response in order to prevent and control diseases of bacterial, fungal, viral and nematode origin.

Market Potential

The technology has been tweaked for 16 crop disease combination important in Indian context, and the market potential within India is over Rs 15000 cr. globally a few diseases of horticulture crops such as Citrus canker and rotting of Kiwi fruits are not satisfactorily addressed by chemical treatments. Such problems represent immense opportunity for Swasti technology.

National/ Societal Relevance

At micro-level farmers growing pomegranate - which is a highly paid cash crop - are uprooting orchards because this disease makes the farming operation non-viable. This technology can be applied to 16 other crop disease combinations where farmers lose more than Rs 1,50,000 cr. worth production every year. While this production can be saved, farmers will make 10 - 20X benefits on the input costs and there will be tremendous environmental benefit as toxic chemicals will not be needed.

Project Deliverables

Progress vis-a vis objectives - Beta version of the product has been successfully launched and is growing at over 5 folds annually.

Technology/Product developed - First product for prevention and early control of bacterial blight of pomegranate XanSil - is developed

IP generated/Potential for IP generation - Provisional IPR filed for the process.

Resources Generated - Training of three technical personnel.

Plans to take innovation further

We have signed collaboration with National Research Center for Pomegranate, ICAR

Risks Envisaged

Looking at the market need quick commercialization is necessary, and to avoid competition huge team and funds need to be mobilized. The raw material availability could be limited in India and this may have to be sourced from Latin America.

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BIRAC Innovators
Industrial
Biotechnology
September 2015

Affigenix Biosolutions Pvt Ltd

The Innovation

Development of trypsin resistant PAN reactive trypsin antibodies for industrial application

Brief Description

Enzyme Trypsin is widely used in various biological processes such as Insulin manufacturing to cleave peptide linkers from the pro-drug C peptide removal from Proinsulin and activation of vaccine viruses. Residual Trypsin analysis is used during downstream processing.

Stage of Development

Proof-of-Concept

Innovative Element

The selected anti trypsin antibodies allow to address critical unmet market need such as rapid, sensitive, specific and reliable trypsin clearance assay, anti-trypsin antibody immunogenicity assessment kit and matrix for purifying Trypsin from various sources.

Market Potential

As readymade Trypsin clearance assay is not available in the market, the product would find use in biologics and biosimilar companies who routinely use Trypsin during downstream processing. Companies involved in Trypsin manufacturing might be potential customers for affinity matrix as it will aid in purifying the enzyme with fewer steps and thereby reduce the cost of goods. Diagnostic companies can exploit the antibodies for developing prenatal diagnostic point of test to detect presence of immunoreactive Trypsin.

National/ Societal Relevance

Anti-trypsin antibodies and immunoassay developed by Affigenix will enable drug companies to monitor the clearance of the Trypsin used in downstream processing of Biologics and Biosimilars. Enables purifying Trypsin from native and recombinant source Trypsin inhibitor could be used as therapeutic agent for treating pancreatitis, shock and disseminated intravascular coagulation.

Project Deliverables

Progress vis-a vis objectives - Identifying Trypsin & Trypsinogen peptide mimetic is complete. Peptide synthesis and conjugation and anti peptide/s antibody production is complete. Critical reagent preparation, Method development and Qualification is also complete

Technology/Product developed - Under development

IP generated/Potential for IP generation - Planning to file the MAB antibody sequences with appropriate utility by 2015.

Resources generated - Equipped the cell culture facility, trained two scientists in Immunoassay development, generated employment for two scientists for 18 months period.

Plans to take innovation further

The company plans to install fully automated robotic system for ELISA plate coating. Field trials are also planned .

The company has plans to collaborate with an industry partner in integrating their antibody as an immunomatrix for purifying trypsin from native and recombinant sources. Once the proof-of-Mechanism is established in vitro, they intend to look for partners for preclinical development and for further clinical development towards treating pancreatitis patients.

Risks Envisaged

Regulatory hurdles in commercializing the diagnostic products. Unknown risk associated with therapeutic antibody drug development might be there.

Team Members

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AlgaIR NutraPharms Private Limited

The Innovation

Establishment and Validation of Commercially Viable Technologies for the Production of Omega-3 Fatty Acids from Marine Microalgae

Brief Description

The project aims to develop an economically viable technology, which can overcome the major challenges that limit commercial implementation of EPA and DHA production.

Stage of Development

Validation

Innovative Element

Microalgae strains isolated for DHA and EPA are being analysed for molecular level identification

Market Potential

The proposed technology comes under nutraceutical segment. The Indian Nutraceutical Market Forecast for 2017 estimates a market size of USD1 billion and the market for nutraceutical products is expected to reach USD 6.1 billion by 2019-2020, due to rising awareness about health, fitness and changing lifestyle.

National/ Societal Relevance

None of the multinational companies are full Fledged into the business of algae-derived nutraceutical products such as omega-3 fatty acids, and its value added formulations.

Project Deliverables

Progress vis-a vis objectives - For EPA: 300 Kg Biomass/Month/Unit will be subject to extraction by cold press method. On an average of 300 Kg of EPA oil will be extracted from 3 ponds.

For DHA: 200-800 Kg of DHA oil/Month depending on the tank volume ranging from 3000-10,000-Ltrs

Technology/Product developed - Microalgae strains isolated for DHA and EPA

IP generated/Potential for IP generation - Microalgae strains isolated for DHA and EPA are now subject for DNA analysis which have IP generation potential

Resources generated - The promoters have contributed funds.

Plans to take innovation further

Planning for incubation

Risks Envisaged

None as of now.

Team Members

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Amit Morey - CCAMP

The Innovation

Developing Novel Lactic Acid Bacteria Antimicrobial Interventions to Improve Food Safety and Shelf-Life

Brief Description

Developing first novel and indigenous "all-natural" antimicrobial to improve food safety and shelf-life

Stage of Development

Validation

Innovative Element

Isolation of bacteria from novel niches in India is being studied. It is hypothesized that these microorganisms may secrete novel metabolites to eliminate foodborne pathogens and spoilage organisms.

Market Potential

By the end of 2016 the Global Market for Natural preservatives will be at USD 2.55 billion.

National/ Societal Relevance

The product will be the first of its kind in India. Through our innovative product, Indian food manufacturers will be able to provide safer foods to the consumers and increased shelf-life will reduce food wastage.

Project Deliverables

Progress vis-a vis objectives - Project is Progressing well as per the objectives.

Technology/Product developed - A product mixture of bacterial metabolites has been developed and it is in the testing phase.

IP generated/Potential for IP generation - Not yet.

Resources generated - A well equipped microbiology lab has been set-up. Four scientists have been trained on food microbiology methods.

Plans to take innovation further

We are seeking partnership with any interested groups/company to help us expand our operation and collaborate on more projects.

Risks Envisaged

None.

Team Members

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Anthem Biosciences Pvt. Ltd.

The Innovation

Generation of a thermotolerant strain of Lactobacillus acidophilus

Brief Description

To create a thermotolerant strain of the widely used probiotic bacterium Lactobacillus acidophilus which would ideally exhibit increased tolerance compared to wild-type L. acidophilus to elevated temperatures.

Stage of Development

Discovery

Innovative Element

The proposed study would lead to the construction of a novel, robust strain that can withstand elevated temperatures experienced by probiotic strains during processing and storage. Overexpression of the native heat shock chaperonin complex GroEL and GroES in L. acidophilus has not been done before.

Market Potential

There is an increasing demand for functional foods containing probiotics in India. The Indian probiotic market turnover is expected to reach USD 8 million by the year 2015. Improving the endurance of a L. acidophilus strain as a result of engineered thermal tolerance would increase the number of viable cells that are being delivered in the final product thereby increasing product effectiveness and reducing costs.

National/ Societal Relevance

L. acidophilus generated, could be used to generate starter cultures for large scale manufacturing of fermented foods and other functional foods containing probiotic strains. Such a thermotolerant strain would retain viability at elevated temperatures. Loss in viability as a result of exposure to elevated temperatures can reduce the total live bacterial dose that is ultimately available to the consumer.

Project Deliverables

Progress vis-a vis objectives - A thermotolerant strain of L. acidophilus which exhibits improved survival at elevated temperatures compared to WT has been generated.

Technology/Product developed - Generation of a thermotolerant strain of Lactobacillus acidophilus

IP generated/Potential for IP generation - The proposal aims to generate a novel strain that should thus lead to generation of new IP.

Resources generated - None

Plans to take innovation further

None

Risks Envisaged

Generation of a L. acidophilus strain that overexpresses the chaperone complex GroESL is a low risk aspect of the proposal. The high risk component is the identification of novel genes other than GroESL and DnaK that are involved in the L. acidophilus thermotolerant phenotype.

Team Members

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Bhamis Research Laboratory Pvt. Ltd.

The Innovation

Process Crystallization as a Purification Tool to Therapeutic Antibody

Brief Description

To develop a purification procedure for monoclonal antibody, trastuzumab where Protein A column is replaced by protein crystallization method directly from clarified CHO cell supernatant

Stage of Development

Validation

Innovative Element

Compared to chromatography, crystallization shows no mass-transfer limitation and a scale-up is easily possible using simple standard equipment. Use of process crystallization for purification has the potential to allow significant cost reductions in the manufacturing process of therapeutic antibodies.

Market Potential

Trastuzumab has a market value of USD 7B. However, the cost for a single dose is around Rs. 75,000 which is very costly and people cannot afford it. If we can reduce the cost involved in manufacturing of this drug, it will definitely bring down the total cost for a single dose which in turn opens up this huge market and new patient population in third world countries.

National/ Societal Relevance

It is estimated that the cost of therapeutic antibody production in mammalian cell culture ranges from USD300-USD3,000/gram. In therapeutic monoclonal antibody production, the downstream processing costs are 50-80% of the total costs. Therefore, more economic procedures able to replace at least one chromatographic operation are subject to extensive research.

Project Deliverables

Progress vis-a vis objectives - Screening for crystallization condition was performed for both pure commercially available Trastuzumab and clarified CHO cell supernatant. The conditions were optimized to get crystals in batches in ~ 1g quantities.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - We are in the process of filing patent application which covers mainly monoclonal antibodies for which either patents are expired or will be expired in various therapeutic areas using crystallization technology

Resources generated - Currently, Bhamis Research Laboratory BRL employs 12 people and has 2000 sq ft lab space.

Plans to take innovation further

Licensing to big Pharma companies to conduct Phase 1 to Phase 3 human clinical trials and trying to get Venture capital to further advance the program and eventual marketing and commercialization.

Risks Envisaged

Team Members

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Cellzyme Biotech

The Innovation

Development of Iron Rich Rice Bran Protein Hydrolysate from the Byproduct of Rice Bran oil Industry

Brief Description

Rice bran protein hydrolysate will be developed which can either be used as a functional food or a fortification agent. The product is rich in essential vitamins, micronutrients and minerals which can be used by pregnant women and young children.

Stage of Development

Proof-of-Concept

Innovative Element

The inventive step is to optimize the parameters for enhanced recovery of proteins and micronutrients from rice bran. Product will be used to formulate the novel functional foods.

Market Potential

Rice production in India is over 102 million tonnes and the production of rice bran oil is around 1 million tonne and still untapped market is around 0.6 million tonne. This easily translates into the defatted rice bran availability in the country of over 0.9 million tonne. Therefore, the solution based on rice bran will have an excellent sustainability index with low environmental footprint.

National/ Societal Relevance

Inspite of enjoying a strong economic growth, the wide prevalence of undernutrition is an indicator of the poor nutritional status of the masses. Children under five years of age and the expectant mothers were devoid of nutrition. To address this unmet need it is imperative to develop the solutions with the sustainable technology.

Project Deliverables

Progress vis-a vis objectives - Optimized conditions for producing protein hydrolysate had been achieved in lab scale. Pilot scale studies are in progress. Investigation of functional and nutritional properties are planned.

Technology/Product developed - Protein hydrolysate from rice bran

IP generated/Potential for IP generation - IP generation potential is high

Resources generated - Required equipments were procured and 4 scientists were trained

Plans to take innovation further

On realization of Proof-of-Concept and third party validation trials, a small scale production facility will be built to manufacture the product.

Risks Envisaged

Constant supply of the high quality raw material and high energy consuming utilities for manufacturing pose a risk. To mitigate the envisaged risks, extensive optimization on pilot scale is required. Consumer awareness about the nutritional advantages offered by rice bran is required to attain commercial success.

Team Members

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Daurala Sugar Works

Collaborator - Shriram Institute for Industrial Research

The Innovation

Removal of hydrogen sulphide from biogas by recovering sulphur from it

Brief Description

In the present project chelated $Fe3^{+}$ in aqueous medium will be used for scrubbing hydrogen sulfide from biogas to form elemental sulphur to precipitate out. The reduced $Fe2^{+}$ will be regenerated to $Fe3^{+}$ in presence of oxygen in air and recycled.

Stage of Development

Validation

Innovative Element

The proposal intends to remove H_2S from biogas to make it pollution free and safe, upgrade biogas by removing CO_2, when its calorific value increases from 25 MJ/ m^3 to 40 MJ/ m^3 and recovers Sulphur from biogas to find various uses 99.9% H_2S removal. The developed technology will be applicable to various biogas compositions

Market Potential

The upgraded biogas may be a good substitute of CNG, PNG, LPG. It will reduce the demand for electric power and fossil fuel and will reduce the carbon emission and global warming. Recovered sulphur may be considered for an extra revenue generation

National/ Societal Relevance

It will generate a clean & green fuel. It will develop a cheap & renewable fuel and reduce the greenhouse gas emission. It will hold the key to energy security of India

Project Deliverables

Progress vis-a vis objectives - Removal of H_2S in laboratory, recovery of sulphur from biogas in laboratory is under progress.

Technology/Product developed - Under development

IP generated/Potential for IP generation - There is huge potential of generating new IP through this project.

Resources generated - One junior engineer has been recruited and lab scale facilities have been created.

Plans to take innovation further

It is too early to make plans to take the work further

Risks Envisaged

There are risks associated with cost economy, profitability, operational and Process risk

Team Members

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Embio limited

The Innovation

Demonstration of conversion of Benzaldehyde to Phenylacetylcarbinol (PAC) with improved efficiency on scale of 4 Kilo Liters

Brief Description

DPRDP Program at IITB resulted in genetic engineering at the allosteric site of enzyme PDC, such that the catalytic site remains open PCT/IN2010/000511. This resulted in lower Km value of enzyme for pyruvate.

Stage of Development

Validation

Innovative Element

Reduced Km value by genetic engineering, has translated into reduced feed stock requirement. Throughput per batch is also increased and thereby effluent per Kg of output decreases.

Market Potential

Embio is second largest producer of R-PAC related APIs and exports to 24 countries.The innovator in BASF Germany, who is on verge of exiting this business. This superior technology could accelerate this exit and give Embio a bigger market share.

National/ Societal Relevance

The production of R-PAC from benzaldehyde was a CDRI technology licensed by MDPL chennai.The DPRDP program at IITB has brought in a technological breakthrough. This is currently under validation phase. Commercialisation of the process would amount to an evolving success story of public/private partnership.

Project Deliverables

Progress vis-a vis objectives - The technical aspects have been achieved. For commercial viability the utility optimization work is underway.

Technology/Product developed - A process to efficiently produce R-Phenylacetylcarbionol.

IP generated/Potential for IP generation - PCT/IN2010/000511

Resources generated - The utilities were upgraded.

Plans to take innovation further

Plan to scale-up at plant level after successful techno-commerical viability proven.

Risks Envisaged

Utility inputs for the process should match current norms. DMF changes and acceptance by the customers for the same is a major issue.

Team Members

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GVS Biotech Pvt. Ltd.

The Innovation

Commercial Scale Extraction Unit to Produce 0-Calorie Natural Sweetener from Stevia Leaves.

Brief Description

Stevia white powder extract is a zero calorie natural sweetener produced from stevia leaves which are grown organically. Green technology is used for extraction of steviol glycosides. This technology involves use of chemical free and cost effective process.

Stage of Development

Commercialization

Innovative Element

In India particularly in Punjab stevia farming was started few years back. Process design, pilot scale unit and commercial scale unit to produce zero calorie natural sweetener from stevia dry leaves without using any chemical solvent is the highlight.

Market Potential

With rapidly changing life-styles and increasing prominence of Diabetes and Obesity, people are becoming sensitive to their calorie intake. India has one of the world's largest diabetic populations in the world estimated at over 40 million. This figure is likely to increase up to 75 million by 2025. No sweetener currently available on the market has proven to be a fully satisfactory replacement for sugar, but the emergence of Stevia has rekindled hope. In Japan, companies like Sunkist and Nestle use Stevia as a sweetener. Coca-Cola uses stevia in Japan for its Diet Coke, as the herb is non-caloric.

National/ Societal Relevance

Due to increasing incidences of Diabetes stevia is the need of the hour. India becoming the diabetic capital of the world with over 45 million patients. As a result there is a need for effective natural, zero calorie sweeteners safe for diabetics

Project Deliverables

Progress vis-a vis objectives - Commercial scale extraction unit is in operation.

Technology/Product developed - Green Technology/Hot- water Extraction Technology has been developed. Product developed are tsg total steviol glycosides and Table top packing under brand "CHEENI KUM"

IP generated/Potential for IP generation - There is a great potential for IP generation.

Resources generated - Manpower skilled as well as unskilled have been employed along with some trainees. Fund mobilization to be started for raw material in the coming months.

Plans to take innovation further

There is a plan to take innovation further by taking into partnership with some national as well as international companies.

Risks Envisaged

Raw material i.e. stevia dry leaves are not easily available in the open market and for that purpose self farming or controlled farming is the only option.

Team Members

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Healthline Pvt. Ltd.

The Innovation

Development of silk protein based cryopreservation medium for bovine sperm to sustain viability and motility to enhance success rate of artificial insemination

Brief Description

Cryopreservation extends the availability of sperm for fertilization for longer period however, the fertilizing potential of the frozen-thawed bovine sperm is compromised because of alterations in the structure and physiology of the sperm cell especially

Stage of Development

Proof-of-Concept.

Innovative Element

Extraction of specific silk proteins, purification, validation of anti-freezing capability and standardization of the fractions formulating semen extender

Market Potential

Number of straws required by 2016-17 is 100 million containing silk protein in semen diluant. Once the proof of concept is established, we propose to conduct large scale trial with the help of NDDB and if found successful the new ingredient can become part of semen extender in all the 56 cattle semen stations of the country. Quality frozen semen being the key requirement of dairy industry huge market potential exists in dairy centric countries.

National/ Societal Relevance

National Dairy Plan is to have quality frozen semen production so as to ensure better fertility and conception rate of semen produced at all 56 cattle semen stations of the country. In addition NDP has a vision of increasing percentage of animals bred through artificial insemination from current level of 20 to 35 by 2016-17 and further to 50 by 2021-22. That means apart from ensuring quality of frozen semen during its life-cycle quantity of semen straws need to increase from current 66.8million to 100 million by 2016-17 and 140 million by 2021-22.

Project Deliverables

Progress vis-a vis objectives - New range of anti-freezing proteins derived from silk-proteins as additive to semen extender- five different silk protein fractions obtained starting from cocoons from three different silkworm breeds. They are under characterization and testing.

Technology/Product developed - Under process

IP generated/Potential for IP generation - There is a possibility of generating IP for formulation and specific application for semen cryopreservation in terms of assuring better productivity by using anti-freezing proteins which acts non-colligatively.

Resources generated - One manpower recruited and second one to be recruited. Special cryo-microscope under development.

Plans to take innovation further

We may have to team up with NDDB for large scale trial to take this innovation further, post completion of the project.

Risks Envisaged

Silk protein/peptide not performing to the expectations with no significant support to maintain viability and motility of the sperm.

Team Members

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Hrishikesh Mungi - IKP

The Innovation

A novel formulation for Probiotic food additive

Brief Description

A novel formulation comprising a potential probiotic strain as a probiotic food additive which will help reduce cholesterol. As hypercholesterolemia being the risk factor lowering of serum and food cholesterol will help reduce the risk.

Stage of Development

Validation

Innovative Element

The formulation comprises of novel probiotic strain with enhanced probiotic properties. The organism produces higher and faster Bile salt Hydrolase enzyme which would interfere in the enterohepatic pathway, thus reducing serum cholesterol. The organism has a capacity to lower food cholesterol as tested by in-vitro conditions. Thus it will reduce both serum and food cholesterol without any side effects.

Market Potential

Global industry analysis forecast for 2012 -2018 indicate global probiotics demand was worth USD 27.9 billion in 2012 and is expected to reach USD 44.9 billion by 2018, growing at a CAGR of 6.8% from 2013 to 2018. European probiotic demand is expected to grow at a CAGR of about 6.7% from 2013 to 2018, with Germany and U.K expected CAGR of over 6% each from 2013 to 2018. The markets of North America and emerging countries such as Brazil also show huge potential for growth.

National/ Societal Relevance

As per WHO data cardiovascular disease related deaths in India are estimated as 1.25 million and Globally 10.00 million. Indian market for drugs/nutraceuticlas to reduce/ minimize risk of cholesterol is estimated at USD12 billion and globally as USD29 billion.

Project Deliverables

Progress vis-a vis objectives - Identified mode of formulation. Powder form Permission for Pre-clinical trials has been acquired. Studies for testing the effect of Probiotics to provide a synergistic effect are ongoing.

Technology/Product developed - Under development

IP generated/Potential for IP generation - Provisional Patent Filled

Resources generated - Abhiruchi Probiotics Pvt Ltd Enterprise created, 2 People employed, Probiotic Strain Testing Characterization and production facility development is in process.

Plans to take innovation further

Commercialization through Abhiruchi Probiotics Pvt Ltd.

Risks Envisaged

Need to establish reproducibility and repeatability for lowering of cholesterol by Probiotic Strain. Improvement in Shelf Life.

Team Members

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India Glycols Ltd.

Collaborator - DBT-ICT Centre for Energy Biosciences, Mumbai

The Innovation

Setting up 10 ton Lignocellulosic biomass/day processing plant to produce about 3000 Litre ethanol/day (Phase II: To run the plant in integrated continuous mode)

Brief Description

The present proposal aims to extend the earlier BIPP supported Lignocellulosic ethanol pilot plant using the unique technology developed at the DBT-ICT Centre for Energy Biosciences.

Stage of Development

Validation

Innovative Element

The inventive features include size reduction and feed slurry preparation from biomass feed working at 500kg/h ~ 10 ton/day. A Novel ammonia + nitric acid based two-step continuous fractionation of biomass to cellulose, hemicelluloses and lignin fractions working at 400kg/h ~ 10ton/day is the highlight of the project. The plant will include continuous enzymatic process with enzyme recycle to convert cellulose and hemicellulose into fermentable sugar in yields 90% working at 15kg/h. Recycle of ammonia and process water whatever used

Market Potential

Current norms dictate 5% blending of ethanol with gasoline. Although the political will exists to raise this to 10 or higher, there is no ethanol available in quantities enough to meet the projected requirement. With a potentially successful lignocellulosic ethanol technology, this gap can be more than bridged and blends up to 50% ethanol can be possible.

National/ Societal Relevance

The need for substantial ethanol production free from vagaries of sugarcane production cannot be overemphasized. With more than 250 million tons of surplus agricultural residue available in the country, putting up of decentralized commercial lignocellulosic ethanol plants each producing about 100KL ethanol/day is a distinct possibility provided a viable and sustainable technology is available.

Project Deliverables

Progress vis-a vis objectives - Detailed engineering packages for each of the segments and connecting equipment between segments is complete. Equipment ordering is complete and procurement is going on. Necessary civil and electrical work is in progress.

Technology/Product developed - The current project will result in converting the technology from discontinuous mode to fully integrated continuous flow mode.

IP generated/Potential for IP generation - NA

Resources generated - Yes

Plans to take innovation further

It is now desired that the entire plant be integrated to operate at constant and same capacity throughout from biomass size reduction to fermentation in a continuous integrated manner.

Risks Envisaged

No Risk

Team Members

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Institute of Microbial Technology

Collaborator - Rossari Biotech Limited

The Innovation

Development of a novel bioreactor system for production of IMTECH-laccase and verification of commercial viability of IMTECH process.

Brief Description

- Laccase is an unique enzyme with 4 copper atoms produced mainly by fungi known as white rot fungi. Laccase exhibits broad substrate range which, can be further enhanced by small organic molecules called "mediators".

Stage of Development

Validation

Innovative Element

The project involves design of a novel reactor for fed-batch operation of surface culture for scale up of laccase production. The constraints posed by the physiology of the fungus can be addressed by the design and operation of reactor in fed-batch mode. The reactor will enable linear scale-up of the process.

Market Potential

Laccase is one of the expensive enzyme. Laccase is currently being imported in India. The laccase produced in India is expected to reduce the cost in India as well as it expected to be cost competitive in the International market with export potential.

National/ Societal Relevance

Indigenous production of laccase will result in self reliance in the laccase production saving foreign exchange. Due to cost competitiveness, Laccase produced in India will also have export potential.

Project Deliverables

Progress vis-a vis objectives - Profile of the bacterial culture is complete. Batch profile residual glucose and enzyme activity, has been completed. Testing of IMTECH laccase for denim finishing has been evaluated by industrial partner Rossari Biotech in their lab facility.

Technology/Product developed - Under development

IP generated/Potential for IP generation - A novel surface culture reactor developed will have the potential of a PCT patent.

Resources generated - Two persons, a project assistant and a Research associate are being trained.

Plans to take innovation further

Setting up the pilot plant or industrial plant for laccase production

Risks Envisaged

There is no risk involved as the fermenter parameters have been standardized and the yield is stable

Team Members

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The Innovation

Low-Cost Technology for probiotic products for the Women and Children of Lahaul and Spiti

Brief Description

Prevalence of diarrhea and other gastrointestinal disorders necessitates preventive and promotive health care through functional foods. The main theme of the project is to develop novel food products to effectively address the issues of nutritional requirement.

Stage of Development

Discovery

Innovative Element

Novel probiotic product will be developed for the first time in India based on fruit juice and malt mixtures.

Market Potential

Food & beverages dominated the application market and accounted for over 80% of the total probiotics market. The market is expected to reach USD 52.34 billion by 2020. Asia-Pacific is expected to be the fastest growing market, at an estimated CAGR of 7.7% from 2012 to 2020. India represents a huge market opportunity for the development of probiotics. Indian probiotic market will register revenue growth of 19.80% each year to 2019.

National/ Societal Relevance

As per the district health plan 2008-2009, one of the three diseases which are most common, is Diarrhea. Interventions carried out to control the diseases bring out mixed results. Due to single cropping season, there is a dearth of year round employment opportunities in the area. Therefore, agro-processing assumes importance and can also provide additional income and employment avenues to the farmers especially during winter months when there is virtually no farm operation.

Project Deliverables

Progress vis-a vis objectives - Preliminary standardization of the juice matrix is complete. The conditions for inhibition of browning and pasteurization are complete. Biochemical testing of strains is complete.

Technology/Product developed - Under development

IP generated/Potential for IP generation - In the process of filing.

Resources generated - Manpower employed and trained in new product development, quality assessment testing etc.

Plans to take innovation further

Discussions are in progress with the NGO, Ecosphere, stationed at Spiti, Himachal Pradesh. Registration for own company is also in process. Negotiations are also on with Biologic Applications Pvt. Ltd, for technology transfer.

Risks Envisaged

None

Team Members

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Neera Bhalla Sarin - FITT

The Innovation

Innovative approaches for upscaling natural alpha-tocopherol production from engineered Brassica juncea (Indian mustard) for therapeutics

Brief Description

The objective of the project is to enhance the synthesis of alpha-tocopherol using in vitro cell cultures as well as hairy root cultures. Very simple technology is being utilized based on our experience with tissue and cell cultures.

Stage of Development

Proof-of-Concept.

Innovative Element

The use of cell and hairy root cultures for increasing the level of alpha-tocopherol.

Market Potential

Natural vitamins are preferred over synthetic ones. Therefore, we see a lot of market potential for the product that we will produce in India.

National/ Societal Relevance

This product could be of national as well as societal relevance in the long run.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development

IP generated/Potential for IP generation - There seems to be a good potential for generation of IP.

Resources generated - Three post-docs have been employed so far and trained. More are being trained. We are going to set up the fermenter which is scheduled to arrive by next week.

Plans to take innovation further

Talking to people who would like to benefit from this endeavour which is a bit premature at the moment.

Risks Envisaged

The temperature fluctuations can affect the growth of the cultures. Sometimes contamination can take place.

Team Members

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Oriental Aquamarine Biotech India Pvt. Ltd.

Collaborator - National Centre for Aquatic Animal Health

The Innovation

Design modification and commercialization of nitrifying bioreactor technology for the establishment of organic recirculation prawn seed production system

Brief Description

The company offers Nitrifying Bioreactor Product, Packed Bed Bioreactor (PBBR) to develop a bio-secure Recirculating Aqua-culture System (RAS). The reactor has a modular design and can be scaled up.

Stage of Development

Validation

Innovative Element

The Nitrifying Bioreactors are superior to the conventional filtration systems as they work using specific nitrifying bacterial consortia generated according to the salinity of water.

Market Potential

The global aqua-culture industry, currently valued at over USD144 billion, is growing at an average of 8% annually in the last 20 years. In 2014, aqua-culture overtook wild-caught fish as the leading source of seafood. By the year 2020, the industry's value is expected to reach over USD 200 billion a 38% increase.

National/ Societal Relevance

Commercialization of this technology would give ample avenues to manage the required water quality in aqua-culture sector with little hardship, maximum consistency, least incidents of diseases and with enhanced survival rate.

Project Deliverables

Progress vis-a vis objectives - The performance of the PBBR in a shrimp maturation system under Recirculating Mode was demonstrated in West Coast Hatchery, Alleppey. Field validation of Stringed Bed Suspended Bioreactor (SBSBR) in the *Penaeus monodon* larval rearing systems was conducted at Queens Hatchery Kodungallore. New design concepts have been finalized.

Technology/Product developed - The work carried out has resulted in development of an *Ex-situ* PBBR with a capacity of 60 tons per day and an *In-situ* SBSBR.

IP generated/Potential for IP generation - The technology has been patented in India (Patent No. 241648), Thailand, Japan, Philippines, South Korea and Indonesia etc. as well as PCT i.e. WO 02/30835 A1.

Resources generated - Established a manufacturing facility to manufacture 3 units of PBBR and 25 units of the SBSBR per month. A Nitrifying Bacterial Consortia Production Unit and a Microbiology laboratory have been established to culture the bacterial consortium necessary for 6 reactors per month.

Plans to take innovation further

We plan to demonstrate the capability of PBBR in improving the efficiency of operation in Indian Market in collaboration with leading institutions like RGCA etc. To facilitate subsidy from Government Agencies like MPEDA / NFDB / NABARD to customers and to increase the reach of the product in the industry. Globally, we target neighboring countries with a well-established aquaculture industry like Sri Lanka, Thailand, Indonesia, Malaysia, Philippines etc.

Risks Envisaged

Overcoming any mental block hatchery technicians may have from years of doing it differently.

Team Members

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Rohan H. Kamat - CCAMP

The Innovation

Development of a novel technology for generation of stable transgenic systems with no off-target effects.

Brief Description

We are trying to develop a process to generate stable transgenic model systems which will have no off-target effects typically caused due to genetic perturbations.

Stage of Development

Discovery/ Proof-of-Concept.

Innovative Element

The innovative element in our technology is the NO off-target effects factor which has not yet being claimed by any of the close competitors.

Market Potential

Our technology fits majorly in two sectors: Basic R&D academia wherein genetically altered model systems form the basis of research, and the pharmaceutical industry wherein drug discovery platforms would utilize our technology.

National/ Societal Relevance

The proposed project opens up indigenously developed Genome Editing platforms in India thereby adding a major feature to the Life Science industry in India.

Project Deliverables

Progress vis-a vis objectives

A kit to make stable transgenic cell lines with no off-target effects.

Technology/Product developed

Under development

IP generated/Potential for IP generation

Filing for process patents and eventually file for product patents for various components of the proposed technology.

Resources generated

Incorporated Viravecs Labs LLP which has 2 employees so far.

Plans to take innovation further

We plan to grow further by partnering with other units which can provide us with expertise in respective model systems.

Risks Envisaged

The risks envisaged are the market potential of the said process/product and the market outreach.

Team Members

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Sorokhaibam Suresh kumar Singh - KIIT

The Innovation

Development of food colourants and textile dyes from natural pigments of microbial origin

Brief Description

Colour pigments play key role in food consumption. The use of synthetic colourants in food are well known to cause various side effects to human health and environment. Various natural pigments are produced by filamentous fungi.

Stage of Development

Proof-of-Concept.

Innovative Element

The pigment is water soluble and hence will not accumulate in body tissues after consumption. The pigment is eco-friendly and can be biodegraded in the environment. The strain of the organism is novel by producing no mycotoxins in the culture conditions of pigment production though the type strains produce mycotoxins.

Market Potential

The pigment being organic in nature will be equivalent to other herbal based products in the market. Market potential will be local and abroad in terms of organic food colourant demands.

National/ Societal Relevance

In India, there has been no such similar product being developed so far and are not available in the market. Therefore, at the introductory phase, there may be reluctance of peoples to consume foods coloured with this dye from fungi. In developed countries, particularly EU , US and other Asian countries, already similar products have been introduced in the market and the people are well educated about healthy food systems will not create much negative concern about the product.

Project Deliverables

Progress vis-a vis objectives - Production of red pigment at laboratory scale completed. Crude pigments has been isolated from liquid culture with a yield of 5.3g/L. The amount of purified separated pigment yield to about 2.3g/L.

Technology/Product developed - A novel strain of fungus was isolated and a standard protocol of production of a red pigment has been developed.

IP generated/Potential for IP generation - Filing of patent for production protocol of the mycotoxins free red pigment from the novel strain of fungus is in progress.

Resources generated - A research staff, a JRF is employed and trained with specialized skills in production protocol and purification of the red pigment.

Plans to take innovation further

After completion of validation and commercial trials of the proposed product, it is planned to partner with any of the market leaders in nutraceuticals or pharmaceuticals for product formulation and marketing.

Risks Envisaged

Presence of toxic compounds may contaminate a product or a batch of product. However, such problems can be resolved before release of a product in the market through proper and regular verification/examination for every batch of product.

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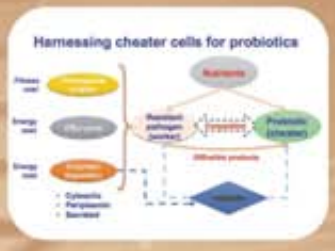
Soumen Roy - CCAMP



The Innovation

Harnessing cheater cells for probiotics: applying game theory for nutrition and health

Brief Description

Introduction of rational strategies for the use of probiotics by a combination of experiments, advanced clustering techniques and game theoretical modelling.

Stage of Development

Proof-of-Concept.

Innovative Element

Use of probiotics for enabling antibiotic action. To provide a prescription for probiotics based on growth dynamics of probiotic-pathogen mixed population, in the presence of antibiotics will give a competitive edge to probiotic organisms.

Market Potential

A combination antibiotic-cheater therapy with probiotics as cheater cells may lead towards renewed use of antibiotics which have become useless due to resistance development. This re-utilization is important since the discovery of newer antibiotics is an extremely slow and costly process. Any therapy based on probiotics is expected to be cost effective due to the ready availability of these beneficial organisms that require little or no processing after growth.

National/ Societal Relevance

Antibiotic resistance is a major problem and the product should lead to new type of cost effective therapy against antibiotic-resistant organisms.

Project Deliverables

Progress vis-a vis objectives - Project is progressing well as per the objectives.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - High potential for IP generation.

Resources generated - Started an experimental lab in the incubation facility at IIT-Kharagpur which is well equipped for basic microbiology and molecular biology work and are planning to increase lab facilities. Appointed two post graduate Technical Assistants.

Plans to take innovation further

Collaboration with companies specializing in neutraceuticals and with companies like Amul and Mother Diary. In the long run, collaboration with companies producing antibiotics, as the method has potential therapeutic uses.

Risks Envisaged

The validity of in vitro determined successful strategies is to be implemented in an in-vivo model at an incubator located at a distance which is difficult.

Team Members

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Srinivas B V - CCAMP

The Innovation

Value added products such as nutraceuticals, poultry feed, aqua feed from the wastes/byproducts of palm oil mills and silk reeling industries

Brief Description

Of the total raw silk produced, 75% is discarded as waste silkworm pupa rich in omega-3-fatty acid and proteins. In Oil palm industry, for every 1Kg of oil, 3.45Kg of waste is generated. These wastes can be used to develop valuable products.

Stage of Development

Commercialization.

Innovative Element

Palm industry solid wastes has high content of anti-nutritional factors, like lignin, that prohibit its use as feed. In silk industry wastes one of the major hindrance to usage is its odor. Achieved lignin utilization in palm industry waste and reduction of odor in silkworm pupa waste.

Market Potential

Awareness of omega-3 fatty acids as an important nutrient for physical and mental health has reached critical mass and the number of consumers seeking such products has increased dramatically with global market valued at USD 2,786.2 million in 2014 and is anticipated to reach USD 7,499.5 million by 2021. The global poultry feed additives market is expected to reach USD7,829.8 million by 2018 growing at a CAGR of 6.1% from year 2013 to 2018.

National/ Societal Relevance

The silkworm pupa is discarded due to its bad odor and becomes an environmental hazard. If this waste is effectively utilized, it can completely meet the Omega-3-fatty acid requirement RDA of 78 lakh children or 26 lakhs pregnant women/lactating mothers. Additionally, the cake discharged is rich in protein and comprises of all the essential amino acids and can be used as a raw-material for poultry feed, aqua feed etc. Also, waste coming out of oil palm industry can be utilized for developing different value added products.

Project Deliverables

Progress vis-a vis objectives - Complete profiling of the effluents discharged from palm and silk reeling industry successfully completed. Pre-treatment of the raw materials and their evaluation has been completed. Poultry feed, aqua feed and nutraceuticals successfully formulated at pilot scale. In vivo studies performed.

Technology/Product developed - A novel process to obtain deodorized omega-3 fatty acid from silkworm pupae and to utilize palm industry wastes to cultivate lignin-utilising edible mushrooms

IP generated/Potential for IP generation - Filed provisional patent (4613/CHE/2014): A Biodegradable insecticidal palm fiber mat from remnants of bio-oil extraction. Filed complete patent (3965/CHE/2015): Alpha-linolenic Acid enriched oil from silkworm for nutraceutical & cosmeceutical applications

Resources generated - Trained around 15 students. Facility created for pilot scale production of poultry feed and aqua feed and their analysis. A company Aspartika Biotech Private Limited incorporated.

Plans to take innovation further

To establish partnership with firms and people or a merger for the successful entry and stabilization of products.

Risks Envisaged

No risk at this stage

Team Members

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Srividya Janani Venkatraman - CCAMP

The Innovation

Mapping of Prochiral Chemical Space covered by Ketoreductases

Brief Description

Engineered E. coli cells capable of producing chiral alcohols

Stage of Development

Discovery

Innovative Element

Design and construction of novel engineered bacterial strains that produce chiral alcohols

Market Potential

Chiral alcohols are important intermediates in the synthesis of drugs and fragrances

National/ Societal Relevance

Fermentative production of chiral alcohols removes dependence on imports

Project Deliverables

Progress vis-a vis objectives - Designing a library of chemically diverse ketones for screening against the available set of ketoreductases has been achieved.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - We will patent the best engineered strains that produce Shikimic acid

Resources generated - Employed three scientists.

Plans to take innovation further

Stitching together a collaborative ecosystem for the fermentative production of shikimic acid. Speaking to facilities such as Biozeen to set up a pilot scale process and looking for potential customers such as NatCo.

Risks Envisaged

Scale of chiral intermediate production and costs involved may not be compatible with market realities.

Team Members

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Steer Engineering Pvt. Ltd.

Collaborator - Manipal College of Pharmaceutical Sciences

The Innovation

Continuous process for economic production of effervescent preparations of amino acids and other supplements

Brief Description

A twin screw hot-melt extrusion process could be modified such that it could be used without the use of water or organic solvents to prepare effervescent granules. Drying and particle size reduction will be performed *in-situ*.

Stage of Development

Validation

Innovative Element

It will be a continuous process for manufacturing effervescent preparation through an environmental friendly process (no use of organic solvent) wherein product retains high percentage of Carbon dioxide which in turns help fast disintegration of the tablets in less than a minute. The granules generated will have excellent properties of tableting.

Market Potential

The effervescent technology platform could be used for several supplements and amino acids apart from NAC, which is currently required in several diseases conditions. Effervescent formulation will be used by the patient with difficulty in swallowing (Pediatric and Geriatric patients). The formulation will also be utilized for the preparation of Nutraceuticals and OTC.

National/ Societal Relevance

The amino acid NAC precursor for cysteine which is in turn used for synthesis of glutathione used in the treatment of oxidative stress in several disease conditions. With the current innovation, NAC and other unstable supplements could become affordable. The effervescent granules can also be used for supplement of electrolyte.

Project Deliverables

Progress vis-a vis objectives - A process for preparation of effervescent granules without use of water or organic solvents and in a continuous operation and without requirement of drying step or size reduction step has been developed.

Technology/Product developed - Effervescent preparations of NAC and two other drugs.

IP generated/Potential for IP generation - A Hot Melt Fragmentation Extruder and Process (PCT Application Number: PCT/IN2014/000358 dated May 27, 2014) Effervescent Compositions and Methods of Making and Using the Same (PCT Application Number: PCT/IB2015/000400 dated March 26, 2015)

Resources generated - Two Scientist employed. Tablet compression machine, tablet hardness tester, Microscope and thickness tester have been purchased. Low humidity processing area facility created.

Plans to take innovation further

The technology will be and licensed to the suitable partners.

Risks Envisaged

Processing temperature is the critical variable when using sodium bicarbonate as carbon-dioxide source as decomposition of sodium bicarbonate produces water which in-turn triggers further effervescence. NAC is an amino acid which is sensitive to alkaline hydrolysis.

Team Members

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String Bio Pvt. Ltd - CCAMP

The Innovation

Economical process for conversion of waste to green chemicals

Brief Description

While the problem of waste is an escalating crisis, existing solutions for managing waste have several limitations. String solution is a sustainable, scalable, fermentation based to convert waste to value added products.

Stage of Development

Proof-of-Concept

Innovative Element

Our key innovations are IP protected engineered strains that function at high yields, effective and efficient fermentative designs, and smart downstream processing to create economically viable products.

Market Potential

Lactic acid has applications in food, pharma, industrial solvents, personal care and manufacture of biodegradable plastics. Lactic acid market is expected to grow to USD3.5 billion by 2019 at a CAGR of 20%. Polylactic acid, a biodegradble polymer, is the largest use of lactic acid. Succinic acid has applications in food, pharma, plasticizers, solvents/lubricants and manufacture of polybutylene succniate, a biodegradable polymer. Global succinic acid market is expected to reach USD0.5 billion by 2020, growing at a rate of 45.6% between 2013-2020.

National/ Societal Relevance

Our proposed solution offers a sustainable answer for managing waste.

Project Deliverables

Progress vis-a vis objectives - Successfully completed our first two milestones on target.

Technology/Product developed - Developed a scalable and sustainable process to convert methane generated from waste into value added products.

IP generated/Potential for IP generation - Over the course of the project we have generated key IP around our critical parts highlighted above namely, the microorganisms, fermentation process and downstream purification.

Resources generated - Generated employment for Masters and Doctoral level candidates. All employees were trained through in-house training program.

Plans to take innovation further

String is in the process of setting up a demo facility for conversion of waste to methane and methane further to value added products. Post successful implementation of the program, we will work with strategic partners for scaling up as well as licensing of the core technology

Risks Envisaged

None as of now.

Team Members

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Swayambhu Biologics Pvt. Ltd.

The Innovation

Bioremediations for Agro Industrial Solid Wastes By ARBIT for Effective Management through Energy and Biomanure conversions

Brief Description

Solid waste management of Agro process and product industries like coirpith, Sugar and distillery industry etc and converting their waste into humus rich organic manure.

Stage of Development

Validation/Commercialization.

Innovative Element

Accelerated Rapid Biological Intervention Technology (ARBIT). Coirpith is used without any acid and alkali treatment. Bioremediation of coirpith within 27 days with reduction of C:N ratio , Netural pH. Enrichment of Sugarcane industry and Distillery Spentwash for Potash which can be used as organo potash substitute for Synthetic fertilizer

Market Potential

All the Technologies have high Market Potential both in India and Abroad

National/ Societal Relevance

Presently there are around 40 coirpith industries and 400 sugarcane industries have their process waste in the form of coirpith and ash in different forms which can be converted into high value nutrient substitute that can benefit both farmers and environment.

Project Deliverables

Progress vis-a vis objectives - Signed MOU for both the technology Coirpith and Spentash. Full Fledge R&D Lab in IIT Madras Research Park. Standardized the protocols and procedures for coirpith and Spentash.

Technology/Product developed - Technology developed on Coirpith.

IP generated/Potential for IP generation - Filed 2 patents on converting sugarcane pressmud in 14 days against 90-120 days and other for effective management of Spentwash onto the pressmud 4:1 . PCT filed for Spentwash technology. Corpith and Ash enrichment will be filed within 2 months.

Resources generated - Trained around 30 unskilled labourers in industrial operations and now in the process of establishing Technology Programme Management Systems in the respective industry premises. Mobilised funds to the tune of 1.00 crore through private placement to conduct mass scale commercial demo to industries this crushing season viz.Sept 2015 to Jun 2016. High profile industries such as Bajaj evinced interest in our technology.

Plans to take innovation further

The Company have already signed an MOU with Indus Coco substrates, TN, India for Coirpith project. Once commercial validation is done the technology will be transferred.

Risks Envisaged

Propagation of technology takes time. Sugar industries operation is seasonal and hence the Ash is not available throughout the year and might be chargeable in future.

Team Members

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Symchem Research Labs Pvt. Ltd.

The Innovation

Development of a novel synthetic route for manufacturing Levoglucosan for making affordable value added downstream products

Brief Description

Levoglucosenone can be used in growing chiral markets and as a scaffold, particularly in new oncology and anti retroviral treatments. Derivative work has been underway in many leading universities in North and South America, Russia, Japan and Sweden.

Stage of Development

Validation.

Innovative Element

Symchem has used D-Glucose as starting material to synthesis Levoglucosan, bypassing the traditional pyrolysis route. This new synthetic route promises to be scalable upto commercial production levels, conforms to green chemistry and is forecast to be financially viable.

Market Potential

The potential market size has been estimated to be in excess of USD 250 billion considering its application areas in different segments of use.

National/ Societal Relevance

Levoglucosan or its derivatives are being increasingly used for its bioeconomic potential globally. Today India imports Levogluosan whereas Symchem has done advanced research to develop an Industrial process to commercially manufacture it.This will make India self sufficient and self reliant and conserve foreign exchange.

Project Deliverables

Progress vis-a vis objectives - Optimisation of Catalyst/solvent is in progress

Technology/Product developed - Under development.

IP generated/Potential for IP generation - The Process qualifies for a new IP.

Resources generated - NA

Plans to take innovation further

After completion of project

Risks Envisaged

The risk factor is in scaling up to commercial scale due to the fractional availability of Levoglucosan. The yields have to be increased depending on use of different catalytic agents. The role of optimizing the catalytic agents is a key risk factor as it is very expensive.

Team Members

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Varuna Biocell Pvt. Ltd.

The Innovation

Production of Beta Galactosidase using Agriwaste

Brief Description

Dairy products are difficult to digest by huge population particularly infants due to lactose intolerance because of absence of an enzyme lactase or Betagalactosidase. Lactase has attracted our attention as it has wide area of application in many industry.

Stage of Development

Validation.

Innovative Element

Suitably modulated and induced organism will secrete viable quantity of Beta galactosidase on specially designed nutrient and SSF system. For industrial production of enzymes it is important to improve conditions so as to obtain better yield and better stability at ambient temperatures. Only 5 of enzymes are being produced by solid state fermentation. Submerged fermentation appears to be method of choice where sterilization and process control is easier to achieve. We develop strains and process in solid state fermentation using agri waste.

Market Potential

There are very few manufacturers of Beta galactosidase in India. It is largely imported from Europe, Japan and China. Development of lactase production technology will help Indian population by import substitution.

National/ Societal Relevance

Production of Beta galactosidase using agriwaste, for its application in dairy industry. Suitability of its application in infant nutritional feed for lactose intolerance. Development of economically viable production of beta galactosidase and its use in dairy, child food and in pharmaceutical industry.

Project Deliverables

Progress vis-a vis objectives - The project has just started.

Technology/Product developed - Under development.

IP generated/Potential for IP generation - There is a possibility of IPR as we have worked out a unique method of modulating strains for enhancement of specific secretions and its production using Agri waste.

Resources generated - Under Progress

Plans to take innovation further

After successful pilot scale production and stabilisation of the enzyme, trial in various dairy giants as well as its formulations that could be used in pharmaceutical industry will be planned.

Risks Envisaged

At this point of time we do not foresee any risk.

Team Members

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Way Forward

BIRAC, over the last 3 years has reached out to all aspects of nurturing bio-innovations in the country. The efforts by BIRAC would now require scaling and a sustained push to build an innovation environment in India that compares to the best in the world.

BIRAC would continue to focus on deepening its impact through partnerships with national and global agencies across the value chain of the biotech product development. BIRAC's partnership with SRISTI to encourage innovations at grassroots and with the Department of Electronics & IT (DeitY), Government of India allude to the commitment to seek partners with whom BIRACcan share resources to create greater impact. BIRAC will continue to build upon existing partnerships with Bill & Melinda Gates Foundation, Wellcome Trust, CEFIPRA. BIRAC will continue to focus on entrepreneurship development and social innovation especially through BIG and SPARSH. Besides, efforts to bridge the valley of death at early stages of entrepreneurship will continue with operationalisation of an equity fund BIRAC AcE fund.

BIRAC will keep its ears to the ground to listen to the feedback from all stakeholders such that gaps can be identified and solutions for the gaps are then put in action.

The efforts in "Nurturing Opportunities" will continue to fulfil BIRAC's mission of Empowering and Enabling the Biotech Innovation Ecosystem for Affordable Product Development

Biotechnology Ignition Grant (BIG)

S.No.	Title	Applicant	BIG Partner
1	Deglycosylated ethnic banana as a mucosal health protectant-	A Pallavi	Foundation for Innovation and Technology Transfer (FITT), New Delhi
2	An innovative, hand-held (pen-styled) sensor system for early identification of coarctation of aorta in neonates	Abhijith Bailur	Foundation for Innovation and Technology Transfer (FITT), New Delhi
3	A novel formulation for Probiotic food additive.	Abhiruchi Probiotics Pvt. Ltd	IKP Knowledge Park, Hyderabad
4	Development of an aptamer-based platform to detect novel Tuberculosis markers in human serum	Achira Labs Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
5	Detection of Circulating Tumor Cells by Multifunctional Highly Dispersible Polymeric-Magneto-Antibody Nanosystem -	Actorious Innovations and Research	Foundation for Innovation and Technology Transfer (FITT), New Delhi
6	Development of trypsin resistant PAN reactive trypsin antibodies for industrial application	Affigenix Biosolutions Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
7	An Affordable, 'Point-of-sample collection' Cervical Cancer screening tool	Aindra Systems Pvt. Ltd.	IKP Knowledge Park, Hyderabad
8	Establishment and Validation of Commercially Viable Technologies for the Production of Omega-3 Fatty Acids from Marine Microalgae	AlgalR NutraPharms Pvt. Ltd.	IKP Knowledge Park, Hyderabad
9	Production of collagen and by production from fresh water fish origin for biomedical applications:	Amnivor Medical Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
10	Development of a novel diagnostic kit for Tuberculosis	Annweshan SciTech. Pvt. Ltd.	IKP Knowledge Park, Hyderabad
11	Renewable chemicals for high performance materials	Aseem Gupta	Foundation for Innovation and Technology Transfer (FITT), New Delhi
12	First-in-Class Therapeutics for Lysosomal Storage Disorders	Aten Biotherapeutics Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
13	Laser Desorption / Ionization Mass Spectrometric (LDI MS) solutions for HIGH throughput detection and analysis of residual compounds, contaminants and small molecules in milk and dairy products	Barefeet Analytics Pvt. Ltd.	IKP Knowledge Park, Hyderabad
14	Process Crystallization as a Purification Tool to Therapeutic Antibody	Bhami's Research Laboratory	Foundation for Innovation and Technology Transfer (FITT), New Delhi
15	Osteoconductive Bone Graft Susbtitutes	BiolMed Innovations Pvt. Ltd.	IKP Knowledge Park, Hyderabad
16	Mapping of Prochiral Chemical Space covered by Ketoreductases	Biomoneta Research	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
17	Brun – A Perinatal Monitoring Device	Brun Health Pvt. Ltd.	IKP Knowledge Park, Hyderabad
18	Unraveling mechanism of action for anti-bacterial compounds emerging from phenotypic screens	Bugworks Research	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
19	Synthetic biology for overproduction of 2, 3-butanediol	Butacell Research Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
20	Green Manufacturing of Cephalosporin Antibiotics Using Recombinant Deacetylase	Cellzyme Biotech India Pvt. Ltd.	Venture Center, Pune

S.No.	Title	Applicant	BIG Partner
21	Enzymatic maceration of mango pulp to produce quality wine	Codon Biosciences Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
22	Novel and effective way to reduce the risk of ventilator associated pneumonia	Coeo Labs	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
23	SphinX - Ostomy management device	Crimson Healthcare Pvt. Ltd.	Venture Center, Pune
24	Innovative scar-free organ retractor for reduced port laparoscopic surgery	Croleon Innovation Labs Pvt. Ltd.	Venture Center, Pune
25	Pharmacological Evaluation of N-oxide Metabolite of Antipsychotic Drug for Type 2 Diabetes	Crystalin Research Pvt. Ltd.	IKP Knowledge Park, Hyderabad
26	Scintilla - a portable urine protein analyser device for Mass Healthcare	Cutting Edge Medical Devices Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
27	Conversion of CT/MR data to 3d printed models help the surgeons plan surgery more accurately by means of better implants thereby increasing accuracy & reducing time taken for actual procedure. This brings down costs, increases throughput & accuracy	DF3D Creations Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
28	Interaction of Nano-embedded Piriformospora indica with the plant of medicinal importance, Brassica oleracea var. Botrytis (Broccoli)	Dr. Ajit Varma	Foundation for Innovation and Technology Transfer (FITT), New Delhi
29	Manufacturing of a new universally adjustable orthodontic bracket	Dr. Alka Banker	Foundation for Innovation and Technology Transfer (FITT), New Delhi
30	Design and development of a low cost, easy-to-use stretcher, for complete immobilization of spine and limbs, and shock absorption during transport of physical trauma patients	Dr. Anupan Bam	Foundation for Innovation and Technology Transfer (FITT), New Delhi
31	Tear Dipstick immunoassay for diagnosis of adult primary glaucoma	Dr. Aparna Rao	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
32	Novel Therapeutic interventions against fatal canine viral pathogenisis	Dr. B. Mohana Subramanian	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
33	Multiplexed bead based suspension array for dengue serotyping	Dr. Biswadeep Das	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
34	Transdermal Iron Replenishment Therapy	Dr. H.N. Shivakumar	Foundation for Innovation and Technology Transfer (FITT), New Delhi
35	Intraosseous Device	Dr. Jayant Karve	Foundation for Innovation and Technology Transfer (FITT), New Delhi
36	An implantable drug-delivery device for improving Tuberculosis treatment adherence and compliance	Dr. Jonathan Pillai	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
37	3D printer filaments that are biomaterial-based and eco-friendly	Dr. Karthik Chetan	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
38	Development of De-metalizer Kit from Biopolymers for Efficient Removal of Heavy Metal Ions from Contaminated Water Especially of the Mining Areas	Dr. Luna Goswami	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
39	Production of Phytate free food grains: Effective Strategy to deal with micronutrient deficiency	Dr. M.K. Reddy	Foundation for Innovation and Technology Transfer (FITT), New Delhi

S.No.	Title	Applicant	BIG Partner
40	Development of economically viable synergistic nutraceutical formulations with Cordyceps and male silkworm larvae for disorders related to pancreas, kidney, liver, impotency etc. by culturing Cordyceps on silkworm in an artificial environment	Dr. Mousumi Mondal	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
41	Automated detection of abnormal copy number variants in human diseases	Dr. Naga Mohan Kommu	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
42	Innovative approached for upscalling natural tocopherol production from engineered brassica juncea (Indian mustard) for therapeutics	Dr. Neera Bhalla Sarin	Foundation for Innovation and Technology Transfer (FITT), New Delhi
43	Development of a molecular needle as a novel platform for delivery of anticancer drugs	Dr. Nusrat J M Sanghamitra	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
44	Development of affordable breast prosthesis and mastectomy bras for breast cancer patients	Dr. Pawan Mehrotra	Foundation for Innovation and Technology Transfer (FITT), New Delhi
45	Low-Cost Prophylactic Topical Dermal Cream to Prevent Chronic Exposure of Toxic Pesticides	Dr. Praveen Vemula	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
46	Engineered stable, nano-sized bubble liposomes - a commercially viable drug delivery platform	Dr. Praveer Gupta	IKP Knowledge Park, Hyderabad
47	Optically tunable nanobio-sensor for detecting the efficacy of mosquitocidal repellants	Dr. Raghabendra Samantaray	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
48	Process to produce double haploid parental lines with new, unique, rare genetic combinations using DH technology coupled with a strategy to increase or alter meiotic recombination in the technology demonstration system of mustard	Dr. Renuka Diwan	Venture Center, Pune
49	Development of a point-of-care device for prenatal diagnosis of congenital anomalies	Dr. Rishi Adhikary	Venture Center, Pune
50	Hand-held Imaging Flow Cytometer for Quantitative Diagnosis of Malaria	Dr. Sai Siva Gorthi	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
51	Microarray based technology for simultaneous detection of food and water borne pathogens	Dr. Sampath Srisailam	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
52	Production of Ccclodextringlycosyltransferase / CGTase enzyme using a Membrane Cell Recycle Bioreactor (MCRB)	Dr. Sanjay Nene	Venture Center, Pune
53	Development of early Breast and Cervical cancer detection method using novel, high resolution digital holographic microscope	Dr. Sarita Ahlawat	Foundation for Innovation and Technology Transfer (FITT), New Delhi
54	Development of highly sensitive and portable optical microscope for malaria parasite detection.	Dr. Satya Tapas	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
55	Design and Development of a Rapid Point-of-Care Device for Endotoxin Detection in Critically Ill/Septicemia Patients.	Dr. Shalini Gupta	Foundation for Innovation and Technology Transfer (FITT), New Delhi
56	Recombinant Enabling MDR Platform	Dr. Shrikant Mishra	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
57	Harnessing cheater cells for probiotics: applying game theory for nutrition and health	Dr. Soumen Roy	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore

S.No.	Title	Applicant	BIG Partner
58	Develop and Test Certain 3D Printing Technologies to Produce Innovative limbs at Affordable Costs for the Disabled in India	Dr. Srinivasa Prakash Regalla	IKP Knowledge Park, Hyderabad
59	Bile acid lipoids as potential therapeutics for psoriasis	Dr. Srujan Kumar Marepally	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
60	Upscaling Banana propagation using bioreactors	Dr. Sukhada Mohandas	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
61	Detection and diagnosis of Urinary Tract Infection through development of a rapid and sensitive non-invasive agglutination method	Dr. Surajit Bhattacharjee	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
62	Development of food colourants and textile dyes from natural pigments of microbial origin	Dr. Sureshkumar Singh	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
63	Application of pentose utilizing yeast strain(s) for higher ethanol production from hemicelluloses	Dr. Sushma Meshram	IKP Knowledge Park, Hyderabad
64	Developing Novel Lactic Acid Bacteria Antimicrobial Interventions to Improve Food Safety and Shelf-Life	Dr. Swetha Morey	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
65	A safe and effective technology for treating musculoskeletal dirorders in elder patients	Dr. Vanaja K Gowda	Foundation for Innovation and Technology Transfer (FITT), New Delhi
66	A cost effective process of making Anaerobic Granulated Sludge optimized for quick start-up and easy operation of UASB in WWTP while making the process energy efficient, achieving higher COD removal rate, high yield of CH4 at higher loading rates	Dr. Vanita Prasad	Venture Center, Pune
67	Dr. Vikas Mehra - Expression of therapeutic diabody against TNF-alpha and IL17R	Dr. Vikas Mehra	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
68	A Yeast based system for protein expression and metabolic engineering	Dr. Vinod Nayak	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
69	Rapid diagnosis of bacterial gastroenteritis in resource poor settings	Dr. Vivekanandan Perumal	Foundation for Innovation and Technology Transfer (FITT), New Delhi
70	Development and Validation of Gene Delivery System for Novel Model Organisms	Dr. Yashoda Ghanekar	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
71	To demonstrate Proof of Concept for a novel, non-invasive exosome -based screening (for early detection) cum diagnostic kit for multiple cancers (using one test) utilizing patient derived biofluids	ExoCan Healthcare Technologies Pvt. Ltd.	Venture Center, Pune
72	Development of Diagnostic Reagents for Acute Myocardial Infarction- S. Ghosh	G.M. Biotech	Foundation for Innovation and Technology Transfer (FITT), New Delhi
73	Establishing and Validating a novel drug target in mycobacterium tuberculosis	GeNext Genomics Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
74	Bicistronic self replicating DNA vaccine for rabies and immunocontraception in stray dogs	Geniron Biolabs Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
75	Hollow Fibre Membrane Based Low-Cost Oxygen Concentrator for Medical Applications	Genrich Membranes Pvt. Ltd.	IKP Knowledge Park, Hyderabad
76	MCAPD Mobile Continuous Ambulatory Peritioneal Dialysis	Gowrishankar W	Foundation for Innovation and Technology Transfer (FITT), New Delhi

S.No.	Title	Applicant	BIG Partner
77	Biochemical Research & Development to Improve the Efficacy of a Dry, Thermophilic, Anaerobic Reactor	GPS Renewables Pvt. Ltd.	IKP Knowledge Park, Hyderabad
78	Personal Ophthalmic Diagnostic System (PODS)	I4Vision Diagnostics Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
79	A Safer and easier Nasal foreign body extractor for clinicians in under-served areas	Inaccel Consulting	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
80	Novel, Percutaneous Soft Tissue Biopsy System with assisted Hemostasis	Indio Labs Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
81	To demonstrate proof-of-concept for an automated clinical analysis and annotation pipeline for NGS based somatic cancer genomic test for diagnosis, prognosis and personalized therapy.	InDNA Research Labs Pvt. Ltd.	Venture Center, Pune
82	Mechanical Heart Valve Fixation System: A Improve Design for Superior cardiac performance.	Innovator Lab Consultants Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
83	Industrial application of a novel cancer drug screening method	InvivoD Solutions Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
84	World's Most Affordable, long life Defibrillator that is Battery less, Hand Cranked, Rugged with reusable paddles.	Jeevtronics Pvt. Ltd.	IKP Knowledge Park, Hyderabad
85	Evaluation of Clovamide analogs as Neuroprotective Agents for treatment of Parkinson's disease	Kinome Pharma	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
86	Clonal propagation of elite genotype of orchid hybrids synthesised in Manipur for commercial cultivation	Kwaklei & Khonggunmelei Orchids Pvt. Ltd.	IKP Knowledge Park, Hyderabad
87	Networked Critical Care Monitoring in Low Resource Settings	Lattice Innovations Pvt. Ltd.	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
88	A gonio camera without a slit lamp	Lumisoft Technologies Pvt. Ltd.	Venture Center, Pune
89	Glycolytic Inhibhitor	M/s. AtharvWin Healthcare Pvt. Ltd.	IKP Knowledge Park, Hyderabad
90	Development of a Biosensor based Point-of-care Nucleic Acid Testing System	M/s. Purius Nanosystems Pvt. Ltd.	IKP Knowledge Park, Hyderabad
91	Use of Novel Superoxide dismutase with anti-ageing properties as oral supplement and cosmetics.	Mahesh Sankar Dhar	Foundation for Innovation and Technology Transfer (FITT), New Delhi
92	To develop a novel, cost effective, non-allergic herbal formulation for management of spontaneous bleeding and allied complications in multiple coagulation disorders.	Miss. Tania Paul	Venture Center, Pune
93	A simple platform based novel,rapid and color changing one-time and reusable nanofiber strips for selective detection of Enterohaemorrhagic Escherichia coli (EHEC)O157:H7	Module Innovations Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
94	Use of Portable Raman Spectrometer for Soil & Minerals Analysis	Molqbits Sensors and Data Pvt. Ltd.	Venture Center, Pune
95	Remote Cardiac Monitoring and Real-Time Outpatient Cardiac Telemetry	Monitra Healthcare Pvt. Ltd.	IKP Knowledge Park, Hyderabad

S.No.	Title	Applicant	BIG Partner
96	Design second stage of prototype for Low cost, low dosage Digital X-Ray using TDI sensor	Mother Diagnostic Systems Pvt. Ltd.	Venture Center, Pune
97	A novel organic and inorganic nano-formulation for rapid wound healing and control of infection	Mr Milind K. Choudhari	Venture Center, Pune
98	Bio-Synthesis, Production and Formulation of Sophorolipids for the purpose of Sanitizing/ Sterilizing Fruits and Vegetables thus enhancing their shelf-life.	Mr. Mihir Mehta	IKP Knowledge Park, Hyderabad
99	Metabolic engineering of Pseudomonas putida for 3-Hydroxypropionic acid production	Mr. P.Sathyavrathan	IKP Knowledge Park, Hyderabad
100	Value added products such as nutraceuticals, poultry feed, aqua feed from the wastes/ byproducts of palm oil mills and silk reeling industries	Mr. Srinivas Bandlamori	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
101	Development of a commercial grade low cost Arterial pulse analyzer	Mr. Sushant Poojary	Foundation for Innovation and Technology Transfer (FITT), New Delhi
102	Direct beta thalassemia carrier detection kit	Mr. Yogesh Badhe	Venture Center, Pune
103	Design And Evaluation Of Novel Formulations Of Some Anti- Cancer Drugs For Metronomic Chemotherapy	Ms. Chaitali Vibhakar Surve	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
104	Exploring Muga silk fibre as a promising suture material	Mugagen Laboratories Pvt. Ltd.	IKP Knowledge Park, Hyderabad
105	Rapid Detection of Acute Myocardial Infarction by sensing Cardiac Markers using Micro Cantilever Technology	Nanosniff Technologies Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
106	Production of non-alcoholic drink enriched with essential vitamins and minerals by microbial fermentation of natural raw materials	Naturlich Global Beverages Pvt. Ltd.	IKP Knowledge Park, Hyderabad
107	ISITE Intra-Ocular Lens for Spectacle Free Vision	Nayam Innovations Pvt. Ltd.	IKP Knowledge Park, Hyderabad
108	Pupil Expansion Devices and Delivery System	Nayan Eye Centre	Foundation for Innovation and Technology Transfer (FITT), New Delhi
109	Introduction and development of a new DNA based kit for Early and accurate diagnosis of Tuberculosis	Nextec Lifesciences Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
110	Study, Design and Development of Hit Molecules for Type II Diabetes	Novo Informatics Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
111	Testing the feasibility of Nano magnetic disc based ablation of Cancer cells in vitro	Nurture Earth R&D Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
112	Establishment of a Mesenchymal Stem Cell Bank as an Alternative Skin Bank	OCT Therapies and Research Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
113	DNA Testing on Disposable Plastic Biochips: A High Sensitivity Platform for Malaria Detection	OmiX Research and Diagnostics Laboratories Pvt. Ltd.	Venture Center, Pune
114	Bioabsorbable implants based on polylactic acid (PLLA)	Orthocrafts Innovations Pvt. Ltd.	IKP Knowledge Park, Hyderabad
115	Modular Resilin-mimetic Elastomeric Platform	Pandorum Technologies Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore

S.No.	Title	Applicant	BIG Partner
116	Development of Handheld Device for Glycated Hemoglobin and Albumin Sensing	Pathshodh Healthcare Pvt. Ltd.	IKP Knowledge Park, Hyderabad
117	PentaFluVac â€" An indigenous replication-incompetent viral vaccine for avian, swine and human influenza	Pentavalent Bio Sciences Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
118	Development and Validation of novel pseudobioaffinity based purification method for efficient recovery of coagulation factor VIII	Plasmatech Solutions Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
119	Fetal Electrocardiogram and Uterine Activity signal extraction from Maternal Electrocardiogram eliminating the need for the use of conventional transducers	Pradin Technologies	IKP Knowledge Park, Hyderabad
120	Non-invasive prenatal diagnosis kit for sickle cell anemia	Pregene Research Pvt. Ltd.	IKP Knowledge Park, Hyderabad
121	Point-of-Care Diagnostic Kit for Diarrheal Bacterial Pathogens	Priti Sundar Mohanty	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
122	3-D Bone Graft and GBR Membrane for Maxillofacial and periodontal repair: Towards a clinical study	Regensol	IKP Knowledge Park, Hyderabad
123	"The PubMed Graph: System to query and rank search results spanning multiple biomedical documents"	RelAgent Technologies Pvt. Ltd	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
124	Development of Long Circulating Biodegradable Nanoparticle MRI Contrast Agents Based on Hydroxypropyl-beta-Cyclodextrin	Robust herbals Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
125	A Platform for Rapid Antibiotic Susceptibility Testing (AST) and Assessment of Bacterial Load	Sabio Innovative Solutions Pvt. Ltd.	IKP Knowledge Park, Hyderabad
126	Development of an indigenous rapid card test to detect IgM against TORCH infections in prenatal and perinatal causes using recombinant proteins as capture antigens	Sakosh Biotech Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
127	Development of Oral Cancer Screening Camera	Sascan Meditech Pvt. Ltd.	IKP Knowledge Park, Hyderabad
128	Metabolic Engineering of marine bacteria for the production of isobutanol in salt water	Sea6 Energy Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
129	Novel Oncotherapeutic Measles Virus using eSAME system	Seagull Biosolutions Pvt. Ltd.	IKP Knowledge Park, Hyderabad
130	Affordable and Safe therapy for Neonates with Hypoxic Ischemic Encephalopathy	Sensivision Health Technologies Pvt. Ltd.	Venture Center, Pune
131	Keyhole surgery replaceable artificial heart	SG ArtHeart Private Limited	Foundation for Innovation and Technology Transfer (FITT), New Delhi
132	Atomic Force Probing of cells for for clinical and pharmaceutical applications	Shilps Sciences Private Limited	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
133	Development Of Low Cost High Performance Immobilized Lipases For Intersterification of Oils Andfats To Produce Healthy Fats	Shirdi Sai Nutraceuticals Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
134	Novel process for manufacturing of D-Penicillamine	Shweta Shree Life Sciences Pvt. Ltd.	Venture Center, Pune
135	Biomimetic Bone Substitutes: -	Sitalogics Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi

S.No.	Title	Applicant	BIG Partner
136	Multispectral Optical Imaging and Computing Technologies for Realtime In situ Functional Characterization and Monitoring of Cutaneous Wound Healing Progression	SkinCurate Research Pvt. Ltd.	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
137	A Novel method of converting Agri Waste to Energy with direct benefit to farmers: Use Rice Husks to produce Carbon-coated Nanoporous Si/SiO2 for Li-ion batteries & create THRIFT fund for farmer contribution for solar water pump under subsidy scheme	Sky Solar & Power India Limited	IKP Knowledge Park, Hyderabad
138	A novel device to screen newborns for hearing loss in resource poor settings	Sohum Innovations Pvt. Ltd.	IKP Knowledge Park, Hyderabad
139	Economical process for conversion of waste to green chemicals	String Bio	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
140	Novel Chitosan derivative for building SAR in plants: specifically leaf blight of Pomegranate caused by Xanthomonas sp.	Swasti Agro & Bioproducts Pvt. Ltd.	Venture Center, Pune
141	Bioremediations for Agro Industrial Solid Wastes by ARBIT for Efficient Management Through Energy and Biomanure Conversions.	Swayambhu Biologics Pvt. Ltd.	IKP Knowledge Park, Hyderabad
142	Development of Fucose Knock out technology platform in CHO S cell line for improved Biotherapeutics	Theramyt Biologics Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
143	A novel therapeutic modality using Adipose derived Mesenchymal Stem cells (ADMSCs) for treating Osteoarthritis patients & establishing clinical based evidence.	Total Potential Cells Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
144	Fibre lasers for photoselective tissue ablation	Unilumen Photonics Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
145	Delivery and retention of Irinotecan loaded magnetic nanoparticles for treatment of brain tumors	Vegrandis Therapeutics Pvt. Ltd.	IKP Knowledge Park, Hyderabad
146	Development of a novel technology for generation of stable transgenic systems with no off-targets	Viravecs Labs	KIIT Technology Business Incubator (KIIT-TBI), Bhubaneswar
147	Development of smartphone based eye imaging system	Visint Healthcare	Venture Center, Pune
148	Development of a novel monolayer based parallel artificial membrane permeability assay to determine permeability of new chemical entities and drugs	Vital Bioscientific Solutions Pvt. Ltd.	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
149	Novel inhibitors of DNA Gyrase for the treatment of multidrug resistant infections	Vitas Pharma Research Pvt. Ltd.	IKP Knowledge Park, Hyderabad
150	VodCa for Distillery Industry [VodCa: Vortex Diode based Cavitation Devices]	Vivira Process Technologies Pvt. Ltd.	IKP Knowledge Park, Hyderabad
151	Cancer treatment through autologous activated dendritic cells	Western Range Biopharmaceuticals	Centre for Cellular and Molecular Platforms (C-CAMP), Bangalore
152	Novel Integrated Newborn Resuscitation Solution to Empower Front-line Health Workers to Resuscitate Newborns Effectively	Windmill Health Tech. Pvt. Ltd.	IKP Knowledge Park, Hyderabad
153	Development of a novel fungal bio control agent using protoplast fusion technology to target drug resistant gastrointestinal cattle worms responsible for reducing productivity, by an eco friendly approach.	Wobble Base Bioresearch Pvt. Ltd.	IKP Knowledge Park, Hyderabad
154	Developing a rapid multiplex test to dianose extensively drug resistant (XDR) TB and Multidrug resistant (MOR) TB	Yaathm Biotech Pvt. Ltd.	Foundation for Innovation and Technology Transfer (FITT), New Delhi
155	Creation of transgenic zebrafish as cancer	Zephase Therapeutics Pvt. Ltd.	IKP Knowledge Park, Hyderabad

Small Business Industry Research Initiative (SBIRI)

S.No.	Title	Applicant	Collaborator (s), if any
1	A PointofCare POC Genetic Testing Device for TB Markers Suitable for Primary Health Care Centers Phase I	ABC Genomic India Private Ltd.	1) King George Medical University
2	Towards Generation of A Library of Monoclonal Antibodies Against Human Embryonic Stem Cells.	Abexome Biosciences	NA
3	Gastroretentive Superhydrodyanamic Pulsatile Platform Technology	Actorius Innovations and Research Pvt. Ltd.	NA
4	Identification of DNA markers linked to elite traits in micropropagated banana plants.	Aditya Biotech Lab and Research Pvt. Ltd.	NA
5	Marker assisted introgression of yellow vein mosaic virus YVMV resistance trait in high yielding varieties of okra.	Aditya Biotech Lab and Research Pvt. Ltd.	NA
6	Design and Development of an Innovative Locked BonePlating SystemDesign and Development of an Innovative Locked Bone Plating System	Adler Mediequip Pvt. Ltd.	NA
7	Novel sample processing for the simple and rapid diagnosis of TB, MDR-TB and XDR-TB.	Advanced microdevices Pvt. Ltd.	1) AIIMS-Dr. Jaya S. Tyagi 2) NITRD -Dr. R. Sarin 3) THSTI- Dr. S. Haldar 4) T.B. Hospital - Dr. V.S. Malhotra
8	Preclinical studies of Human mesenchymal stem cells MSCs isolated and characterized from different sources in autoimmune disease, namely rheumatoid arthritis RA and type 1 diabetes T1DM	Advanced Neuroscience Allies Pvt. Ltd.	1) Vittal Mallya Scientific Research Foundation
9	Computer Assisted Reading Tool for Automatic Detection and Grading of Diabetic Retinopathy.	Advenio TecnoSys Pvt. Ltd.	NA
10	Development and Validation of Low Cost Indigenous Single Use Safety Syringe with Passive Spring Actuated Needle Stick Injury and Reuse Prevention Mechanism.	Alfa Corpuscles Pvt. Ltd.	NA
11	Development of diagnostic tools for GMO testing and agriculture disease diagnostics.	Amar Immunodiagnostics Pvt. Ltd.	NA
12	Generation of a thermotolerant strain of Lactobacillus acidophilus	Anthem Biosciences Pvt. Ltd.	NA
13	Generation of an E. coli K12 strain for extracellular production of industrial.	Anthem Biosciences Pvt. Ltd.	NA
14	Integrated Fiber based Fourier domain OCT with spectrometer	Appasamy Ocular Devices	1) Indian Institute of Technology Madras
15	Development and clinical validation of methods for diagnosis of tuberculosis and bacterial drug resistance by smear microscopy, culture and polymerase chain reaction using processed clinical samples and kit thereof.	Arbro Pharmaceutical Ltd.	1) All India Institute of Medical Sciences 2) LRS Institute of TB and Respiratory diseases
16	Development of improved PCR kits with internal control for shrimp viruses WSSV, YHV, TSV and IHHNV.	Aristogene Biosciences Pvt. Ltd.	1) Bangalore University

S.No.	Title	Applicant	Collaborator (s), if any
17	Bacteriophage based control of Vibrio harveyi infection in shrimp	Aristogene Biosciences Pvt. Ltd.	NA
18	Detailed Chemical Profiling and Pre Clinical Evaluation of a USpatented Antidiabetic Plant Extract.	Arjuna Natural Extracts Ltd.	NA
19	Cloning and Expression of Recombinant Lipase enzyme.	Aumgene Biosciences Pvt. Ltd.	NA
20	Scale-up & commercialization of technology for production of recombinant lipase enzyme.	Aumgene Biosciences Pvt. Ltd.	NA
21	Detection of A1 and A2 casein variants in cows and development of high throughput genotype screening technology.	Auroprobe Laboratories Pvt. Ltd.	1) Maharshi Dayanand Gosamwardhan Kendra
22	Scaleup and evaluation of highvalue biosimilar product Etanercept aimed at providing costeffective healthcare solutions to the emerging markets.	Avesthagen Limited	NA
23	Hepatocytelike cells generated from human embryonic stem cells hESC for hepatotoxicity screening of xenobiotics in the drug discovery process.	Avesthagen Limited	NA
24	Development of Platform Technology for Adherent cells on Microcarriers.	Bangalore Biotech Labs Pvt. Ltd.	NA
25	Development of disease resistant double haploid line in Cucumber	Beej Sheetal Research Pvt. Ltd.	NA
26	Genetically modified vegetable crops for insect pest and disease resistance (Phase - I)	Beej Sheetal Research Pvt. Ltd.	NA
27	Development of Dual Resistance in Tomato against virus infection & insect damage.	Beej Sheetal Research Pvt. Ltd.	1) Indian Agricultural Research Institute IARI
28	Development and standardization of manufacturing and testing methodologies for human neonatal rotavirus vaccine candidate (Phase - II)	Bharat Biotech International Ltd.	NA
29	Clinical Development, Process Development and Scale up of a commercially viable manufacturing process of Recombinant Follicle Stimulating FSH expressed in recombinant Chinese Hamster Ovary CHO cell line.	Bharat Serums And Vaccines Ltd.	NA
30	Expression of recombinant proteins for development for synthetic pulmonary surfactant for respiratory distress syndrome (Phase-I)	Bharat Serums And Vaccines Ltd.	NA
31	Processes for manufacture of R and S3hydroxybutyrolactones from biomass and bioactive products there from.	Bharavi Laboratories Pvt. Ltd.	NA
32	Development of probes based on a human BAC library for the diagnosis of disease for use in situ hybridization and in microarray.	Bhat Biotech India Pvt. Ltd.	1) Manipal Life Sciences Centre
33	HRPIIpLDH based diagnostic kits for the differential detection of malarial parasites.	Bhat Biotech India Pvt. Ltd.	1) National Institute of Malaria Research

S.No.	Title	Applicant	Collaborator (s), if any
34	Proposal for Development of MEMS based Sensor for Neutrophil Gelatinase Associated Lipocalin NGAL for diagnosis of Acute Kidney Injury AKI	Bigtec Pvt. Ltd.	NA
35	Development of Larginine production process with novel genetically engineered E.coli strains	Bionary Bioproducts Pvt. Ltd.	
36	Development of synthesis platform for the production of O-Glucuronides of Drug molecules and their Deuterium labeled analogues	Bioorganics and applied materials Pvt. Ltd.	NA
37	Deuterium labeling of molecules for drug discovery and clinical research.	Bioorganics and applied materials Pvt. Ltd.	NA
38	"Development of drought tolerant genotypes of rice, corn and cotton through genetic engineering(Phase - I)"	Bioseed Research India Pvt. Ltd.	Shriram Bioseed Genetics India Ltd., Hyderabad and International Centre for Genetic Engineering and Biotechnology, New Delhi
39	"Development of transgenic salinity tolerant rice hybrids (Phase - II)"	Bioseed Research India Pvt. Ltd.	Shriram Bioseed Genetics India Ltd., Hyderabad and International Centre for Genetic Engineering and Biotechnology, New Delhi
40	Novel quorum sensing inhibitors against biofilm forming bacteria	Biozone Research Technologies Pvt. Ltd.	NA
41	TB screen test for of diagnosis of pulmonary and extra pulmonary tuberculosis evaluation of prototype kit at selected hospitals peripheral health centres research laboratories.	Bisen Biotech And Biopharma Pvt. Ltd.	1) Jiwaji University, Gwalior
42	Development of Mycobacterium w as an Adjuvant for anti rabies vaccine	Cadila Pharmaceuticals Ltd.	NA
43	An Innovative, HighEnd, Palm Sized, Single Lead ECG Display Device for Ambulatory and Long term rhythm monitoring and OnThe Go Applications.	Cardea Biomedical Technologies Pvt. Ltd.	1) All India Institute of Medical Sciences
44	Apoptosisinducing humanorigin Fcebased chimeric proteins for targeted elimination of mast cells and basophils a new approach for allergy & asthma treatment	Century Pharmaceuticals Ltd.	NA
45	Novel inhibitors of the PI3K-Akt-mTOR pathway: Structure based approach for Lead optimization	Chemveda Life Sciences India Pvt. Ltd.	1) National Institute of Pharmaceutical Education and Research (NIPER)-Hyderabad
46	Development of cost effective process for the production of bifunctional cellulase with endoglucanase and glucosidase activities from Streptomyces species.	Codon Biosciences Pvt. Ltd.	NA
47	Studies on bioconversion of glycerol, a byproduct of Biodiesel industry, into economically important 1,3 propandiol and PHA, their purification and licensing for scaling up process.	Codon Biotech Pvt. Ltd.	NA
48	Preclinical Testing of Soluble Curcumin Cocrystals	Crystalin Research Pvt Ltd	NA

S.No.	Title	Applicant	Collaborator (s), if any
49	Restoring The Bodys Intrinsic Tumor Eradication Ability Through The Discovery Of Novel Small Molecule Modulators Of The Apoptotic Pathway	Curadev Phatma Pvt. Ltd.	NA
50	Development of automated bioinstruments viz. automated dispensing system and automated cell counter.	Customised Technologies Pvt. Ltd.	NA
51	Production of virus free garlic through tissue culture	Devleela Biotech	1) Indian Agricultural Research Institute
52	Demonstration of conversion of Benzaldehyde to Phenylacetylcarbinol PAC with improved efficiency on scale of 4 KL	Embio Ltd.	NA
53	Expression of Peptidyl Amidase and Aprotinin in Baculoviral Systems and Development of Silkworm as a Bioreactor	Enzene Biosciences Pvt. Ltd.	NA
54	Proposal for Low Cost Blower BLDC Motor ICU Ventilator	Erkadi Systems	NA
55	Novel Tissue Engineering and Three Dimensional Cell Culture Technology.	ExCel Matrix Biological Devices Pvt. Ltd.	1) National Institute of Immunology
56	Development of a stable nanofiber carrier for biofertilizers	FIB-SOL Life Technologies Pvt. Ltd.	NA
57	Tissue engineering of homologous natural biomaterial for clinical use	Frontier Lifeline Pvt. Ltd.	NA
58	Development of blast resistant rice hybrid GK 5017 and rice variety GK46 through Molecular Marker Assisted Breeding	Ganga Kaveri Seeds Pvt. Ltd.	NA
59	Development of Bacterial leaf Blight resistant Rice Hybrids through molecular marker assisted breeding.	Ganga Kaveri Seeds Pvt. Ltd.	NA
60	Developing sensitive, inexpensive and handheld diagnostic point of care poc instrumentation to detect malaria and other pathogens.	Genomix Molecular Diagnostics Pvt. Ltd.	1) National Institute of Malaria Research Field Station 2) Osmania University 3) National Institue of Malaria ResearchNIMR 4) Birla Institute of Technology & Science
61	Development of F1 Hybrid Tomato with high shelf life	GEO Biotechnologies India Pvt. Ltd.	1) University of Agricultural Sciences, Bangalore
62	Generation, Evaluation and Regulatory Appraisal of Selected Transgenic Events for Enhanced Tolerance Against Lepidopteran Insect Pests in Cotton, Rice and Brinjal.	Global Transgenes Ltd.	NA
63	Control white spot syndrome virus of shrimp using Nano-formulated dsRNAi	gpsbiotech	1) C. Abdul Hakeem College
64	Commercial Scale Extraction Unit to Produce 0Calorie Natural Sweetener from Stevia Leaves.	Gvs Biotech Pvt. Ltd.	NA
65	Developing face mask for cosmaceutical application using sericin, peptides from silk fibroin and nonwoven silk sheet.	Healthline Pvt. Ltd.	NA

S.No.	Title	Applicant	Collaborator (s), if any
66	Silk Protein blend film Development and Commercialization for burn wound management.	Healthline Pvt. Ltd.	NA
67	Silk Protein Blend film for wound management Standardization of production process, clinical evaluations, value enhancement and concept establishment.	Healthline Pvt. Ltd.	NA
68	Development of silk protein based cryopreservation medium for bovine sperm to sustain viability and motility to enhance success rate of artificial insemination	Healthline Pvt. Ltd.	NA
69	Development of platform technology for Nitrilase catalyzed biotransformation processes.	Hi Tech Biosciences India Ltd.	1) Indian Institute of Technology Bombay
70	Development and Scaleup of novel biopesticides based on M. anisopliae for control of Helicoverpa armigera.	Hi Tech Biosciences India Ltd.	1) National Chemical Laboratory
71	PROVE IT Promoting Rural Opportunities by Value additions through Extraction Intervention Technologies to AgriHorti Crops Lycopene from Tomato.	Hydrolina Biotech Pvt. Ltd.	NA
72	Conversion of lactose and glucose based feedstocks to Butanol-feasibility study	I Cube Nanotec India Pvt. Ltd., Noida	Institute of Microbial Technology (IMTECH), Chandigarh
73	Risk based Process Design for large scale Manufacturing of male injectable contraceptive.	IcubedG Ideas Pvt. Ltd.	NA
74	Generation of induced pluripotent stem iPS cells from adult somatic cells using nongenomic protein transduction method.	Imgenex India Pvt. Ltd.	NA
75	Nanotechnology based delivery of peptide inhibitors for the treatment of Osteoporosis.	Imgenex India Pvt. Ltd.	1) Institute of Life Sciences
76	Discovery and Development of Novel, Selective and Potent Dihydroorotate Dehydrogenase Inhibitors in Inflammatory Bowel diseases.	Incozen Therapeutics Pvt. Ltd.	NA
77	Large scale production of curcuminpiperoyl conjugate.	India Pesticides Ltd.	NA
78	Generation of Prototype Lateral Flow Assay Kit using Antigen Specific Hybridomas to Develop Rapid Diagnostic Test for Clinical Diagnosis of Malaria	Indian Immunologicals Ltd.	1) Indian Institute of Science
79	Marker assisted gene pyramiding of blast and bacterial blight resistance genes into CMS & maintainer lines of rice	Indo American Hybrid Seeds	NA
80	Utilization of Marker Assisted Selection for development of salt tolerant hybrids in rice Oryza sativa.	Indo American Hybrid Seeds	NA
81	Development of cell associated serotype 1 Mareks Disease vaccine of Poultry from an indigenous field isolate.	Indovax Pvt. Ltd.	NA
82	Development of AntibodyPlatinum Conjugates for The Therapy of EGFRoverexpressing Tumors.	Invictus Oncology Pvt. Ltd.	NA

S.No.	Title	Applicant	Collaborator (s), if any
83	Advanced Active Transdermal Drug Delivery for Migraine Management	iTrace Nanotech Pvt. Ltd.	Indian Institute of Chemical Technology, Hyderabad
84	Scale up and optimization of the process for production of Pneumocandin B0 by aerobic fermentation of Glarea lozoyensis.	JC Biotech Pvt. Ltd.	NA
85	An Innovative Algorithm-Based Detection of Identical Multi-Repeat Sequences (IMRS) in the Genome of Plasmodium and its Validation in Malaria Diagnostics.	Jigsaw Bio Solutions Pvt. Ltd.	1) Indian Institute of Science
86	Evaluation of potential antagonistic microorganisms for the management of sheath blight of rice.	Juan Biotechnology Pvt. Ltd.	NA
87	Fermentation technology for entomopathogenic nematodeepnproduction	KN Biosciences India Pvt. Ltd.	NA
88	Pilot Scale Production of Plant Promoting Fungus Piriformospora indica â€“ A step forward towards Commercialization	Krauter Healthcare Ltd.	1) Amity University Uttar Pradesh
89	Development of Transgenic Bhendi Resistant to Yellow Vein Mosaic Virus.	Krishidhan Research Foundation Pvt. Ltd.	1) Jawaharlal Nehru University
90	Establishment of Tissue Culture unit for Micropropagation of high quality Potato Seeds.	La Chandra Biosciences Pvt. Ltd.	NA
91	Development Of Methods For Large Scale Growth, Characterization And Applications Of Suspension And Anchorage Dependent Cell Cultures In The Torocell Disposable Bioreactor Systems.	Lablinks Biotech Pvt. Ltd.	NA
92	Development of Curcumin as high value phytopharmaceutical for treating Cataract.	Laila Impex	NA
93	Computational design & development of inhibitors for the treatment of Tuberculosis.	LeadInvent Technologies Pvt. Ltd.	1) AIIMS
94	Study, design and development of Hit Molecules for cancer targets	LeadInvent Technologies Pvt. Ltd.	Indian Institute of Technology, Madras, Chennai
95	Development of affordable, toxicity free Amphotericin B loaded Liposomal preparation for treatment of Kalaazar A PreProof of Concept	Lifecare Innovations Pvt. Ltd.	NA
96	Evaluation of transgenic cotton containing antisense AV2 gene for resistance to cotton leaf curl disease (Phase-I)	Maharashtra Hybrid Seeds Company Limited	1) Indian Institute of Science
97	Development of a cost effective process for phytase production and its application studies.	Maps Enzymes Limited	1) Regional Research Laboratory CSIR
98	Upscaling and Downstream processing of Industrially Important Enzymes from Solid State Fermentation to Submerge Fermentation for Import substitution with Export potential.	Maps India Limited	NA
99	Design, Development and Clinical Evaluation of Implantable Drug Eluting CardiacPacing Leads.	MediVED Innovations Pvt. Ltd.	NA
100	Efficient organotypic culture of Human Keratinocytes with potential pigmentation regulators	Micro Therapeutics Research Labs Pvt. Ltd.	NA

S.No.	Title	Applicant	Collaborator (s), if any
101	Development, industrial manufacture and marketing of selected probiotic tablets containing Lactobacillus strains along with polyherbal microbicide for relieving vaginosisvaginitis and replenishment of probiotic Lactobacilli strains.	Microbax India Limited	NA
102	Pet animal food, fish leather and other marine biotechnology products from fish waste.	Millennium Exports Ltd.	1) Aquaculture Foundation of India
103	A novel IVDMIA for predicting breast cancer prognosis and relapse	Mir Lifescience Pvt. Ltd.	NA
104	Enhancing the effectiveness of nucleopolyhedroviruses of Helicoverpa armigera HaNPV and Spodoptera litura SlNPV through incorporation of enhancing inclusion proteins and sunlight UV protectants in commercially produced HaNPV Helimar and SlNPV Spodomar.	Multiplex Bio-tech Pvt. Ltd.	NA
105	Synthesis of novel molecular drugs through biopolymerization of active principles from medicinal plants using the laccase enzyme.	Myko Tech Pvt. Ltd.	1) Ashathagiri Herbal Research Foundation
106	Micropropagation of Nandan1 and Nandan2, high yielding Jatropha curcas L. hybrids for sustainable & profitable cultivation.	Nandan Biomatrix Limited	NA
107	Optimisation of fermentation and purification of recombinant Human Serum Albumin and recombinant Human Thrombin produced in yeast.	Navya Biologicals Pvt. Ltd.	NA
108	Development of a platform for production of complex peptides and proteins.	Navya Biologicals Pvt. Ltd.	NA
109	Identification of Genetic Biomarkers for Esophageal Cancer in North-East Indian Population	NeOMICS Research Foundation	NA
110	Development of okra varieties resistant to YVMV using marker assisted selection	Nirmal seeds Pvt. Ltd.	1) The Energy and Resources Institute
111	Stacking of candidate genes validated in planta addressing different moisture stress resistance strategies in maize Zea mays. Stacking of candidate genes validated in planta addressing different moisture stress resistance strategies in maize Zea maysPhase I & II	Nuziveedu Seeds Limited	1) International Centre for Genetic Engineering and Biotechnology
112	Biofortification of maize with carotene and high quality protein using functional genomics and molecular breeding approaches.	Nuziveedu Seeds Limited	NA
113	Bleomycin sulphate bearing nanostructured lipid particles for targeting brain cancer.	oniosome healthcare Pvt. Ltd.	NA
114	Development of reuterin based biopreservative as an alternative to harmful sodium nitrite & sodium nitrate based chemical preservatives for use in packaged meat food products.	Orbit Biotech Pvt. Ltd.	NA

S.No.	Title	Applicant	Collaborator (s), if any
115	Development and validation of a Celltissue coculture model for aiding liver specific studies and drug discovery applications.	Orchid Research Laboratories Ltd	1) AUKBC Research Center
116	Design modification and commercialization of nitrifying bioreactor technology for the establishment of organic recirculation prawn seed production system.	Oriental Aquamarine Biotech India Pvt. Ltd.	Cochin University of Science and Technology, Kochi
117	Detailed performance evaluation and accelerated commercialization of the nitrifying bioreactor technology in Indian market" (Phase-II)	Oriental Aquamarine Biotech India Pvt. Ltd.	1) National Centre for Aquatic Animal Health, Cochin University of Science and Technology
118	Design, Synthesis, evaluation and development of the Novel H3 and other GPC receptor ligands for various therapeutic applications.	Oxygen Healthcare Research Pvt. Ltd.	NA
119	Radiation Field Analyzer Rfa.	Panacea Medical Technologies Pvt. Ltd.	NA
120	Development Of Digital Imaging Detector For Medical Diagnostic Imaging System (digital Radiography).	Panacea Medical Technologies Pvt. Ltd.	NA
121	Smart drug delivery matrix for oncological applications	Pandorum Technologies Pvt. Ltd.	NA
122	Value added products from crustacean exoskeleton and coir pith integrated zero discharge processing project.	Pelican Biotech and Chemical Labs Pvt. Ltd.	NA
123	Novel methods of isolation of biochemicals from crustacean exoskeleton.	Pelican Biotech and Chemical Labs Pvt. Ltd.	NA
124	PIGA A platform of medical tool positioners for use in image guided interventional procedures.	Perfint Healthcare Pvt. Ltd.	NA
125	Design and development of a SMART SENSOR SYSTEM for therapy monitoring and validation of soft tissues tumors.	Perfint Healthcare Pvt. Ltd.	NA
126	Scientific validation and standardization of the active fraction, PM2040, enriched from the patient tested Ayurvedic antidiabetic drug, Parinam	PhytoMyco Research Pvt. Ltd.	NA
127	Production and evaluation of a novel Hexavalent lipooligosaccharide vaccine for Nesseria mengitidis against Meningococcal disease	Pochiraju Industries Limited	NA
128	Control of White Spot Syndrome Virus WSSV of shrimp in the culture system by Nanoparticlesmodified nanosystem.	Poseidon Biotech	NA
129	Low-cost, efficient and portable blood cell counter for point-of-care diagnostics.	Pratimesh Labs Pvt. Ltd.	1) Indian Institute of Science,Bangalore
130	Enzyme catalyzed manufacture of Esters	PRIVI Organics Ltd.	NA
131	Transgenic Cassava Production with Genes Conferring Resistance to Indian Cassava Mosaic Virus Disease	Rasi Seeds Pvt. Ltd.	1) Tamil Nadu Agricultural University
132	Development of Real Time Polymerase Chain Reaction assay and prototype kit for direct detection of Methicillin Resistance MRSA in S. aureus from clinical specimen under commercialization of available innovative research leads scope of SBIRI.	Ravindranath G E Medical Associates Pvt.Ltd.	1) University of Hyderabad

S.No.	Title	Applicant	Collaborator (s), if any
133	An open label, multicenter, prospective clinical study to evaluate the safety and efficacy of tissue engineered RSTE001 in patients with symptomatic cartilage defect of femoral condyle.	Reliance Life Sciences Pvt. Ltd.	
134	Micropropagation of Date palm for Sustainable agriculture and Rural Economic growth.	Reliance Life Sciences Pvt. Ltd.	NA
135	Manufacture and clinical evaluation of Non polymeric Nanocarbon porous matrix Drug Eluting Stent DES.	Relisys Medical Devices LTD	NA
136	Design and Development of Fieldtestable prototypes of a Large Field of View, Battery Operated, EasytoUse Retinal Imaging Device for the diagnosis of Retinopathy of Prematurity ROP in premature infants	Remidio Innovative Solutions Pvt. Ltd.	NA
137	Design and Development of Automated In Vitro Diagnostic Instrumentation ELISA processor, Automatic Biochemistry and Urine strip Analysers.	Robonik India Pvt. Ltd.	NA
138	Value addition and waste utilization in Banana pseudostemValue addition and waste utilization in Banana pseudostem	Rope Production Centre, Madurai	Krishi Vigyan Kendra, Madurai
139	Culture and characterization of Porphyromonas gingivalis under strict anaerobic conditions and characterization of gingipains	Samleen Bioengineering Pvt. Ltd.	
140	Cellular Biomarkers of rejection and immunosuppression in transplantation	Sandor Proteomics Pvt. Ltd.	NA
141	Extraction, purification, stabilisation & biological studies of natural gonadotropins & other uroproteins	Sanzyme Limited	1) Institute of Chemical Technology
142	Research, design, engineer and manufacture Multi Deck Shaker.	Scigenics Biotech Pvt. Ltd.	NA
143	Development of Single Tube Multi Gene OncoDiagnostic Tests for use with Next Generation Sequencing Platforms	SciGenom Labs Pvt. Ltd.	NA
144	Pre-clinical Development of First-in-class Glucose Dependent Insulinotropic compound for management of type-2-diabetes and related complications	Shantani Proteome Analytics Pvt. Ltd.	NA
145	Development of a Novel Method to Identify New Drug Targets for Type 2 Diabetics Treatment	Shantani Proteome Analytics Pvt. Ltd.	NA
146	Validation of Smallmolecule Target Identification Technology for its Versatility	Shantani Proteome Analytics Pvt. Ltd.	NA
147	Development of streaming data webservice engine for bioprocess equipments for improved monitoring of bioprocesses	Simplyfeye Softwares Pvt. Ltd.	NA
148	Manufacturing and commercialization of a low cost and reliable clinical chemistry analyzer.	Span Diagnostics Limited	NA
149	Scaling up production and data package development for commercialization of bioweedicides for weed management in rice	Sri Biotech Laboratories India Limited	1) University of Hyderabad

S.No.	Title	Applicant	Collaborator (s), if any
150	Production, formulation and commercialization of microbial agents for weed management in rice Oryza sativa L. Phase I	Sri Biotech Laboratories India Limited	1) University of Hyderabad
151	Complete in vitro characterization of Umbilical cord Whartons jellyderived Mesenchymal Stem Cells UCMSC.	Sri Raghavendra Biotechnologies Pvt. Ltd.	NA
152	Continuous process for economic production of effervescent preparations of aminoacids and other supplements	Steer Engineering Pvt. Ltd.	1) Manipal College of Pharmaceutical Sciences, Manipal University
153	Large scale expansion and characterization of human Whartons Jellyderived mesenchymal stem cells.	Stempeutics Research Pvt. Ltd.	NA
154	Production of laboratory animal feed special feed diet for experimental animals PhaseII.	Sugen Life Sciences Pvt. Ltd.	NA
155	Wound healing efficacy of novel formulation SLS03 Preclinical studies	Sugen Life Sciences Pvt. Ltd.	NA
156	Development of commercial scale micropropagation technology for elite Red Sandalwood in India.	Sun Agrigenetics Pvt. Ltd.	NA
157	Development of commercial scale micropropagation technology for elite Date palm.	Sun Agrigenetics Pvt. Ltd.	NA
158	Development of an oral therapeutic kit for treatment of Mucositis during cancer therapy.	Suparna Chemicals Limited	NA
159	Scientific validation of BroncoT a polyherbal formulation for bronchial asthama in experimental models Phasel	Surya pharmaceuticals	NA
160	Passive Immunotherapy using Chicken IgY Consortium with Probiotics supplementation for Gastrointestinal infections in Poultry	T.Stanes & Company Limited	1) PSG College of Arts and Science
161	Development of lipid lowering phytoformulations. Development of lipid lowering phytoformulations.	T.Stanes & Company Limited	1) PSG of College of Technology
162	Development of a highly efficient and economical process for therapeutic antibody fragment	Theramyt Novobiologics Pvt. Ltd.	NA
163	To Improve And Standardize Protocol of Prognostic Clinical Laboratory Testing For Atherothrombosis By Incorporating Demonstration Of Thrombotic Platelets Using The New Thrombochek Test	Thrombochek Labs Pvt. Ltd.	Na
164	Differentiation of Human Adipose tissue Derived Stem Cells to Islet Cell mass Aggregates and its preparation for clinical application.	Total Potential Cells Pvt. Ltd.	NA
165	Stem Cell Implant Biocomplexes For Periodontal Tissue Regeneration	Tran-Scell Biologics Pvt. Ltd.	NA
166	Novel process development and optimization of process parameters for orlistat production.	Transgene Biotek Limited	NA
167	Development of a Vaccine Capable of Eliciting Immunological Memory for the	USV Ltd.	NA

S.No.	Title	Applicant	Collaborator (s), if any
68	Development and characterization of lipid carrier based nanogel formulation for 5Fluorouracil	V.B. Medicare Pvt. Ltd.	NA
169	Production of Beta Galactosidase using Agriwaste	Varuna Biocell Pvt. Ltd.	NA
170	Indigenous Production of Dextranase using SSF Technique Phase II Commercial Production.	Varuna Biocell Pvt. Ltd.	NA
171	Indegenous production of Dextranase using SSF Technique	Varuna Biocell Pvt. Ltd.	NA
172	Innovative Methed To Extract Silk Grade Banana Fiber.	Vel- Natural Fibers	NA
173	Design and development of Fiber Laser based portable Raman SpectrometreDesign and development of Fiber Laser based portable Raman Spectrometre	Vinvish Technologies Pvt. Ltd.	NA
174	Development of commercialization of a recombinant uricase for the prevention and treatment of tumor lysis syndrome associated with leukamia, lymphoma & solid tumor malignancies (Phase-II)	Virchow Biotech Pvt. Ltd.	NA
175	Indigenous development of a recombinant Fuzeon for the treatment of AIDS.	Virchow Biotech Pvt. Ltd.	NA
176	Process optimization for production of freezedried Brucella abortus Strain 19 Vaccine for veterinary use	Vivimed Labs Limited	NA
177	Development of a novel production technology to enhance the scalability and affordability of the peste des petits ruminants (PPR) vaccine	Vivimed Labs Limited	1) Translational Research Platform for Veterinary Biologicals - TANUVAS
178	Production of Recombinant Exenatide Incretin mimetic like GLP1	Vivo Bio Tech Limited	NA
179	Adaptation and validation of dendritic cells-based therapy for treatment of cancers	Western Range Biopharmaceuticals Pvt. Ltd.	NA
180	Development of drought and saline tolerant high biomass yielding Bamboo plants as energy crop	Xcelris Labs Limited	1) Abellon Agrisciences Ltd. 2) Abellon CleanEnegy Ltd.
181	Development of highly specific immunoassays for prostate and breast cancer through molecular characterization of existing markers and establishment of	Yashraj Biotechnology Limited	NA

Biotechnology Industry Partnership Program (BIPP)

S.No.	Title	Applicant	Collaborator (s), if any
1	Establishment of in vitro Pharmacological Assay Platform for Biosimilars	Abexome Biosciences	NA
2	Single step extraction of Cottonsead with miscella refining	Abhay Cotex. Pvt. Ltd.	NA
3	Electrophoretic pre-concentration to enable the fluorescence-based detection of ultra-low concentrations of analytes in human sera at the point-of-care	Achira Labs Pvt. Ltd.	NA
4	Multi-stacking genes to develop engineered rice; with enhanced drought and multiple diseases & pests tolerance	Advanta India Limited	NA
5	"RNAi and other cutting edge technological interventions to develop insect-pest, diseases & viruses tolerant tomato hybrids for Indian & International markets	Advanta India Ltd.	1) Division of Plant Pathology, IARI, New Delhi
6	Percutaneous Aortic Valve Technology	Agada Medical Technologies	NA
7	Immunodiagnostic kits for detection of autoimmune diseases	Amar Immunodiagnostics Pvt Ltd	NA
8	Identification and development of promiscuous anticancer compounds from microorganism	Amrita Therapeutics Limited	1) National Institute of Immunology, New Delhi 2) B.V.Patel PERD Centre, Ahmedabad
9	Development of Value added Corn Steep Powder suitable for food and fermentation Industry up to Pilot scale (1TPD)	Anil Ltd.	1) National Chemical Liquor and Labotatory, Pune
10	Third generation RNAi for engineering Tomato leaf curl (ToLCV) and tospovirus (GBNV) resistance in tomato	Ankur Seeds Pvt. Ltd.,	NA
11	Ketoreductases - Whole cell Biotransformation for chiral chemistry	Anthem BioSciences Pvt. Ltd.	1) Cellworks Research India Pvt. Ltd.
12	Project on Value Addition including Potential neutraceuticals from derivatives of Rice	AP Organics Pvt. Ltd.	NA
13	Generation of Proof of Concept for Animal Studies of PEG conjugated fully human Fab Antibody Fragment expressed in E. coli for the treatment of Rheumatoid Arthritis	Apcegen Technologies	NA
14	Development and pilot scale production of Anti-TNF-Antibody scFv for treatment of infalamatory diseases	ARA Healthcare Limited	NA
15	Bioconversion of coal rejects to biogas and acid	Ardee Hi-tech Pvt Ltd	1) BITS-Pilani, Hyderabad humic Campus
16	Development of self-glucogenic Pearl Millet adapted for marginal lands	Avesthagen Limited	NA
17	Automated Portable Epilepsy-EEG system	Axxonet System Technologies	1) NIMHANS
18	Development of Affordable Semi-synthetic Artemisinin for the Treatment of Malaria	Bakul Finechem Research Centre	NA
19	Development of Herbicide & Stress tolerant transgenic Onion	Beej Sheetal Research Pvt Ltd.	1) International Centre for Genetic Engineering & Biotechnology

S.No.	Title	Applicant	Collaborator (s), if any
20	Phase III Testing and Evaluation of safety and Efficacy of oral Rotavirus Vaccine Candidate 116E	Bharat Biotech International Ltd.	1) Translational Health Science and Technology Institute 2) KEM Hospital Research Centre 3) Christian Medical College
21	Development of process know how for butanol production from lignocellulosic biomass	Bharat Petroleum Corporation Ltd.	1) The Energy and Resources Institute
22	Process Development and scale up of a commercially viable manufacturing process of an essentially similar therapeutic peptide based implant with anti cancer properties and development of a technology platform for implant based sustained release formulations incorporating therapeutic peptides/ recombinant proteins	Bharat Serum Vaccine Limited	NA
23	Design and Expression of humanized antibodies against soluble Interleukin-6R, soluble gp130 in Bacteria and Animal Cell lines	Bhat Biotech India Pvt. Ltd.	1) Manipal Life Sciences Centre
24	Assay validation enabling infectious disease detection at point-of-care using bigtec handheld microPCR	Bigtec Pvt. Ltd.	NA
25	A Multicenter, Randomized, Double-Blind, Placebo Control Study of IN-105 tablets [oral insulin] in Patients with Type 2 Diabetes Mellitus who have inadequate Glycemic Control on Optimal doses of Extended Release Metformin Tablets	Biocon Limited	NA
26	Open Label, Randomized, Multicentric Studies to Compare Safety and Efficacy of Recombinant Insulin Aspart- Biphasic and Regular with NovoLog@ Mix 70/30 and NovoRapid in T1DM and T2DM Patients	Biocon Ltd	NA
27	A Multicentric, Parallel Randomised (2:1) Open Label Phase III Clinical study to evaluate the immunogenicity and safety of BE's inactivated JE, Vaccine inhealth > 1 to < 3 year old Indian subjects in comaprison with purified inactivated JE vaccine (IXIARO (R)) of Intercell - An non-inferiority study	Biological E Limited	NA
28	Development of rice hybrids with improved drought and salinity stress tolernace	Bioseed Research India Pvt. Ltd.	1) ICGEB
29	Novel antibiotics for gram negative bacteria: Structure based strategy to ameliorate antibiotic efflux and enhance compound efficacy	Bugworks Research India Pvt. Ltd.	NA
30	Flow Analyzer	C-CAMP	1) Indian Institute of Technology - Madras
31	Clinical Development of Influenza Vaccines	Cadila Pharmaceuticals Limited	NA
32	Scale-up of Plasma Fractionation Facility for High Value Products	Celestial Biologicals Ltd.	NA
33	Multiplex Fast-PCR based diagnosis and prognosis of tuberculosis	Chromous Biotech Pvt. Ltd.	NA
34	Multiplexed Fast PCR-based detectio kit for a group of viruses affecting Potato	Chromous Biotech Pvt Ltd	1)Indian Agricultural Research Institute
35	Production of Ranibizumab a recombinant humanized Anti-VEGF monoclonal antibody fragment (recombinant huFab V2) expressed in Hansenula Polymorpha.	Clonz Biotech Pvt Ltd	NA

S.No.	Title	Applicant	Collaborator (s), if any
36	Clinical trials of novel anticancer drug cocrystal	Crystalin Research Pvt. Ltd.	NA
37	Removal of Hydrogen sulphide from biogas by recovering Sulphur from it	Daurala Sugar Works	1) Shriram Institute for Industrial Research
38	Design and development of an affordable Fluorescence Reader for Point-of-care diagnostics	Design Innova	1) ICGEB
39	Validation, Field Trial, Scale-up and Commercialisation of Sensitive and Specific PCR based Diagnostic kit and Instruments for diagnosis of Chlamydia and Nisseria infection	DSS Imagetech Pvt. Ltd.	1) Dr. B.R. Ambedkar Center for Biomedical Research (ACBR), Delhi University
40	Discovery and Development of Novel Bone anabolic agents for accelerated fracture healing	Enem Nostrum Remedies Pvt Ltd	1) CDRI
41	Demonstration of Recombinant Streptokinase in collaboration with CSIR IMTECH for Scaling up to 100L high density fermentation of E.coli harboring rSK and small scale purification	Epygen Biotech Pvt. Ltd.	NA
42	Novel Haemostasis Mechanisms	ExCel Matrix Biological Devices Pvt. Ltd.	NA
43	Porcine Pulmonary Xenograft as a Versatile Conduit in Cardiovascular Surgery	Frontier Lifeline Pvt. Ltd.	NA
44	Bio-similar Interferon beta 1a: From process development to preclinical toxicology	Gennova Biopharmaceuticals Ltd.	NA
45	Development of a Cost Effective Prophylactic Therapeutic Recombinant Human Papillomavirus Vaccine	Gennova Biopharmaceuticals Ltd.	1) Advanced Centre for and Treatment, Research & Education in Cancer
46	State of art cGMP production facility meeting regulatory requirement for production of recombinant Bio-therapeutics	Gennova Biopharmaceuticals Ltd.	NA
47	Association Mapping and Whole Genome Marker Assisted Recurrent Selection for Development of Abiotic and Biotic Stress Resilient Maize	GEO Biotechnologies India Pvt. Ltd.	1) CIMMYT, Hyderabad
48	Bio-Process Development for Production of Biosimilar Trastuzumab â€" Second Phase	Imgenex India Pvt. Ltd.	NA
49	Development of High Expression Plasmid vectors for Production of Biosimilar Herceptin and Other Recombinant Proteins and Antibodies.	Imgenex India Pvt. Ltd.	NA
50	Interferon Beta 1 b Process development	Inbiopro Solutions Pvt Ltd	NA
51	Discovery and Development of Potent, Selective and Novel c-Met Kinase Inhibitors in Cancer	Incozen Therapeutics Pvt. Ltd.	NA
52	Setting up a 10 ton Lignocellulosic biomass/ processing plant to produce about 3000 Litre ethanol/day.	India Glycols Limited	1) DBT-ICT Centre for Energy day Biosciences
53	Setting up 10 ton Lignocellulosic biomass/day processing plant to produce about 3000 Litre ethanol/day (Phase II: To run the plant in integrated continuous mode)	India Glycols Limited	1) DBT-ICT Centre for Energy Biosciences
54	Creation of a state of art integrated facility for high end structural and functional characterization of protein therapeutics & peptides	Intas Biopharmaceuticals Limited	NA
55	Mucosal formulations of Parathyroid Hormone (PTH)	Intas Biopharmaceuticals Ltd.	NA
56	Developing Endosulphan degrading bacteria as a commercial product.	International Panaacea Limited	NA

S.No.	Title	Applicant	Collaborator (s), if any
57	DXPhone	Janacare Solutions Pvt. Ltd.	1) All India Institute of Medical Sciences 2) Narayana Hrudayalaya Hospital City
58	Habits: Reality-TV based Diabetes Prevention Program for India	Janacare Solutions Pvt. Ltd.	1) Madras Diabetes Research Foundation 2) AIIMS
59	Development of Bt-rice with two cry genes	JK Agri Genetics Ltd.	NA
60	Development of Biotic stress resistant Rice through conjunct use of Bio- and Hybrid Technologies	Kaveri Seed Company Ltd.	NA
61	Marker-assisted dissection of genetic basis of yield and improving yield potential under drought stress in Maize	Kaveri Seed Company Ltd.	NA
62	Genomics assisted accelerated product development of high yielding pigeonpea hybrids	Krishidhan Seeds Pvt. Ltd.	1) ICRISAT - Dr. Rajeev Varshney
63	Sustainable and versatile microbial polymers: a biobased prospect for India.	Kumar Organic Products Ltd	NA
64	Production of poly (lactide-co-glycolide) nanoparticles (PLG-NP)and poly (lactide-co-glycolide) nanoparticles encapsulating antitubercular drugs (rifampicin, isoniazid and pyrazinamide-PLG-NP-ATDs) in GMP facilities	Lifecare Innovations Pvt. Ltd.	NA
65	Stress tolerant rice and wheat	Maharashtra Hybrid Seeds Company Limited	NA
66	Development of Sucking Insect Pest tolerant rice and cotton	Maharastra Hybrid Seeds Company Limited	NA
67	Hi-Fidelity Affordable Mannequin for Effective CPR(Cardiopulmonary Resuscitation) Training	Merkel Haptic Systems Pvt. Ltd.	NA
68	Ã¢â‚¬Å“Deregulation Trials Phase I of Transgenic Maize Events Expressing Metahelix Synthetic Cry1C, Cry1Ac and Cry1Ab Genes for Tolerance to Stem and Cob BorersÃ¢â‚¬Â	Metahelix Life Sciences Pvt. Ltd.	NA
69	A proposal for funding of deregulation trials of transgenic rice events expressing Metahelix synthetic Cry1C, Cry1Ac and Cry1Ab genes for tolerance to rice yellow stem borer, Scirpophaga incertulas	Metahelix Life Sciences Pvt. Ltd.	NA
70	Development of PAT-1102, a novel HDAC inhibitor for the treatment of cancer	Mitra Biotech Pvt. Ltd.	1) Anthem Biosciences Pvt. Ltd.
71	To conduct confined field trials and biosafety studies on genetically engineered Brassica juncea (Male sterility and restorer lines as pollination control mechanism) for heterosis breeding and yield improvement	Mother Dairy Fruit and Vegetable Pvt. Ltd.	1) Centre for Genetic Manipulation of Crop Plants, University of Delhi South Campus
72	Enhanced production of extracellular melanin from various fungal sources for protection against UV and gamma radiations.	Myko Tech Pvt. Ltd.	NA
73	Development of Technology Platform for Rare Sugar Production	Nagarjuna Fertilizer & Chemicals Ltd.	NA
74	Transformational Technology Platform Development for Biological Hydrogen	Nagarjuna Fertilizers and Chemicals Limited	NA

S.No.	Title	Applicant	Collaborator (s), if any
75	Scale-up facilities for the production of phytochemical reference substances from Indian medicinal plants of national relevance as a business model	Natural Remedies Pvt. Ltd.	NA
76	Development of novel intensified technology platform for production of low cost MAbs	Navya Biologicals Pvt. Ltd.	NA
77	Development of nutritionally improved mustard (Brassica juncea) varieties/hybrids having low erucic acid and low glucosinolate content using marker assisted selection	Nirmal seeds Pvt. Ltd.	1) The Energy and Resources Institute, New Delhi
78	Development of Viral resistant okra using RNAi approach	Nirmal seeds Pvt. Ltd.	1) University of Delhi South Campus
79	ONCOSCAN - Digital Oncopathology Slide Scanner	Optra Systems Pvt. Ltd.	NA
80	Scale up and validation of technology for the manufacture of DAG using Deacetylcephalosporin C synthase	Orchid Chemicals & Pharmaceuticals Ltd	NA
81	Development of a H1N1 pandemic influenza vaccineA	Panacea Biotec Limited	NA
82	Development of Novel Peptide Based Topical Gel for the Treatment of Alopecia	Panacea Biotec Limited	NA
83	Development of safe and highly efficatious 13-Valent Pneumococcal conjugate vaccine against streptococcus Pneumoniae infections	Panacea Biotec Limited	NA
84	Development of Flat Panel Computed Tomography (FPCT)machine	Panacea Medical Technologies Pvt. Ltd.	NA
85	Solution for planning, execution and confirmation of targeted tumor ablation therapy.	Perfint Healthcare Pvt. Ltd.	NA
86	SanGeniX: A comprehensive Next Generation Sequence (NGS) data analysis solution.	Persistent Systems	1) Indian Institute of Science Education and Research (IISER), Pune 2) National Bureau of Animal Genetic Resources (NBAGR), Karnal
87	Novel Technology for Microbial Production of Paclitaxel,an anti cancer drug.	Phyto Biotech Pvt Ltd	NA
88	Clinical development of Novel CCK receptor antagonists for the treatment of inflammatory pain	PNB Vesper Life Science Pvt. Ltd.	NA
89	Lignocellulosic Biomass to Ethanol Technology : Simultaneous Saccharification and Fermentation	Praj Industries Ltd.	NA
90	Development of Novel Cocktail of cellulolytic enzymes for Deconstruction of Lignocellulosic Feedstocks	Praj Industries Ltd.	1) International Centre for Genetic Engineering and Biotechnology
91	Development of HCV genotype 3a based replicon system	RAS Lifesciences Pvt. Ltd.,	1) Institute of Liver and Biliary Sciences
92	Evaluation of Platinum Nano Particles for the Treatment of Hormone Refractory Prostate Cancer.	Rasayani Biologics Pvt Ltd	NA
93	Development of Rice Lines with Broad Spectrum and Durable Resistance to Bacterial Leaf Blight and Brown Plant Hopper through Markerâ€"Assisted Gene Pyramiding Approach	Rasi Seeds Private Ltd	NA

S.No.	Title	Applicant	Collaborator (s), if any
94	Functional evaluation of autologous cell based therapy in cardiovascular diseases - Molecular Imaging [An innovative non-invasive technology]	Ravindranath G E Medical Associates Pvt. Ltd.	NA
95	Development of low cost rapid quantitative PCR technology for molecular diagnosis	Revelations Biotech Pvt. Ltd.	1) IMTECH
96	Development of Novel and Economic Process for Production of Recombinant Human Insulin	Revelations Biotech Pvt. Ltd.	1) RAS Life Sciences Pvt. Ltd.
97	Enhancement of Ethanol Yield from Molasses Fermentation by adding a specific enzyme to convert an unfermentable sugar to a fermentable sugar	Richcore Lifesciences Pvt. Ltd.	NA
98	Production of Cellulase and Pectinase Enzymes using Agro waste and /Produce as Raw material of Industrial/Feed and Health care use with large viable Market/Demand	Rossari Biotech Ltd.	NA
99	Development & building indigenous capability for Balloon Catheter Manufacturing.	Sahajanand Medical Technologies Pvt. Ltd.	NA
100	Commercial Scale Production of Nanopesticides and Nanofungicides for Indian Agro-industry	Saveer Biotech	NA
101	High Performance Computing Infrastructure	SciGenom Labs Pvt. Ltd.	NA
102	Seaweed Biofuel - Cost-effective offshore biomass production and bio-conversion to fuel	Sea6 Energy	NA
103	Design and evaluation of novel immunogens and monoclonal antibodies against pandemic H1N1	Serum Institute Of India Limited	1) Indian Institute of Science 2) National Institute of Immunology
104	Clinical Development of Polysialylated Erythropoietin	Serum Institute of India Ltd.	NA
105	Development of HPV Vaccine	Serum Institute of India Ltd.	NA
106	Establishment of Bioprocess Facility for large-scale production of Microbial antigens and Monoclonal antibodies under the conditions Compliant with cGMP	Span Diagnostics Limited	NA
107	Bioconversion of Agricultural waste from Mango Kernel, Tamarind Seeds & Cash Mango waste to Polylactic Acid a Bio-Plastic.	SPC Biotech Pvt. Ltd.	NA
108	Novel combination therapy for treatment of resistant and non responsive cancers	Sphaera Pharma Research and Development Pvt. Ltd.	1) Leadinvent Pvt. Ltd. 2) ICGEB
109	Control of Shoot and Fruit Borer Insect Pest (Leucinodes orbonalis GuenÃƒÂ©e) in Brinjal Through RNA interference	Sri Biotech Laboratories Pvt. Ltd.	1) Delhi University South Campus
110	Development of Actinomycetes based metabolites as delivery systems for soil health management in Groundnut (Arachis hypogaea L.)	SriBiotech Laboratories India Limited	1) International Crops Research Institute for Semi Arid Tropics
111	A Randomized, Double Blind, Multicentric, Placebo Controlled, PhaseÃ¢â‚¬â„¢ll Study Assessing The Safety And Efficacy Of Intraarterial (Hepatic) Ex-Vivo Cultured Adult Allogenic Mesenchymal Stem Cells in Patients with Liver Cirrhosis.	Stempeutics Research Pvt. Ltd.	
112	Hepatotoxicity Prediction Platform	Strand Life Sciences Pvt Ltd	NA
113	Bevacizumab upto Pre-clinical studies	Sun Pharmaceutical Industries Ltd.	NA

S.No.	Title	Applicant	Collaborator (s), if any
114	Development of a novel synthetic route for manufacturing Levoglucosan for making affordable value added downstream products	Symchem Research Labs Pvt. Ltd.	NA
115	Development of Anti Thrombin-Clot Specific Streptokinase (ACSSK), A Novel Thrombolytic with twin properties of clot dissolution and prevention of arterial re-occlusion during the Treatment of Acute Myocardial Infarction and Ischemic Stroke	Symmetrix Biotech	NA
116	Inorganic and polymer nano-composites for micronutrient & pesticide delivery: Boosting crop health and yield.	Tata Chemicals Limited	NA
117	Process for Asymmetric Synthesis of Hexahydrobenzophenanthrenes, Dopamine D1 Agonists	TCG Life Sciences Limited	NA
118	Development of an Affordable, Asia specific 15 valent Pneumococcal Polysaccharide - CRM 197 Protein Conjugate Vaccine.	Tergene Biotech Pvt. Ltd.	NA
119	Development of an Affordable, Asia specific 15 valent Pneumococcal Polysaccharide - CRM 197 Protein Conjugate Vaccine II Phase	Tergene Biotech Pvt. Ltd.	NA
120	Development of Anaerobic Membrane Bioreactor (AnMBR) for Waste to Energy Solutions	Thermax Limited	NA
121	Clinical development of TRC150094, a novel Diiodothyronine (T2) analogue, for the treatment of cardiovascular (CV) risk factors defined by Metabolic Syndrome (MS).	Torrent Pharmaceuticals Limited	NA
122	A Strategy for the Development of Alternative Treatments for Heart failure Complicated with Diabetes Mellitus	Torrent Pharmaceuticals Limited	NA
123	Safety and efficacy of TRC150094 in treatment of cardio-metabolic risk in overweight/obese diabetic and pre-diabetc subjects with dyslipidemia Phase II trials	Torrent Pharmaceuticals Limited	NA
124	To develop novel 3rd Generation HIV (Antibody) & 4th Generation (HIV Antigen and Antibody) immunoassay format using flash type chemiluminiscence and magnetic particles as matrix..	Transasia Biomedicals Ltd.	NA
125	Imaging device for monitoring breast tissue changes	Tuscano equipments Pvt. Ltd.	NA
126	An integrated approach to develop recombinant Sclerotium rolfsii (SRL) antitumor lectins in E. coli as novel targeted anticancer drug and drug delivery system for human colon and breast cancer, providing affordable health care to cancer patients	Unichem Labs Limited	1) Karnatak University, Dharwad
127	Design and Development of Photo Dynamic Therapy Laser System	Vinvish Technologies Pvt. Ltd.	1) Centre for Earth Science Studies, Trivandrum 2) Regional Cancer Centre, Trivandrum
128	Development of novel Mucosal vaccine for HPV	Virchow Biotech Private Limited	NA

S.No.	Title	Applicant	Collaborator (s), if any
129	Novel inhibitors of fatty acid biosynthesis for the treatment of drug resistant S.aureus bacterial infections	Vitas Pharma Research Pvt. Ltd.	NA
130	Optimization of Scale-up/Purification and clinical grade material generation of recombinant Urate Oxidase	Vivo Bio Tech Limited	NA
131	Clinical investigation of Galnobax for the treatment of Diabetic food ulcers	Novalead Pharma Pvt. Ltd.	NA
132	To determine the safety, effective dose and frequency of application of Galnobax TM in 50 subjects during Phase 1 trial in the subjects suffering from diabetic foot ulcers	Novalead Pharma Pvt. Ltd.	NA
133	Development of animal component free biosimilar recombinant protein therapeutics using mammalian platform technology.	Wockhardt Limited	NA
134	Tumor Necrosis Factor - alpha (TNFa) inhibiting compound as a first in class drug treatment for neuroinflammatory diseases.	Yasham P2D Lifesciences Pvt. Ltd.	NA

SPARSH Projects

S.No.	Proposal Title	Applicant Name	Collaborator Name
Social Innovation Immersion Program			
1	Pune MedTech Fellowships under the BIRAC-Social Innovation Immersion Program	Entrepreneurship development Center	1) Mahila Sarvangeen Utkarsh Mandal (MASUM), Pune 2) Deenanath Mangeshkar Hospital Research Center (DMHRC), Pune
2	Maternal and child health social immersion program	KIIT-TBI Bioincubator	1) Hello Doctor 24X7 Pvt. Ltd. 2) Dr. Sasmita Nayak, MBBS, PhD (KIMS), Bhubaneshwar 3) Dr. Sanjusmita Tripathi, MD (Gynaecology), BMC Hospital, Bhubaneshwar I 4) Dr. Sonali Kar, MD, PhD (Community Medicine), KIMS, Bhubaneshwar 5) Dr. Rajeev Roy, Assoc Proffesor, IIM Raipur 6) Prof. L.K.Vaswani, Director School of Rural Management, KIIT University, Bhubaneshwar 7) Mr. Samir Ranjan Mishra, CISD (NGO), Bhubaneshwar 8) Dr. Srikant Mishra, Head, Technology Development, KIIT-TBI, Bhubaneshwar 10)Mr. Subhanshu Acharya, DGM, SIDBI, Bhubaneshwar
3	Social Innovation Immersion Programme (SIIP) by Translational Health Science and Technology Institute, Faridabad, India	Translational Health Science and Technology Institute	1) Gurgaon General Hospital 2) Maulana Azad Medical College
4	Entrepreneur-in-residence program aimed at enabling first-time entrepreneurs convert their innovative ideas into successful social enterprises	Villgro Innovations Foundation	1) E V Kalyani Medical Foundation Pvt. Ltd.

S.No.	Proposal Title	Applicant Name	Collaborator Name
Social Innovation Immersion Program			
1	Development of Iron Rich Rice Bran Protein Hydrolysate from the Byproduct of Rice Bran oil Industry	Cellzyme Biotech	NA
2	A novel technique for monitoring of fetal growth through volume imaging of the fundus and estimating the gestational age, amniotic fluid index and intra-uterine growth abnormalities of the fetus	Embryyo Technologies Pvt. Ltd.	NA
3	Low-Cost Technology for probiotic products for the Women and Children of Lahaul and Spiti	Gargi Dey	NA
4	Noninvasive electrical device for transcutaneous iron replenishment	H.N. Shivakumar	St. John
5	Establishing proof of concept for recombinant Sinapultide- A peptide for the treatment of respiratory distress	Izene life sciences Pvt. Ltd.	NA
6	Implantable Scaffolds for Obstetric Fistula	Mugagen Laboratories Pvt. Ltd.	NA
7	Development of a point-of-care diagnostic tool for pre-eclampsia screening	Shantani Proteome Analytics Pvt. Ltd.	NA
8	Electricity Free Baby Incubator	Science for Society Techno Services Pvt. Ltd.	NA
9	Microfluidics based On-chip Real-Time PCR Device for Neonatal and Maternal Screening	Sai Siva Gorthi	NA
10	A point of Care (POC) device for detection of antibiotic sensitivity of uropathogens in human urine.	Xcellence in Biological Innovations and Technologies	NA

"Contract Research Scheme(CRS)"

S.No.	Title	Applicant	Collaborator (s)
1	Validation of a rapid diagnostic method for the detection of HLA allele and its association with cutaneous drug reactions in persons with epilepsy.	All India Institute of Medical Sciences	Dr. Khanna's path lab Pvt. Ltd.
2	Optimization and scale-up of developed transdermal delivery system for Rheumatoid Arthritis.	Bombay College of Pharmacy	Yasham P2D Life Sciences Pvt. Ltd.
3	Association mapping of genes/QTLs for yield under reproductive stage drought stress in rice (Oryza sativa L.)	ICAR - Central Rice Research Institute	Xcelris Labs Ltd.
4	Using Peptidomimetics to design small molecules from a novel P1 peptide, for its interaction with beta amyloid oligomers by in-silico, in-vitro approaches and its efficiency in clearing beta amyloid load by ex vivo model of Alzheimerâ€™s disease	Department of Microbiology, University of Delhi	1) LeadInvent Technologies Pvt. Ltd. 2) National Brain Research Centre
5	Discovery of genome-wide SNPs and its use in developing a reference linkage map and association analysis in castor	ICAR - Indian Institute of Oilseeds Research	Xcelris Labs Ltd.
6	Validation of serological diagnostic reagents and kits for plant viruses affecting horticultural crops	Indian Agricultural Research Institute	IMGENIX
7	Lead identification and development of aza-Flavanones and triazole derivatives as new anti-cancer agents	Indian Institute of Chemical Technology	GVKBIO Sciences Pvt. Ltd.
8	Development of a novel bioreactor system for production of IMTECH-laccase and verification of commercial viability of IMTECH process.	Institute of Microbial Technology	Rossari Biotech Limited
9	Pre-clinical toxicology studies and Phase I clinical trial with PvDBPII, a novel recombinant vaccine candidate for Plasmodium vivax malaria	International Center of Genetic Engineering and Biotechnology	Syngene International Limited
10	Metabolome analysis in ginger and product development using gingerol	Kerala Agricultural University	Arjuna Natural Extracts Ltd.
11	Validation of novel target for HIV-1: Nef-CD80/CD86 for potential therapeutic intervention.	National Centre for Biological Sciences	1) Indian Institute of Integrative Medicine 2) Centre for Cellular and Molecular Platforms
12	Identification of Drug Candidates with Improved PK Properties Using Silicon-Switch Approach	National Chemical Laboratory	Incozen Therapeutics Pvt. Ltd.
13	Development and promotion of local fungal strains of tea ecosystem for the management of tea pathogens and insect pests with special reference to Darjeeling â€“ An Innovative Non Chemical Approach.	Tea Research Association, NBRRDC, Nagrakata	1) Varsha Bioscience and technology (India) Pvt. Ltd.

Design & Production : Airads Ltd. New Delhi

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