
birac
Ignite Innovate Incubate
BIRAC Innovators
Going Forward
September | 2014

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Foreword

Science in general, and biotechnology in particular, are key to solve challenges in healthcare, food- and energy- security; challenges that are both global and national. In the context of India where a significant number of our citizens encounter low resource settings and financial exclusion, it is imperative that we weave innovation in biotechnology to bring products that are of high quality but also affordable such that the hurdles of accessibility of product is overcome. This is the mantra that BIRAC understands and therefore helps foster innovation and research for affordable product development- the theme for the current compendium.

Fostering and empowering Indian biotechnology is the primary motivation of BIRAC and in this regard, over the years, it has established several pioneering programmes such as SBIRI, BIPP and Biotechnology Ignition Grant.

BIRAC has re-doubled its efforts to converge bio-innovation with social goals through launching of programmes such as SPARSH as well as working with partners such as Bill & Melinda Gates Foundation, The Wellcome Trust and the Indo-French agency, CEFIPRA, in addressing issues of maternal and child health and wider family health through improved nutrition, sanitation, detection and diagnosis of diseases.

BIRAC has also strategized to focus on particular innovation research areas that need urgent and continuous attention. For example, it has launched a focused call to solve problems of diseases such as HPV. BIRAC will endeavour to create more such mission led ‘directed innovation research’.

The compendium, like the previous ones, showcases cutting edge bio-innovation emerging in our country from diverse Indian geographies which BIRAC helps to foster. The bio-innovations presented here would provide our stakeholders a sense regarding our biotech industry’s positive appetite to take risk and design solutions through products and services that address the aforementioned challenges.

BIRAC and DBT will continue to interface with all stakeholders of the biotech industry to understand the existing gaps as well as predict future challenges such that, through partnership, we can jointly find appropriate equitable solutions.

All of us in BIRAC would like to congratulate Indian bio-innovators who are helping further the boundaries of scientific enterprise in bioscience for the benefit of the society. We will continue to partner and wish them future success.

Prof. K. VijayRaghavan
Secretary, DBT & Chairman BIRAC

Preface

BIRAC since its inception aims to foster excellence while supporting bio-innovations for societal benefit for all. We have through an exponential learning curve, in our short history, been able to consolidate the efforts to support competitive funding in diverse areas of biotechnology that have become a benchmark in the country. Through various funding programmes, we notice that there has been a significant boost to discovery research and further we see the shift to product development- an arena that we wish to build deeper roots in, such that the benefits of innovation driven research reaches from bench to bedside and farm to fork.

This compendium brings out the current paradigm that we urgently seek in India- combining affordability with high quality innovation. We believe that India is the place where this paradigm, especially in the context of Biotechnology driven product development, could be successfully achieved since we in our country have the resources and the need for such a paradigm to play out.

To achieve success, we need partnership amongst all stakeholders- government, academia and industry. This compendium captures the noticeable deepening of industry-academia linkages in the Indian biotechnology sector and the emerging trends in industry-industry collaboration. We at BIRAC would endeavour to build up on industry-academia collaborations and encourage even more industry-industry collaboration. Our aim is to build solid foundations for several consortia led projects that aim to build affordable and high quality products for India and for other regions including the West.

BIRAC utilises multiple strategies to make an impact in the Indian biotechnology ecosystem. Our future goals include 'strategic directed innovation research' in which we have already taken a few initial steps. We intend to quicken our steps and bring several strands of 'strategic directed innovation research' under the umbrella of RAPID (Research Alliance for Product Innovation & Development)

We also believe that we need to encourage new start ups to take roots who can combine technology and market needs to bring affordable product development. BIRAC is trying to achieve this through pioneering schemes such as Biotechnology Ignition Grant (BIG), Social Innovation Programme SPARSH and other support systems for start ups through the BioIncubator Support Scheme (BISS).

BIRAC intends to create a rapid impact through national and global partnership such that we can extend our reach and encourage osmosis of new ideas and best practices across the world. We intend to strengthen and solidify our partnerships.

I hope, through this compendium, you would notice and appreciate the leap that our bio-innovators are attempting to make such that India becomes the global destination and a hub for bio-innovation that incorporates social good.

Dr. Renu Swarup
MD, BIRAC & Sr. Adviser, DBT

About BIRAC

FOCUS

Empowering and Enabling the Biotech Innovation Ecosystem for affordable product development

VISION

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

Implementation of KEY STRATEGIES

- **Foster innovation and entrepreneurship in all places of research**
- **Promote affordable innovation in key social sectors**
- **Higher focus on start-ups & small and medium enterprises**
- **Contribute through partners for capability enhancement**
- **Encourage diffusion of innovation through partners**
- **Enable commercialization of discovery**
- **Ensure global competitiveness of Indian enterprises**

BIRAC's Core Values

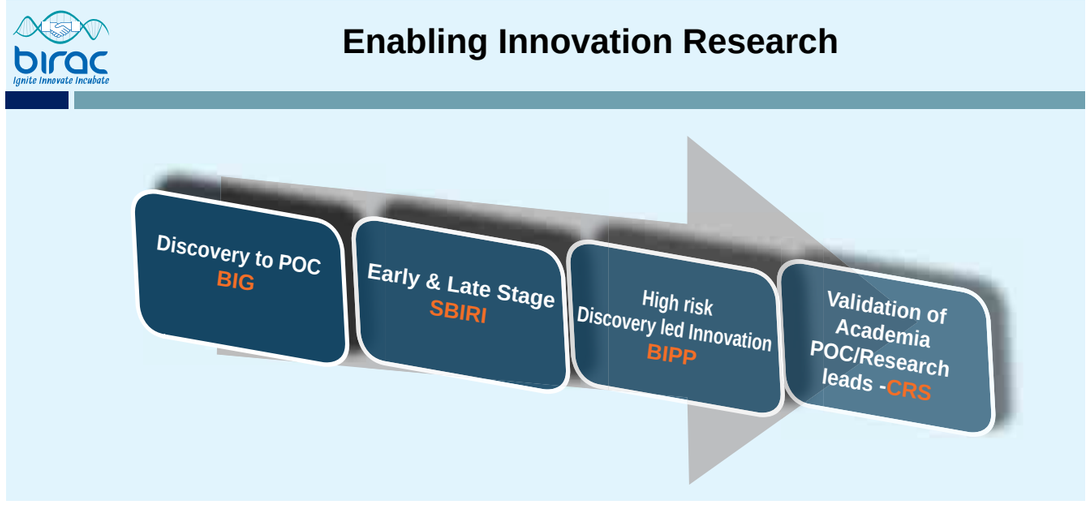
- Integrity
- Transparency
- Team work
- Excellence

Innovation Funding for Affordable Product Development

BIRAC is a Section 25, "Not-for-profit Company" set up by Department of Biotechnology, Government of India as its interface agency to serve emerging biotech industries incorporated on 20th March, 2012, BIRAC is Schedule 'B' Public Sector Undertaking, which is guided by an independent Board of Directors comprising of senior professionals, academicians, policy makers and industrialists. To serve various dimensions of its mandate, BIRAC operates mainly in 3 verticals. Investment schemes provide funding support to entrepreneurs, start-ups, SMEs and Biotech Companies for all stages of the product development value chain from discovery to proof of concept to early and late stage development to validation and scale up, right upto pre-commercialization. There are also special product development missions. The second vertical is Entrepreneurship Development which focusses not only on the funding support, but also on making available the right infrastructure, mentoring and other networks for technology transfer and licensing, IP and business mentoring including regulatory guidance. Lastly BIRAC's strategic partnership group works closely with all partners – national and international which includes Government departments and ministries both central and state, industry organisations, international bilateral agencies, philanthropic organisations and corporate sector, to leverage the strength and expertise and mobilize resources and extend the outreach of its activities. Some of the key components are:-

Investment for Affordable Products

Biotechnology Ignition Grant (BIG) is available to scientist entrepreneurs from research institutes, academia and start ups. It is designed to stimulate commercialisation of research discoveries by providing very early stage grants to help bridge the gap between discovery and invention. The BIG innovators receive mentoring and networking help from five BIG partners (C-CAMP Bangalore, IKP Hyderabad, FITT, IIT Delhi, NCL Venture Center Pune and KIIT-TBI Bhubaneshwar).



Small Business Innovation Research Initiative (SBIRI) is the first of its kind PPP initiative to support early stage innovation focussed incremental R&D in the area of Biotechnology to facilitate risk taking ability by SMEs.

Biotechnology Industry Partnership Programme (BIPP) seeks to provide support for high risk discovery to early to late stage innovation research in biotech industry and/or accelerate commercialisation of new indigenous technologies. It is a partnership scheme which is on a 50:50 cost sharing model.

Contract Research and Services Scheme (CRSS) supports academic institutes across the country to take forward research leads through a validation and translation by the industry. Funding is in the form of grant given to both the academic as well as the industrial partner.

While the industry performs its role as a validation partner and engages on a contractual basis, the IP rights reside solely with the academic partner.

Social Innovation Programme for Products Affordable and Relevant to Societal Health (SPARSH) combines social innovation and biotechnology for the well-being of the society by helping identify and support cutting edge innovations towards affordable product development with potentially significant social impact. SPARSH provides support in the form of impact funding and fellowships for discovery, to POC, to late stage validation.

Affordability as a Paradigm

The complexities of issues and challenges that we face as a nation in the areas of healthcare, food and energy security and further the economic condition of a significant number of our citizens makes it imperative that we focus on biotech products that are excellent in quality but simultaneously are affordable thereby helping to scale accessibility.

Both BIRAC and the Indian biotech industry understand this paradigm of product development which is an amalgamation of affordability and high quality.

During its two years of existence, BIRAC has made a special effort to reach out to all its stakeholders and launch special initiatives which cater to the needs of the growing enterprise and build and strengthen the Innovation Research Ecosystem. BIRAC's key strategies are aligned in a manner that the attention stays focused on "Innovation Research for Affordable Product Development". This includes inculcating and strengthening the Innovation Research Culture in young entrepreneurs, start ups and SME's. For this to happen effectively, the academia – industry interface has been strengthened and systems put in place to encourage academic research leads to move out of laboratories, through the translational phase to product development. "Partnerships" are the key to success – partnerships between academia and industry, between industry consortia, between national and international research groups and industries and also between Innovation–funding and development agencies – national, global, government philanthropic and corporate houses.

BIRAC's main mission is to bring together the like minded organisation, create these network and provide the necessary synergies which are needed for product development partnership. While the attention stays focused on affordable and social innovation, the efforts continue to create capacity and strengths to build a globally competitive Indian 'Biotech Enterprise'.

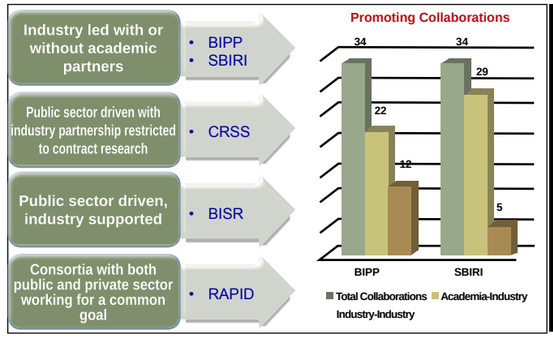
BIRAC as a core 'development agency' focuses on the entire product development chain from idea to proof of concept, to early stage - late stage, validation, scale up, right upto commercialization. The emphasis is not only on providing the funding but complete handholding to help the entrepreneurs to grow and take their ideas forward to product development. BIRAC operates in 3 clear verticals:

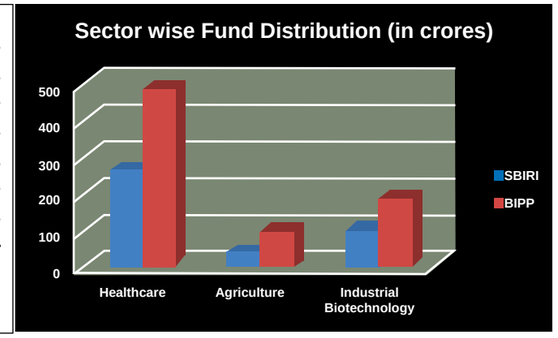
It is important to build a framework to nurture entrepreneurs and support entrepreneurship development. BIRAC has been constantly working in this direction.

BIRAC works towards fulfilling this goal by starting at the bottom of the pyramid, where the base has to be the strongest – that is our student and young entrepreneurs, supporting novel ideas and taking them to proof of concept and then providing the essential support for early and late stage right upto scale up and pre-commercialization.

While funding is a critical component, it cannot be the only support mechanism. BIRAC is working towards strengthening the entire ecosystem, to encourage entrepreneurs to take up innovation research. BIRAC helps them to – 'Ignite, Innovate and Incubate'.

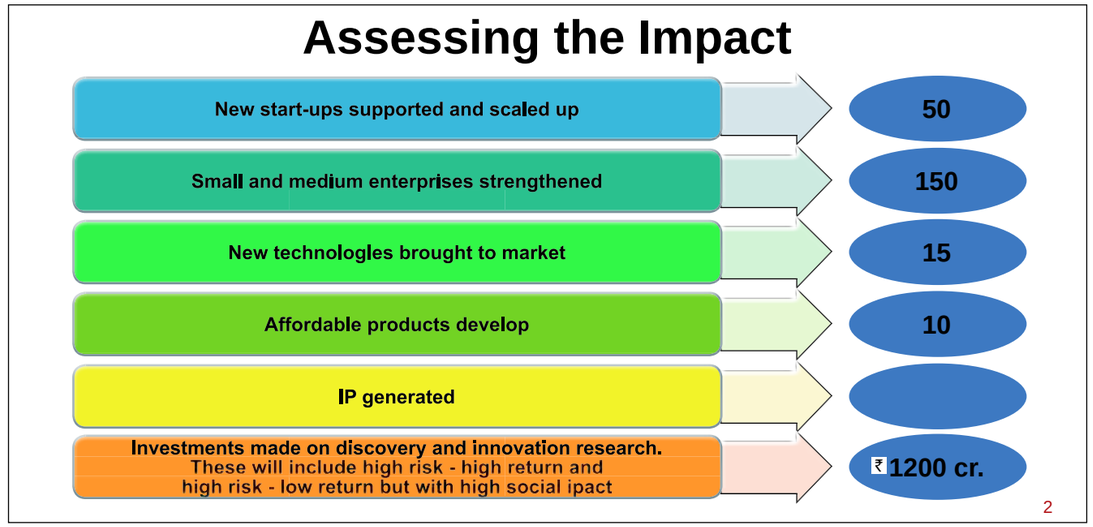
BIRAC supports affordable product development by empowering and enabling Indian biotech innovation ecosystem through its funding schemes. BIRAC's innovation funding schemes encourage collaboration between the two important stakeholders of biotech ecosystem i.e. industry and academia and provide a conducive environment for collaborative R&D by supporting all major areas of biotechnology sector i.e. Healthcare, Agriculture and Industrial Biotechnology.





BIRAC, till date, has supported 240 companies for 360 projects with a funding support of approximately 100 million USD with a commitment of 120 million USD from private sector. Out of these, 77 projects involved Industry-Academia collaborations. These projects have delivered 17 affordable products and 11 new technologies in addition to creating 24 intellectual property and three bio-industrial facilities.

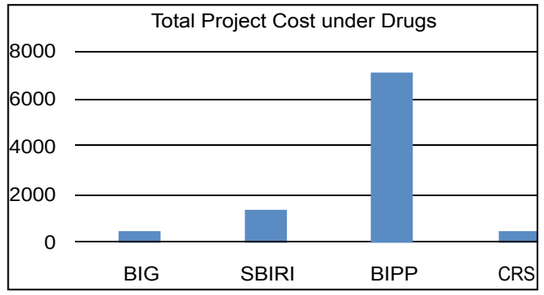
BIRAC's maximum funding support, till date, was given to Healthcare sector covering the areas of Drugs (including Drug Delivery), Devices/Diagnostics, Biosimilars and Vaccines/Clinical trials followed by Industrial biotechnology sector which includes Industrial Products/Processes & Secondary agriculture and Agriculture sector covering Marker Assisted Selection (MAS), RNAi, Transgenics and soil health management through its flagship programmes i.e. SBIRI and BIPP. In addition, BIRAC supports projects from Bio-informatics and Infrastructure also.

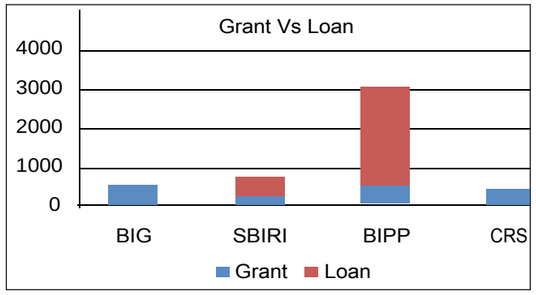


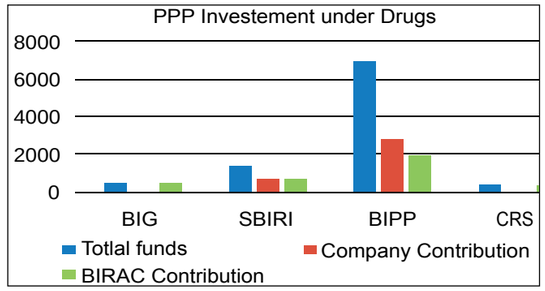
Theme-wise Assessment

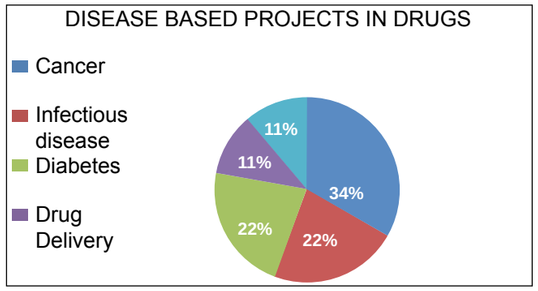
BIRAC monitors and mentors its funded projects through thematic reviews, identify the gaps and chalks out its future course of action accordingly. The following presents theme-wise detailed analysis and observations,

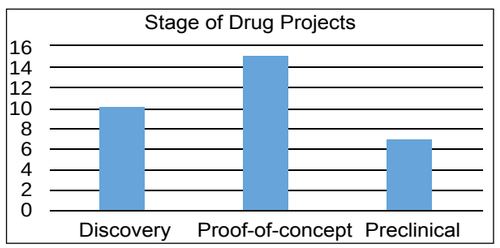
Drugs (including Drug Delivery)









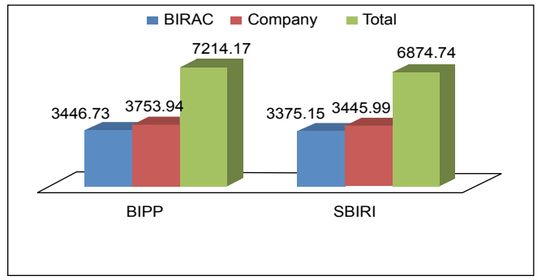


Observations

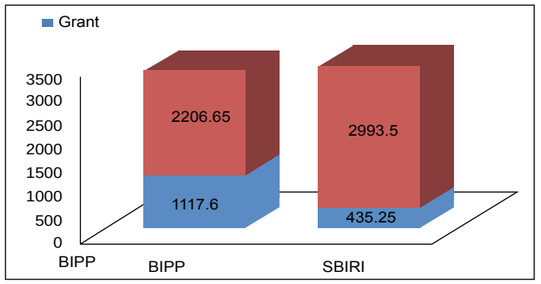
- Cancer projects were funded maximum followed by infectious diseases & diabetes (equal share) and drug delivery.
- Others include antibacterial, neglected and inflammatory diseases.
- Total project cost, as expected, is more for BIPP projects as it supports scale-up towards commercialization.
- Industry is coming forward and investing more or less equal to Government's contribution in SBIRI and BIPP schemes.
- Government's contribution is more for loan component than grant in SBIRI & BIPP.
- Most of the projects are in PoC stage followed by Discovery and Preclinical.

Devices & Diagnostics

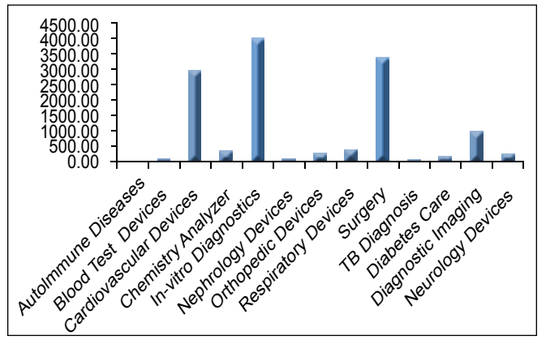
Fund Distribution (in lakhs)



Grant/Loan Pattern



Fund Distribution across areas

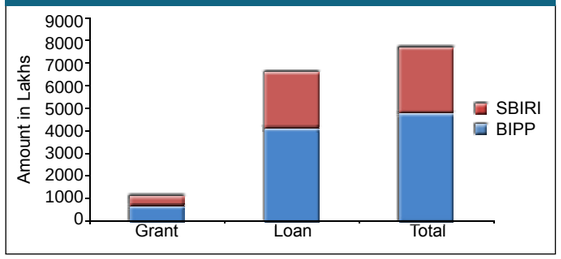


Observations

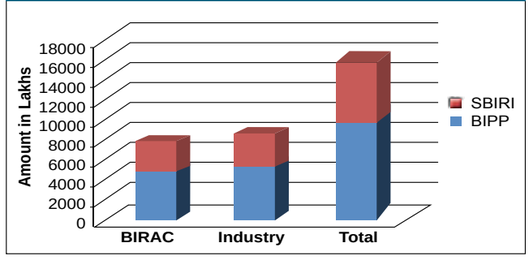
- Funding is maximum for in-vitro diagnostics followed by interventional surgery & cardiovascular devices (almost equal share) and diagnostic imaging.
- Total cost of the projects is almost equal in SBIRI and BIPP schemes though the nature of funding is different.
- Industry contribution is equal to Government's contribution in this sector.
- Loan component is more in SBIRI projects than for BIPP projects.
- Increase in commitment of funding as the market for medical devices is expected to grow 9.9% by 2020.

Biosimilars

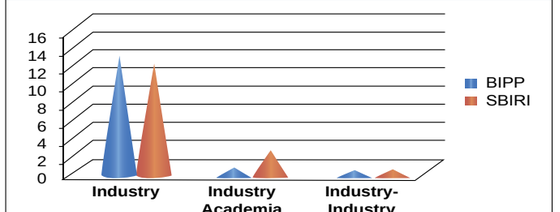
Funds Disbursement in BIPP/SBIRI



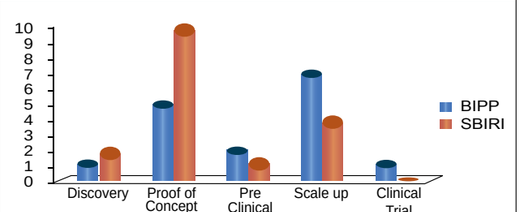
BIRAC Contribution to Projects



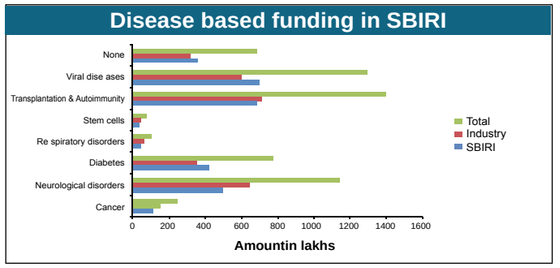
Collaboration Pattern in Biosimilar Projects



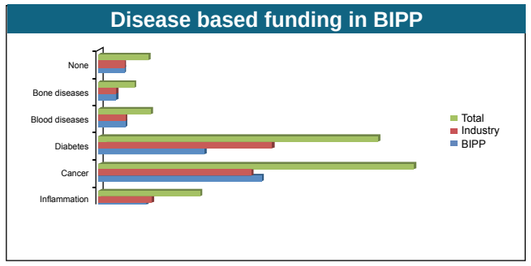
Stage of the Projects



Disease based funding in SBIRI



Disease based funding in BIPP

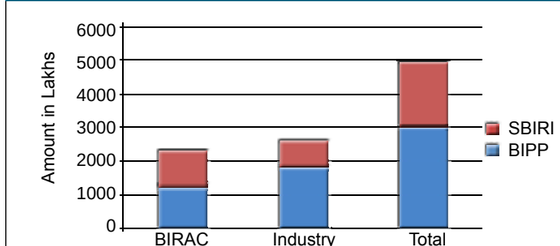


Observations

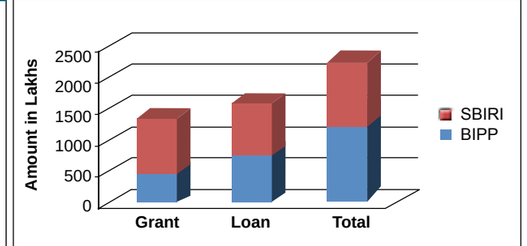
- Diabetes and Cancer projects were funded more in BIPP whereas Transplantation & Autoimmune and Neurological disorders were funded more in SBIRI.
- Many of the projects from SBIRI are in PoC and in Scale-up stage from BIPP as expected by the nature of funding.
- Industry is contributing equally to Government and loan component is more for Government's funding.

Vaccines

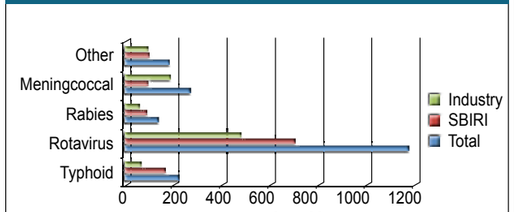
BIRAC/Industry Contribution to Projects



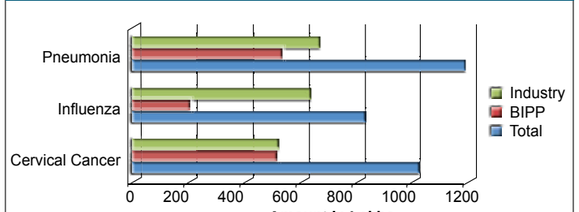
Grant/Loan Disbursement in BIPP/SBIRI



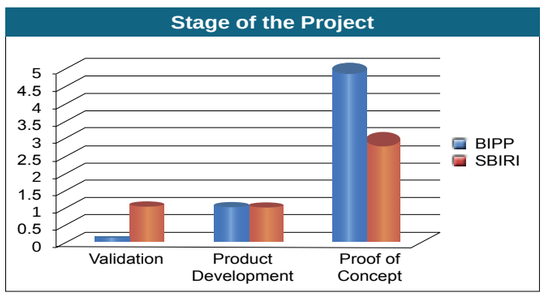
Funding in SBIRI



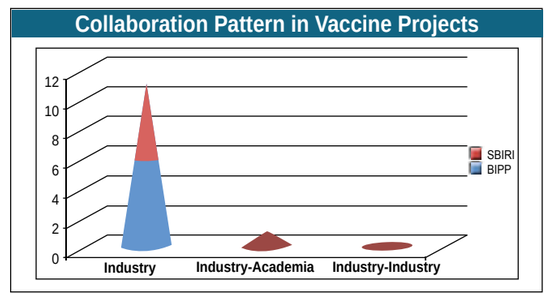
Funding in BIPP



Stage of the Project



Collaboration Pattern in Vaccine Projects

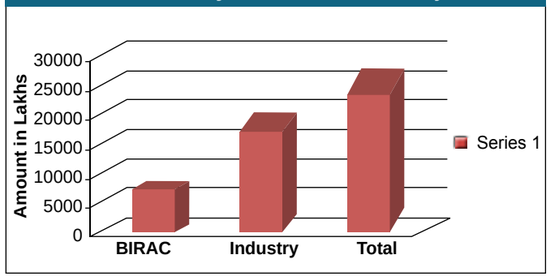


Observations

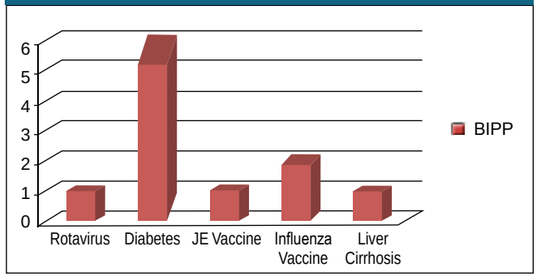
- Many of the projects are in PoC followed by product development.
- Industry is contributing more than or equally to Government and loan component is more for Government's funding.
- Collaborations (either industry-academia or industry-industry) are lacking in this area.

Clinical Trials

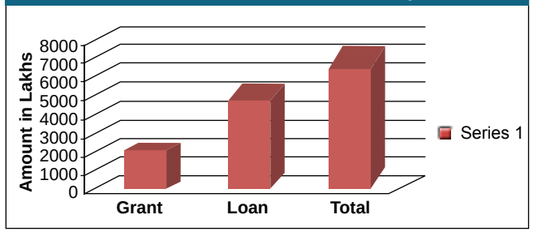
BIRAC/Industry Contribution to Projects



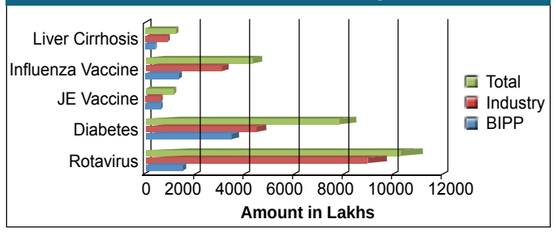
Diseases wise Distribution of Projects



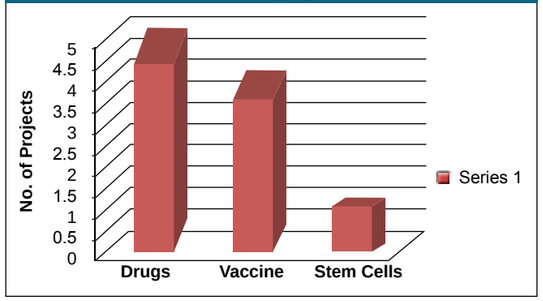
Grant/Loan Disbursement in Projects



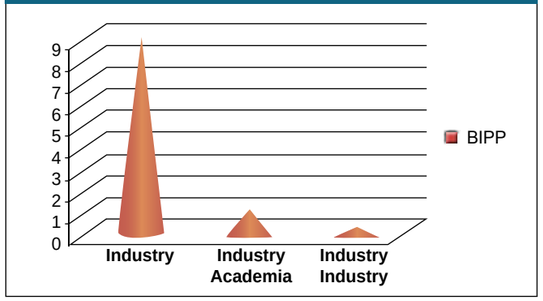
Disease-wise Funding



Classification of Clinical Trials projects under different areas



Collaboration Pattern in Clinical Trials Projects

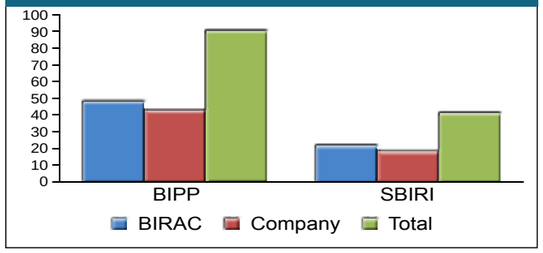


Observations

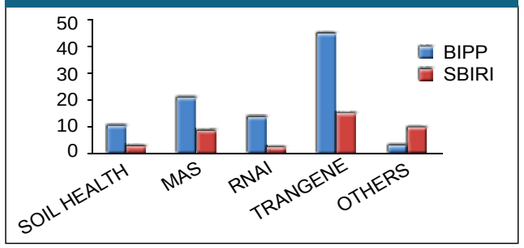
- No. of clinical trial projects under drugs are more followed by vaccines and stem cells.
- No. of projects in the area of diabetes are more followed by influenza vaccine.
- Industry is contributing more than Government's contribution and loan component is more for Government's funding.

Agriculture

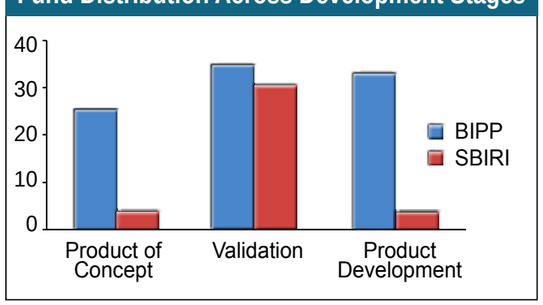
Fund Distribution Across Schemes



Fund Distribution Across Areas



Fund Distribution Across Development Stages



Observations

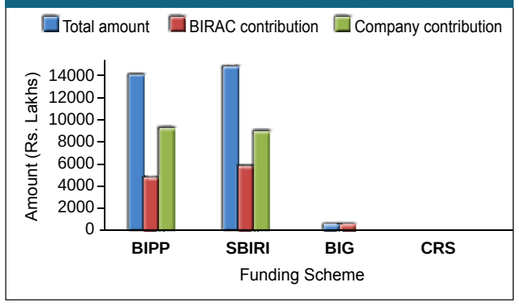
- Government's contribution is more compared to industry in this sector.
- Transgenics have the maximum share of funding followed by MAS.
- Many of the projects are in validation stage followed by product development and PoC.
- Crop improvement through RNAi is encouraged though the technique is in its nascent stage.
- Soil health management is supported through nano-fungicides, nano-pesticides and bio-pesticides.
- Industry-academia collaborations were evident and found to be a major factor for progress towards product development.

Stage Vs. Category Supported

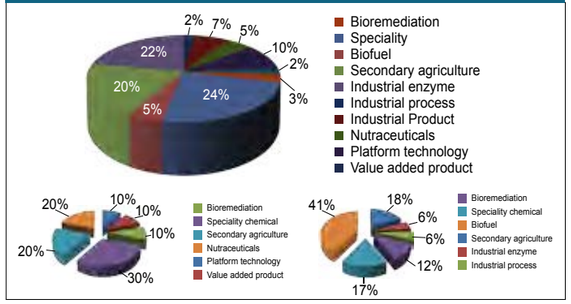
Stage Development / Category of Technique	Proof of Concept	Validation	Product Development
Marker Assisted Selection	Abiotic Stress Tolerance and Identification of Elite Traits for micro-propagation	Yield improvement under stress (Abiotic - Drought and Moisture)	Development of Elite varieties for nutrition, Abiotic and biotic stress
	Crops : Rice and Banana	Biotic- viral and fungal) **Crops: Rice, Maize, Tomato and Okra**	**Crops; Mustard, Rice and Pigeon Pea**
RANi	Development of resistance to insect and viruses	A nascent technology yet to reach validation and product development stage	
Transgenics	Abiotic Stress Tolerance **Crop : Rice**	Development of stress tolerance (Abiotic - Drought, Salinity, Biotic - Insect pest, Viruses) **Crops: Onion, Rice, Cotton, Maize, Cassava and Brinjal and Okra**	Deregulation trails for Insect Pest and Herbicide Resistance **Crops: Rice, Maize, Mustard**
Soil Health Management	Synthesis of Nanopecticides and Actinomycetes Test Crop : Rice	Pilot scale Productions of Biopesticides Nanopesticides and Nanofungicides	Commercial Scale Production biopesticides for weed management

Industrial Biotechnology

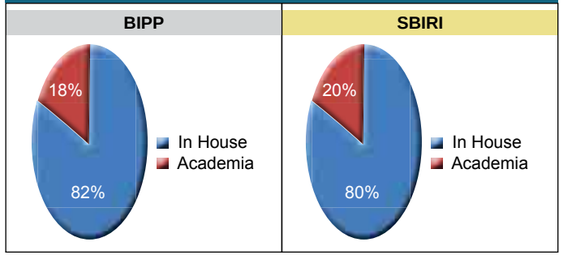
Funds Disbursement across Schemes



Area-wise Project Distribution



Genesis of Technology

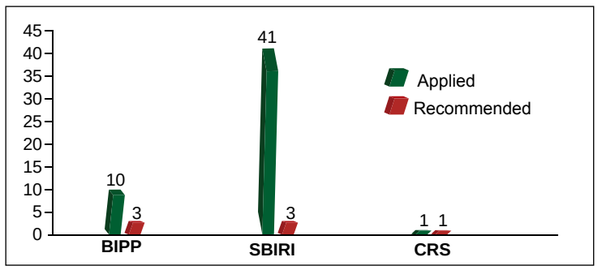


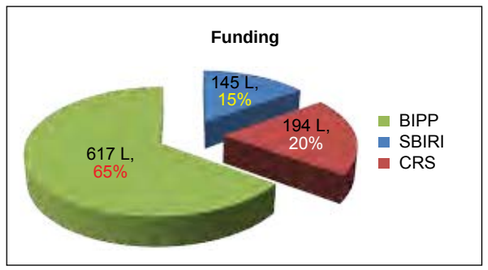
Observations

- Bio-fuels attracted maximum funding from BIPP whereas specialty chemicals followed by secondary agriculture, an upcoming area, have taken maximum share of funding from SBIRI and BIG schemes
- Major share of funding is going to PoC followed by validation
- Few of the proposals from this sector involved Industry-academia collaboration
- Industry is contributing more compared to Government's contribution

Bioinformatics

Status of Bioinformatics Projects : A Comparison



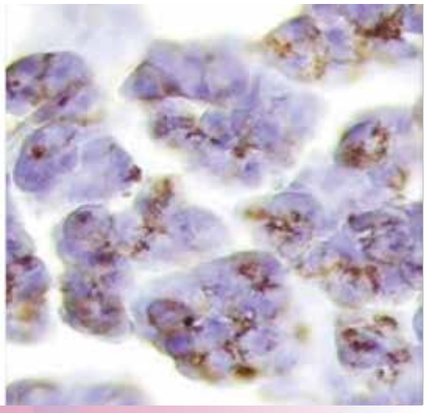


Observations

- BIPP provided maximum funding for bioinformatics followed by CRSS and SBIRI.

Innovation Profiles

Healthcare
Biopharmaceuticals



Affigenix Biosolutions

The Innovation

Glycolytic Inhibitor.

Development Stage: Proof-of-concept

Brief Description
Proposed to develop antibodies against critical epitopes of tryspinogen and trypsin by designing peptide mimetics and purify specific antibodies for intended purpose. The design and development strategy includes use of trypsin peptide mimetic as immunogen for raising active site inhibiting antibodies and through purification strategy selectively raise antibodies against certain epitopes.Screening selected antibodies based on on-rate and off-rate binding and developing critical reagents suitable for process impurity clearance assay for use as affinity matrix to purify Trypsin and for use as surrogate positive control in anti-trypsin antibody assessment in clinical samples.

Innovative Element(s)
Selecting unique peptide mimetic and developing antibodies to all possible peptides and then selecting and screening the “pool of polyclonal antibodies or oligoclonals” that could be used for developing customized assay for various Trypsin from different host.

Market Potential
Biologic/ biosimilar companies routinely use Trypsin during downstream processing are potential customers for affinity matrix and also Trypsin manufacturers.

National/ Societal Relevance
Proposed development of anti-trypsin antibodies and development of immunoassay intends to address various societal issues.

Project Deliverables
Progress vis-a vis objectives
Efforts are in progress as per the objectives.

Technology/Product developed
The design of proposed method is expected to give a rapid, sensitive, specific and reliable trypsin clearance assay, anti-trypsin antibody immunogenicity assessment kit and matrix for purifying Trypsin from various sources.

IP generated/Potential for IP generation
The product antibody IgG sequence developed for the assay may provide IP.

Plans to take innovation further
Planning to expand the facility with relevant accreditation for product generation as well as develop the MAb inhibitor as a potential therapeutic MAb for treating pancreatitis.

Risks Envisaged
Trypsin protease activity is an issue to use native Trypsin as immunogen and for screening antibodies and developing any assay.Instead of using intact Trypsin enzyme its peptide mimetics can overcome the Trypsinisation of anti-trypsin antibodies when used as immunogen. Finding an active site inhibitor MAbs using conventional hybridoma technology and also in delivering precisely to site of action (Pancreas).

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Anil Kumar Roy–IKP

The Innovation

Glycolytic Inhibitor.

Development Stage: Discovery/Proof-of-Concept

Brief Description
Invention intends to explore anticancer properties of prodrug of a small molecule Glycolytic Inhibitor. The prodrug compounds have potential for targeted delivery and exerting glycolytic inhibitor affect therby arresting tumour growth and leaving healthy cell unaffected. Have potential to be effective against various solid tumour types.

Innovative Element(s)
Derivatives are prodrugs and retain the biological activity of the parent compound, but may exhibit different pharmacokinetics thereby exhibiting Glycolytic Inhibitor effect to arrest tumour growth at lower concentration than parent compound.

Market Potential
As glycolytic inhibitor, product of this invention has potential to be positioned as first oral treatment of choice for various cancer including non-small cell lung cancer, glioblastoma, breast, endometrial and prostate cancer.

National/ Societal Relevance
With increasing prevalence of cancer in India, indigenously developed relatively safe broad spectrum oral cancer treatment provides huge opportunity as affordable treatment in India.

Project Deliverables
Progress vis-a vis objectives
Synthesis and characterization work is in progress.

Technology/Product developed
Four prodrug compounds with enhanced anticancer properties are expected.

IP generated/Potential for IP generation
Potential for IP generation currently invention is covered by provisional patent.

Resources Generated
Enterprise Created : Atharvwin Healthcare Pvt .Ltd.

Plans to take innovation further
Licensing and partnering with pharmaceutical company at early and late stage development.

Risks Envisaged
Since this proposal is in its discovery phase, it may have its inherent risks. Superiority of prodrug over parent compound in proof of concept study will mitigate risk and provide opportunity for strong IPR to move innovation to next stage.

Innovator Team
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Mr. Sarin Parayil

Collaborating Partner(s)
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IICT Hyderabad for synthesis

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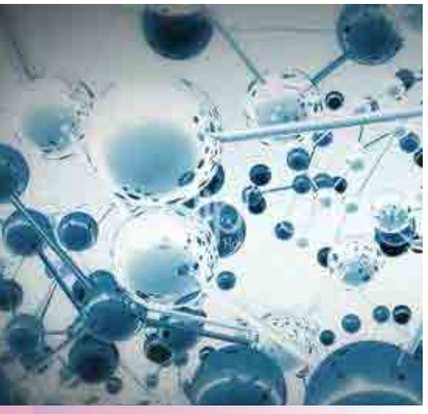
Anthem Biosciences



The Innovation

Ketoreductases- Whole cell biotransformation for chiral chemistry.

Development Stage: Proof-of-concept

Brief Description
Proposed to create a panel of E. coli strains to achieve efficient chiral reduction of commercially important ketones on a large scale. The novelty is the combination of heterologous expression of chiral ketoreductases from different microorganisms in E. coli mutants with specific gene(s) deletions to generate strains that vary in their ability to use cellular NADPH and thus catalyze reduction of pharmaceutically relevant ketones.

Innovative Element(s)
Novel approach was used to delete genes whose products are known to extensively uitilize cellular NADH/NADPH. This has led to generation of the strains that have the capacity to provide a sustained supply of cofactors to support the asymmetric reduction of prochiral ketones when ketoreductase are over expressed.

Market Potential
This platform has immense domestic and international market potential since enantiomerically pure alcohols are important starting materials in a number of industrial applications.

National/ Societal Relevance
The creation of indigenous cutting edge technologies to produce effective whole cell reduction systems for producing enantiomerically pure products is of national importance as it: 1. Reduces the use chemicals commonly used for reduction. 2. Decreases production cost of chiral alcohols of industrial and pharmaceutical relevance.

Project Deliverables
Progress vis-a vis objectives
Development of a hybrid in-silico platform for E. coli based on FBA and ODE, and prediction of KO's and OE's that enrich cofactor regeneration- completed. Synthesis of a diverse set of substrates for KREDs, Synthesis of racemic and chiral alcohols- completed. In-vitro and whole cell biotransformation in KO strains of ketoreductases from various microbial sources that catalyze efficient reduction of diverse prochiral ketones-completed. Enhanced chiral transformation of 5 industrially relevant ketones using co-factor enriched strains-completed.

Technology/Product developed
Enhanced chiral transformation of 5 industrially relevant ketones using co-factor enriched strains demonstrated successfully.

IP generated/Potential for IP generation
Cell works has filed for a patent on molecularly engineering *E.coli* to produce enhanced co-factors.

Resources Generated
Necessary equipments were procured by Anthem and Cellworks. 6 scientists were trained as a part of this exercise between Cellworks and Anthem.

Innovator Team
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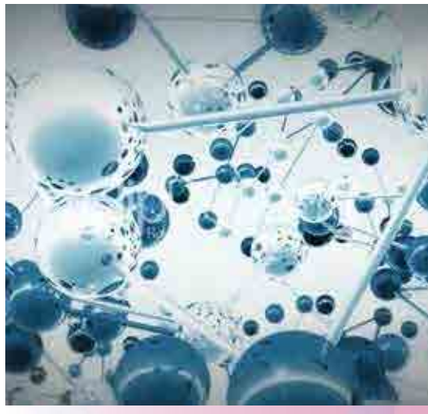
Anthem Biosciences



The Innovation

Development of a novel HDAC inhibitor for the treatment of cancer.

Development Stage: Proof-of-Concept

Brief Description
PAT-1102 is a novel HDAC inhibitor that has shown anticancer activity against a variety of human tumor cell lines. PAT-1102 has demonstrated anti-tumor activity in human cancer models such as lung carcinoma and colorectal cancers in experimental models. Toxicity studies indicated that PAT-1102 has better safety profile compared to other HDAC inhibitors in development.

Innovative Element(s)
PAT-1102 is a structurally novel, best-in-class HDACi and has showed potential anticancer activity against various solid and hematological cancers in cell lines, ex vivo and in vivo human tumor xenograft models. PAT-1102 has the potential to become a potential best in class HDAC inhibitor for solid tumorse specially for Gastrointestinal and Pancreatic cancers. The molecule is a structurally novel and has strong IP protection in several countries.

Market Potential
PAT-1102 has a major application in pharmaceutical/biotech industry for anticancer therapy as a monotherapy or a combination therapy with marketed anticancer drugs. The global anticancer market was $70 billion in 2008. The targeted cancer drug market will double in value, from $25 billion in 2008 to $51 billion in 2015.

National/ Societal Relevance
There is a strong unmet medical need to develop newer anti-cancer therapies. Further, targeted cancer therapy is very expensive and cannot be affordable by most of the cancer patients in India. PAT-1102 is expected to offer safe and affordable cancer therapy to cancer patients in India.

Project Deliverables
Progress vis-a vis objectives
Non-GMP Synthesis & CMC of PAT-1102 and Backup compound synthesis-completed. Selection of cancer indications for PAT-1102 using 'Explant Culture' technology.-Completed. Antitumor efficacy of PAT-1102 in human tumor derived xenografts models-completed.

Technology/Product developed
Oncoprint by Mitra and PAT-1118.

IP generated/Potential for IP generation
Application No. WO 2011021209, IN 2009CH01610, EP 2451790, CN 102548975, JP 201253286, US 20120101099.

Plans to take innovation further
We need to perform GLP Toxicity/ safety studies and CMC documentation before the commencement of clinical trials for PAT-1102.

Risks Envisaged
Toxicity or ADME related problems could be encountered during the development of this compound, as is the case of New Chemical Entity (NCE) to be developed as a drug. In such instances, the backup molecule could be developed.

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Arjuna Natural Extracts

The Innovation

Detailed Chemical Profiling and Pre-Clinical Evaluation of a US-patented Anti-diabetic Plant Extract.

Development Stage: Proof-of-concept

Brief Description
Company would extract and profile active constituents from the US patented antidiabetic plant extract using modern separation and analytical techniques. The standardized extract prepared according to WHO/USFDA guidelines is for preclinical trials, toxicology studies, pharmacokinetic studies and other regulatory requirements such as information about possible bioactives resulting in a potent herbal antidiabetic drug.

Innovative Element(s)
The extract from plant Costus pictus has potent antidiabetic activity and regenerates pancreatic islet cells as proved by animal studies. The proposed project will elucidate the mechanism by which Costus pictus extract imparts the anti-diabetic effect and help 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
There is a tremendous market demand for a safe and effective natural antidiabetic drug. India is having a huge diabetic population which looks forward to an antidiabetic drug of natural origin.

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 care problem in India.. 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 Pharmacoepidemiological studies were completed. Identified various phytochemicals and standardized the extraction procedure. Antidiabetic efficacy of the developed extract was completed in rats. Acute toxicity study of the extract was completed. Scaled up the extraction procedure to pilot scale and plant scale. Detailed toxicity and efficacy studies are ongoing.

Technology/Product developed
Antidiabetic herbal extract is under development.

IP generated/Potential for IP generation
Application patent has been filed.

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

Plans to take innovation further
The antidiabetic herbal extract will be taken up for commercialization.

Innovator Team
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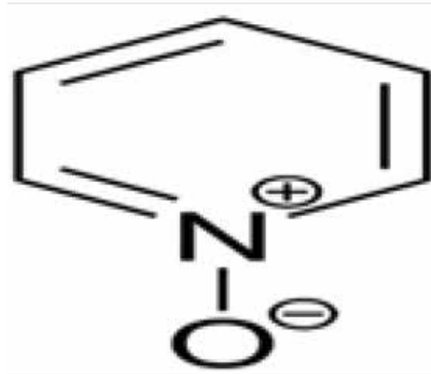
Crystalin Research



The Innovation

Pharmacological Evaluation of N-oxide Metabolite of Antipsychotic Drug for Type 2 Diabetes.

Development Stage: Proof of concept

Brief Description
The selected Antipsychotic drugs will be made their N-oxide and then test the activity of the N-oxide derivatives in promoting insulin secretion form beta-pancreatic cells. The approach is based on recent publications in which Clozapine-N-oxide displayed potent activity against engineered muscarinic receptors in pancreatic β-cells and stimulated insulin exocytosis. Thus Blonanserin N-oxide metabolite will be evaluated for insulin release to reduce glucose levels in text animals and insulinogenic cell lines. It is expected that the underlying mechanism for M3-muscarinic receptor phosphorylation and regulation of glucose-dependent insulin release will be a possible pathway for the drug action for BNO.

Innovative Element(s)
The N-oxides of Antipsychotic drugs is a novel concept in the discovery of type 2 diabetes therapy. The antipsychotic drugs N-oxides will be a First in Class type of molecules for Type 2 diabetes mellitus. A novel T2DM drug based on chemical genetic approach will allow for the conditional and selective activation of beta-cells. The present project will test some of these novel and interesting ideas for hyperglycemic patients.

Market Potential
Diabetic drugs are a crowded area. Notably, the molecule is a First in Class and moreover we feel that it will not have hypoglycaemic side effects associated with current day sulfonylureas.

National/ Societal Relevance
India is the diabetes capital of the world due to life style changes and urban food habits. And T2DM is a major therapeutic goal in India healthcare. The project has high relevance.

Project Deliverables
Progress vis-a vis objectives
All the committed objectives have been delivered at month 18. We expect to complete the trailing experiments in SD rats in next 3 months (with short extension to 21 months).

Technology/Product developed
POC of new BNO drug developed as a Repurposing/Repositioning strategy at final stages.

IP generated/Potential for IP generation
Filing of IP after completing trailing experiments.

Resources Generated
Lab set up for cell culture experiments and crystallizations. 6 MSc/ Biotech scientists were trained during the course of this project.

Plans to take innovation further
File IP and to discuss with potential pharma companies.

Risks Envisaged
None as of now.

Innovator Team
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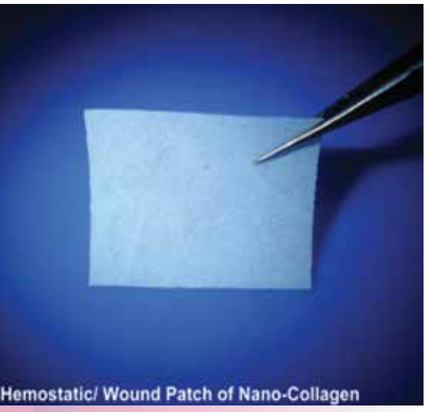
Excel Matrix



The Innovation

Novel Hemostasis Mechanisms.

Development Stage Prototype validation

Brief Description
Haemostasis and wound closure/ coverage require multiple solutions depending on clinical situations. No single approach is suitable due to wide range of challenges that need to be met in a solution. We have developed novel gelling mechanisms of proteins as alternative haemostatic mechanism. Some aspects of the mechanisms also have desirable role in subsequent wound healing.

Innovative Element(s)
The cross-linked protein gel formed is strong enough at a lower crosslinkers/ protein concentration comparable to existing products, which is useful for haemostasis and wound closure/ coverage in emergency. The inventive steps of our novel biomaterial and process technology are further extended through device design for hemostasis and wound closure.

Market Potential
Hemostasis and wound closure market is about 10 billion USD worldwide. Fibrin, synthetic and biopolymers based technologies are used in majority (80%) of applications. As the proposed project manufacturing is inherently simpler, safer and cheaper than fibrinogen/ blood derived based products, it can capture significant share of the market.

National/ Societal Relevance
First aid, haemostasis aid for surgical and acute wounds and for burn wound coverage. Low cost and rapidly deployable by non-experts in remote locations.

Project Deliverables
Progress vis-a vis objectives
Two novel biomaterial based formulations were developed.

Technology/Product developed
Three-product prototypes under development.

IP generated/Potential for IP generation
IP yet to be filed on novel material for hemostasis and process of manufacturing.

Resources Generated
Two manpower is employed and being trained.

Plans to take innovation further
Pilot scale manufacturing, clinical trials for class II/ III indications.

Risks Envisaged
Pilot scale manufacturing issues, Validation in clinical settings and field conditions, Regulatory standards for specific applications, Competition by generic hemostatic products is considerably high and lack of awareness towards novel product.

Innovator Team
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GeNext Genomics

The Innovation

Validation of a novel drug target in mycobacterium tuberculosis.

Development Stage Validation

Brief Description
A validated drug target for the management of mycobacterium tuberculosis and to develop a candidate as a therapeutic.

Innovative Element(s)
Considering the emerging problem of MDR and XDR strain in tuberculosis, we propose to identify a novel and effective target. A novel drug and a possible new biological entity could provide huge opportunity to address afore mentioned problems and can lead to series of therapeutics to fight against tuberculosis infection.

Market Potential
Global TB drug market is around 300$ million dollars and any new target to develop a series of therapeutics will definitely acquire a space in current market share.

National/ Societal Relevance
Considering the prevalence of TB in India, the proposed product has high relevance.

Project Deliverables
Progress vis-a vis objectives
Characterization of native protein against which polyclonal antibody showed 90% inhibition. Cloning and characterizing the target. Validating the inhibition in growth with knock out of the gene.

Technology/Product developed
In process.

IP generated/Potential for IP generation
In process.

Resources Generated
Manpower employed/ Trained four; Instrument for cell biology acquired.

Plans to take innovation further
Once the target is validated and assay developed for screening the molecules we plan to collaborate to develop a lead compound which in turn can be developed into a therapeutic.

Risks Envisaged
Huge risk can be foreseen right from drug development to the FDA approval and market. The good expertise and collaboration is needed to take the research forward.

Innovator Team
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Health line

The Innovation

Developing face mask for cosmaceutical application using sericin and other natural bio-active agent on non-woven silk sheet.

Development Stage: Proof of concept and validation

Brief Description
The cosmaceutical product useful for facial application is in the form of wet facial mask carrying bio-active peptides extracted from silk cocoon, purified and suitably modified to provide – intense and sustained moisturization in stratum corneum, localized tyrosinase inhibition activity and to catalyze epithelial cell regeneration and facilitate other skin rejuvenation steps.

Innovative Element(s)
The various functional properties described earlier was obtained from the single source – viz. silk cocoon in the form of bio-active peptides – as a combination of purified specific extracts, enzyme hydrolyzed fraction and a chelated fraction. The clinical study undertaken indicated sustained moisturization of stratum corneum for at least 8 hours and skin rejuvenation after sustained use.

Market Potential
Anti-aging and skin rejuvenation segment constitute 2% of Rs. 3000 crore domestic market and growing at impressive 93% year-on-year.

National/ Societal Relevance
Demographics of urban India indicate larger numbers of adult men and women who suffer from facial skin dehydration and damage because of extrinsic & intrinsic factors and they are looking for affordable non-allergenic, non-toxic anti-ageing solution.

Project Deliverables
Progress vis-a vis objectives
The project was completed meeting the stated objectives. The product is currently undergoing market validation studies.

Technology/Product developed
The first version of the product has been released to the market in the name of “PurMyso”.

Innovator Team
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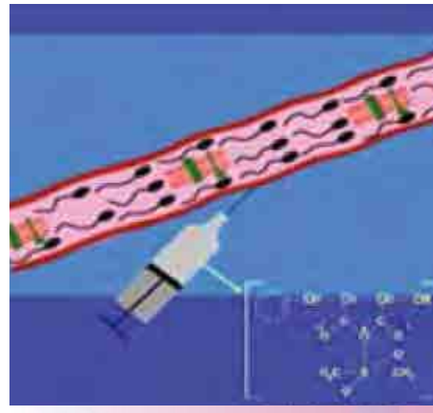

The Innovation

Risk based process design for large scale manufacturing of male injectable contraceptive.

Development Stage: Advanced stage of Phase III Clinical Trial

Brief Description
The innovation comprises of a novel drug named RISUG®“Reversible Inhibition of Sperm Under Guidance”(Formerly known as SMA) (Name registered as Trademark by inventor). Electrical charge generating compound giving long term contraception in the male with single intervention and with reversal potential. A novel special auto-destruct syringe magnetically activated enabling long term storage of chemically reactive compounds and delivery at high pressure and suitable for use in large scale field programs.

Innovative Element(s)
There is no comparable product internationally. The originality lies in Selecting and combining three chemicals- Styrene, Maleic anhydride, and Dimethyl sulfoxide (DMSO), which individually have toxicities in such a manner that a biocompatible new drug molecule is generated. The concept of electrical charge has been brought into the field of contraception in that RISUG generates an electrical charge and devitalizing sperms. The electrical charge is a bound charge which is not lost. Therefore, implantation by one injection gives contraception for a decade or longer.

Market Potential
The enormous potential of injectable contraceptive for males in contributing to the containment of world population is well known. There is no doubt that the product can provide a major support to the population control programmes with consequent long range socio-economic benefit.

National/ Societal Relevance
Important for population stabilization and has high relevance.

Project Deliverables
Progress vis-a vis objectives
Upscaled manufacturing technology developed. Multiple test runs to be done to finalize the technology.

Technology/Product developed
RISUG drug, RISUG pre-loaded delivery syringe.

IP generated/Potential for IP generation
Over 25 patents have been highlighted by the applicant.

Resources Generated
12 PhDs and 15 Master’s degree.

Plans to take innovation further
Presently Phase III Clinical Trials are underway in 5 centres. To be increased to 10 centres. Phase IIIB trial being planned to be undertaken in 8 districts.

Risks Envisaged
RISUG is a single intervention long time effective contraceptive. Opposition from companies who are developing daily/monthly intervention male contraceptive.

Innovator Team
Prof (Dr) Sujoy K. Guha

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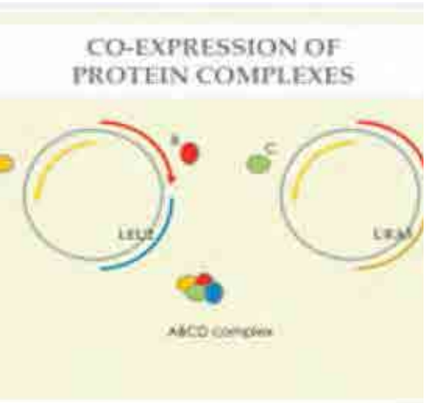

InSTEM

The Innovation

A yeast expression system for protein expression and metabolic.

Development Stage Proof-of-concept/ validation stage

Brief Description

Recombinant protein expression in the appropriate hosts can alleviate problems such as low natural abundance of the desired protein. Our goal is to design and implement a flexible suite of shuttle vectors with multiple promoters and affinity tags to express genes in Saccharomyces cerevisiae. Our ligation independent cloning system will allow the user to clone genes simultaneously into multiple vectors with different promoters and affinity tags. This system can then be easily adapted for high throughput protein expression screening and metabolic engineering. Another aspect is to develop a system of plasmids for multi-gene expression for purification of protein complexes or synthetic biology.

Innovative Element(s)

Our system will make cloning into various vectors seamless, minimize costs and time. Our vectors would provide researchers with a variety of cloning options and expression conditions to optimize protein expression in yeast.

Market Potential

Cerevisiae is convenient and economical eukaryotic expression system. The other aim of our project is to establish systems to simultaneously express multiple proteins for production of protein complexes or reconstitution of biosynthetic pathways. We expect to provide users with an extensive set of tools for protein expression, protein purification and synthetic biology.

National/ Societal Relevance

The yeast S. cerevisiae is the most economical eukaryotic expression system available. The adoption of our system for protein expression and purification would considerably reduce costs for users by cutting down cloning procedures that require expensive enzymes.

Project Deliverables

Progress vis-a vis objectives

We have accomplished most of the stated goals for the 6 month period of the grant. We are currently testing our system for expression of new protein targets.

Plans to take innovation further

We will apply our vectors for the production of various proteins and protein complexes and use the multi-gene expression system for reconstituting biosynthetic pathways in yeast.

Risks Envisaged

Establishment of robust cloning protocols would be essential to make our suite of vectors a viable product. The methods designed for multi-gene cloning have to be tested.

Innovator Team

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Sudipta Sarma
Akanksha Ashwani Kumar

Collaborating Partner(s)

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InvivoD Solutions

The Innovation

Industrial Application of A Novel Cancer Drug Screening Method.

Development Stage Proof-of-concept/ validation

Brief Description

Our 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 and that tumors can be induced in the latter by suitable genetic manipulations. Further, these tumors regress in response to known anti-cancer drugs. Our goal is to make this technology reliable and suitable for industrial application by generating multiple forms of Drosophila cancers by genetic manipulations and by displaying their amenability to anti-cancer drug screens and, finally, finding their industrial applications.

Innovative Element(s)

This technology represent introduction of an in vivo assay at a very early stage of the drug screen pipeline, complementing the cell-culture based assays used screening anti-cancer drugs. 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, which is a perennial problem in cancer drug screen. Further, the model is immensely flexible.

Market Potential

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

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 if in vivo models for human cancer thus making the platform versatile for cancer drug screen.

Project Deliverables

Progress vis-a vis objectives

We have generated multiple, novel as well as genetically well-characterized tumor models in Drosophila. we have screened a library of ant-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 drugs.

IP generated/Potential for IP generation

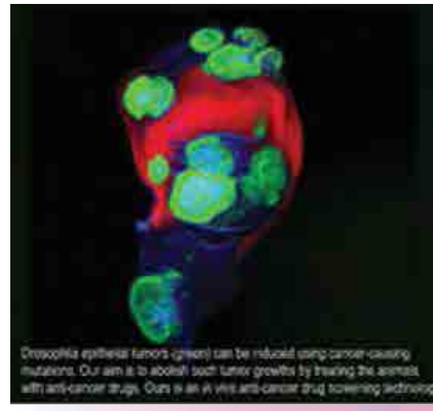
InvivoD is a spin off research carried out at IIT Kanpur. Activities of the InvivoD entailed use of the IP generated at IITK which have been filed for Indian Patent (899/DEL/2013 dated 25th March 2013 and) and besides a PTC (1265/DEL/2013 dated April 30, 2014)

Resources Generated

This is an activity that depends on scientific skills and our activities have impacted the career opportunities of Research Scientists involved in our program.

Risks Envisaged

The major challenge that we face is that of obtaining industrial interface for our technology.



Innovator Team

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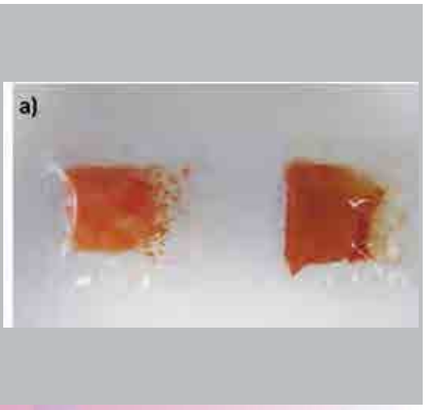
Jonathan Pillai–C CAMP



The Innovation

An implantable drug-delivery device for improving Tuberculosis treatment adherence and compliance.

Development Stage: Proof of Concept

Brief Description

Non-adherence to the standard 6 month long, 4-drug treatment regimen for Tuberculosis (TB) predisposes patients to drug-resistant TB, creating a major barrier to reducing global disease burden. The problem of poor patient adherence by designing a subcutaneous, implantable, drug-delivery device that will auto-deliver the standard 4-drug anti-TB regimen for the first 2 months, and INH and RIF for the remaining 4 months of treatment, equivalent to current oral drug protocols. By combining a biodegradable matrix with an active controlled delivery mechanism, we seek to re-package an adequate amount of drug for sustained delivery.

Innovative Element(s)

For the development of this technology, our team will adapt the predicate technology of Norplant™ (a subcutaneous implant contraceptive device) to accommodate the 4-drug TB regime in a biodegradable polymer matrix.

Market Potential

India accounts for 2.2M patients out of the 8.7M active TB cases worldwide. The current cost of drugs available at the RNTPC subsidized rate is ~INR 6000, not including systemic costs incurred for supporting the DOTS infrastructure. Assuming a market price of INR 10,000 per implant and 15% market penetration over 5 years, the potential market size is approximately INR 800 Crores ($140 Million) in India alone.

National/ Societal Relevance

The adoption of this innovation will have a multi-dimensional impact on management of TB in India, including a significant reduction in the burden of disease because of consistent treatment and adherence to treatment protocol. Current approaches aim to improve patient compliance by either a labor-intensive, system-level strategy like DOTS, patient-dependent solutions (pill boxes, reminder systems) or very expensive sensor or mobile-based monitoring systems (RFID tags).

Plans to take innovation further

On successful demonstation of proof-of-concept, we envisage incorporating a new start-up company for product development and commercialization.

Innovator Team

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Mahesh Shanker Dhar–FITT

The Innovation

Use of Novel Superoxide dismutase with anti-ageing properties as oral supplement and cosmetics.

Development Stage: Proof of Concept

Brief Description

The aim of this project is to provide a cost-effective antioxidant preparation for broad-spectrum use such as a health supplement and cosmetics. We also envision developing this product as a therapeutic for neurological disorders.

Innovative Element(s)

Most of the available antioxidants are not bioavailable after oral ingestion and are destroyed by the human gut. The protein preparation used in the study has superior properties than those already available in the market, as it shows high activity at low pH and was highly resistant to common proteolytic enzyme such as pepsin and trypsin that are present in the gut.

Market Potential

The dietary supplement industry is slated to be the world's fastest growing market. Global market for Nutraceuticals is projected to reach $250 billion by 2018. Dietary supplements market is growing at >35% per year. The booming market of food supplements in India will be worth $2 billion in 2016 – nearly triple 2009 levels.

National/ Societal Relevance

We are trying to market a product which has been thoroughly researched and developed in a cost-effective manner so that it can be in reach of the common man. Furthermore, this product is also being researched for use in neurological disorders such as parkinsons.

Project Deliverables

Progress vis-a vis objectives

The production of the protein has been optimized to increase of 250% of the protein production by optimizing the culture conditions physically and chemically. In vitro assays have shown the role of the product in protecting different cell type from oxidative damage with no toxicity on human and mouse primary cells. The product showed inhibitory effect on some type of cancer cells but not on normal cells.

IP generated/Potential for IP generation

Patent will be filed within the next 6 months.

Resources Generated

For the first six months two research assistants were employed. Currently, a basic microbiology/RDT facility is being run at the TBI-Shriram Institute for Industrial Research, Delhi, where all work is being carried out.

Plans to take innovation further

To take the innovation further by a tie-up with a academic partner.

Risks Envisaged

The greatest hurdles are arranging finance and competing with time as in vivo assays are very expensive and time consuming.

Innovator Team

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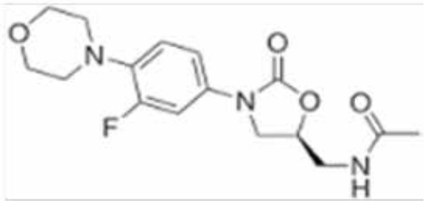
NCL-Incozen Therapeutics



The Innovation

Identification of Drug Candidates with Improved PK Properties Using Silicon-Switch Approach.

Development Stage: Discovery/Proof-of-Concept

Brief Description
Linezolid (Zyvox®) is the lead antibiotic of new class of compounds called oxazolidinones and was approved in 2000 by the FDA. This drug suffers from poor pharmacokinetcis which led to high dose twice daily. Also there are several cases of developing linezolid resistance. By this silicon-switch approach, one can expect to improve pharmacokinetic properties which in turn may reduce the dose of the drug. More importantly, the problem of drug resistance development can be addressed as there is a structural difference in new sila analogs.

Innovative Element(s)
The strategic replacement of carbon with silicon within pre-validated drug scaffolds provides an exciting approach to search for novel new chemical entities (NCEs) in drug discovery. Design and synthesis of silicon analogues of linezolid are the main innovative element.

Market Potential
New antibacterials to address the resistance developed by various bacteria has a huge market potential.

National/ Societal Relevance
This product has high potential relevance as it deal with the development of new antibacterial to address the problem of drug resistance.

Project Deliverables
Progress vis-a vis objectives
Synthesis of series of Si substituted Linezolid analogues is done. ii. Systematic screening and ADME/ PK evaluation of these leads has been done and few experiments are remaining. iii. Establishment of structure activity relationship with comparative improvisation over Linezolid is on-track. At this moment, we have identified “Silinezolid (NDS-100024)”as the initial lead. Need to do further experiments.iv. Nomination of optimized preclinical lead for further safety/Tox testing. Need to do few more experiments in animal models before we nominate the lead compound for further safety/Tox testing.

IP generated/Potential for IP generation
SILA ANALOGS OF OXAZOLIDINONE DERIVATIVES, PCT, 10/11/2012, D. Srinivasa. Reddy, B. Seetharam singh and R. Ramesh, WO054275A1, 2013.

Resources Generated
PhD students and project assistants are being trained in organic synthesis and exposed to drug discovery process.

Plans to take innovation further
Clinical Trials.

Risks Envisaged
We do not see any risk at this moment.

Innovator Team
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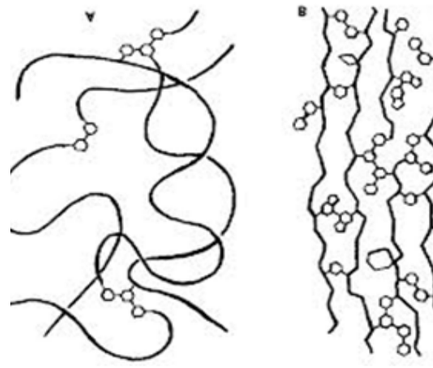
Pandorum Technologies



The Innovation

Modular Resilin-mimetic Elastomeric Platform.

Development Stage: Discovery and Proof-of-concept

Brief Description
Developed a rationale to design and synthesize an advanced class of bio-inspired elastomers and to provide bio-mimetic hydrogels. Such hydrogels can be further loaded with drug molecules with a varied range of aqueous solubility, functionalized to be responsive, nano-casted in various forms etc.

Innovative Element(s)
The core of innovation lies in the discovery of the basic “building blocks” which confer RLPs their much-desired mechanical and biological properties. These basic “building blocks” give an exclusive and powerful rationale to design a novel class of Resilin-mimetic Modular Elastomer (MODELAS).

Market Potential
Pandorum intends to act as an enablement to other commercial entities working in the field of mechanically-demanding tissue engineering, and drug delivery; by providing biomaterials with the appropriately desired properties.

National/ Societal Relevance
PANDORUM’s MODELAS is a hydrogel scaffold material that mimics extra cellular matrix, and has capacity to load macromolecules, such as antibody and growth factors. This is critical for chronic diabetic wound and wounds in patients with compromised immunity systems wherein there are big gaps between socio-economic needs and available affordable technological solutions.

Project Deliverables
Progress vis-a vis objectives
Design of artificial bio-mimetic elastomers and other activities as per the objectives of the program are underway.

Technology/Product developed
‘Smart’ biomaterial with applications in wound healing and tissue engineering is expected.

IP generated/Potential for IP generation
IP will be generated as the project progresses.

Resources Generated
PANDORUM has acquired a high-end computation module with softwares for Molecular Dynamic simulations. A computational biologist working on design and virtual characterization/ optimization of MODELAS and ‘wet lab’ has custom built a LED based photo-irradiation unit for curing hydrogels with a specific frequency and low heat.

Plans to take innovation further
Intends to further develop and validate its core platform technology in the priority application areas of wound management. It also intends to merge the ‘new science’ of molecular design with the ‘old science’ of Ayurveda.

Risks Envisaged
The inevitable risks associated with developing any advanced technology, are applicable to our novel biomaterials.

Innovator Team
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Dr Naninita Roy Bhowmick

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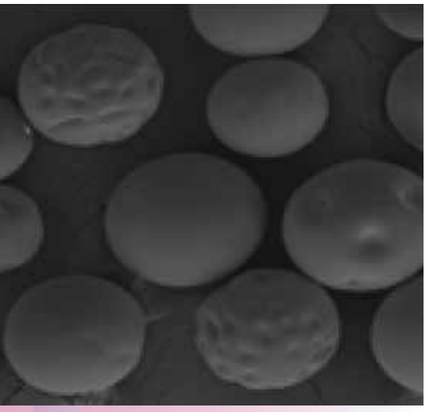
Praveer Gupta–IKP



The Innovation

Engineered stable, nano-sized bubble liposomes - a commercially viable drug delivery platform.

Development Stage: Proof of concept and validation

Brief Description
Our successfully engineered drug-filled bubble liposomes will pave the way for stable pharmaceutical formulations to be commercially prepared that co-encapsulate a broad range of drugs, for targeted delivery AND release to ultrasound accessible tissues/organs.

Innovative Element(s)
We have successfully entrapped the gas inside the core of the liposomes and process in such a way that the echogenecity can be retained for more than 60 days which is lacking in the existing literature.

Market Potential
May be anticipated as it offers a novel drug delivery platform.

National/ Societal Relevance
The proposed platform technology will be a market first, expecting to achieve significantly higher curative/ treatment rates (c.f. existing drug-liposomal formulations), deliver improved quality of life during and directly following therapy, leading to better clinical outcomes in a broad range of disease states.

Project Deliverables
Progress vis-a vis objectives
Empty bubble liposomes have been optimisated. Drug filled bubble liposomes such as Drugs used SAHA, Sorefanib, Doxorubicin has been completed with finished preliminaryin-vitro assays. Animal studies is yet to be conducted.

Technology/Product developed
The technology will be ready and developed aiming to deliver drugs in a more targeted manner with lesser side effects.

IP generated/Potential for IP generation
We are in a position to file a process patent.

Resources Generated
We have created a small formulation lab in IKP with one employee.

Risks Envisaged
Given the positive, reproducible data we have generated for our formulation, we firmly believe future risk factors have been considerably minimized and we do not foresee any risks of note into the future.

Innovator Team
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Praveen K. Vemula–C CAMP

The Innovation

Low-Cost Prophylactic Topical Dermal Cream to prevent chronic Exposure of Toxic Pesticides.

Development Stage: Discovery

Brief Description
Aim to develop low-cost, efficient and protective topical prophylactic cream to prevent agriculture workers from acute/ chronic exposure of toxic pesticides. Organophosphate are absorbed rapidly via the dermal route to accumulate. The dermal cream will have a novel nanoparticle based catalyst that has the ability to detoxify pesticides. The size of the particles will be optimized to prevent particle penetration into the skin, but contains adequate surface area to cleave (detoxify) pesticides before they penetrate into the skin.

Innovative Element(s)
There is no single technology to detoxify the pesticides to prevent chronic exposure. Innovation lies in a biocompatibility with no invasive approach, deactivation of pesticides before they enter into the body. The product will be scalable and cost effective.

Market Potential
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 exist a huge unmet clinical need and untapped market.

National/ Societal Relevance
Self-poisoning with organophosphate pesticides is a major clinical and public-health problem across much of rural Asia. There is a mounting evidence suggesting that long-term contact with pesticides can harm human life and can disturb the function of different organs in the body, including neural, endocrine, immune, reproductive, renal, cardiovascular, and respiratory systems. Thus proposed prophylactic technology to prevent chronic exposure of pesticides will have an enormous impact of millions of farmers in India and around the world.

Project Deliverables
Progress vis-a vis objectives
Synthesis of a novel class of catalysts has been achieved. We have a group of catalysts that are completely characterized. Catalytic ability of these molecules to detoxify pesticides will be evaluated.

Technology/Product developed
Product development is underway.

Plans to take innovation further
We are still in early stage, we will make an appropriate strategy as technology emerges.

Innovator Team
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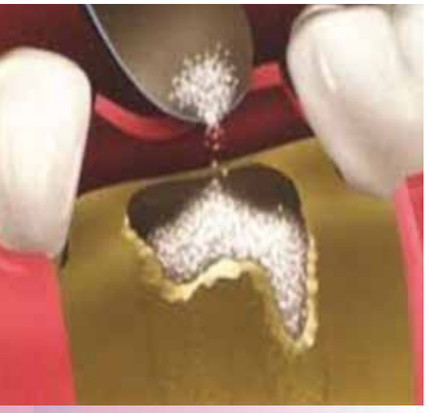

Reg Gen Sol

The Innovation

3-D Bone Graft and GBR Membrane for Maxillofacial and periodontal repair: Towards a clinical study.

Development Stage Proof of Concept

Brief Description
There is significant clinical need for the establishment of alternative therapies for the treatment of bone tissue loss or failure resulting from injury or disease. Three-dimensional porous visco-elastic scaffolds are seen as one approach to enhance bone regeneration by creating and maintaining channels that facilitate cell proliferation. 3-D bone graft and GBR Membrane will be developed to regenerate bone at maxillofacial defects and periodontal pockets.

Innovative Element(s)
A novel 3D scaffold has been developed from the unique combination of nanohydroxyapatite/gelatin/carboxy-methylchitin(n-HA/gel/CMC) for bone tissue engineering by using the solvent-casting method combined with vapor-phase crosslinking and freeze-drying. Electrospinning has emerged as an efficient technique to form nanofibrous GBR membrane which closely mimics the nanometer scale feature of extracellular matrix. The mineralization enhanced the tensile modulus and tensile strength, without increasing the brittleness.

Market Potential
Currently there is 2 % of Indian population suffering from oral health. Oral care market in India is expected to touch US$ 1.8 billion in 2014. Considering these facts, high market potential can be anticipated for the proposed technology.

National/ Societal Relevance
Most of the bone graft devices are imported in India which makes it unaffordable for use. Therefore, innovation in field of bone graft has potential to have impact on the society thus by making the overall treatment cost affordable, improving the oral health care and bringing in better solutions to improve the quality of life.

Project Deliverables
Progress vis-a vis objectives
Efforts are underway as per the objectives.

Technology/Product developed
Product will be ready once it is developed.

IP generated/Potential for IP generation
3-D nano-hydroxyapatite/gelatine/carboxymethyl chitin composite engineered with controllable viscoelastic properties for guided bone regeneration(IPA No.3221/MUM/2012). Electrospunnano-composite bone regenerative material (IPA No.3594/MUM/2012).

Resources Generated
Clean room facility will be created. Grant application to ICMR Clinical trial is in preparation.

Plans to take innovation further
We plan to start venture to manufacture this products.

Risks Envisaged
None as of now.

Innovator Team
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Sabio Innovative Solutions

The Innovation

A Platform for Rapid Antibiotic Susceptibility Testing and Assessment of Bacterial Load.

Development Stage Proof of Concept

Brief Description
Sabio is developing a fluorescence imaging based platform for rapid infection screening and antibiotic sensitivity testing, which aims to deliver results within 6 hours from sample collection.

Innovative Element(s)
A novel reagent formulation and an innovative filtration based concentration device to screen urinary tract infections within minutes instead of 24 hours. Detecting cell growth or death at the individual cell level, thus bringing down the time to result for susceptibility testing.

Market Potential
There are over 15000 hospitals in India, each of these hospitals performing up to a 100 tests for infection diagnosis per day. Primary interest from clinicians is for testing patients in critical care and especially those with bloodstream infections. Hospitals perform about 10-30 microbial detection and 1-5 antibiotic sensitivity tests daily for blood infections. This is a total market potential of about 50 million screening and 5 million antibiotic sensitivity tests per year.

National/ Societal Relevance
Drug resistance is an increasingly prevalent global problem, not only raising the cost of treatment, travel and hospital stay but also indirect costs due to loss in wages and premature death. One of the key factors accelerating the spread of resistance in countries like India is the reflex prescription of antibiotics. The development of a rapid, affordable screening and susceptibility test has been identified as a critical intervention and has high relevance.

Project Deliverables
Progress vis-a vis objectives
Screening test device developed and proof of concept validation complete on urine samples. Rapid antibiotic susceptibility test validated on bacteria isolated from clinical sample to obtain results within 3 hours. Design, fabrication and validation of integrated susceptibility testing device are in progress.

Technology/Product developed
Rapid urinary tract infection screening device and rapid antibiotic susceptibility test is expected.

IP generated/Potential for IP generation
Scope for IP generation for novel filtration device and in productisation phase.

Resources Generated
Facility creation. Planned fund-raise from other sources.

Plans to take innovation further
Sabio plans to raise funds to translate the device and platform from the proof-of-concept stage to market entry in the next phase.

Risks Envisaged
We anticipate some technology risk in translating the technology for various clinical samples like blood and cerebrospinal fluid. We also anticipate market entry risk as a new entrant into the microbiology space and competition risk from existing players in this area.

Innovator Team
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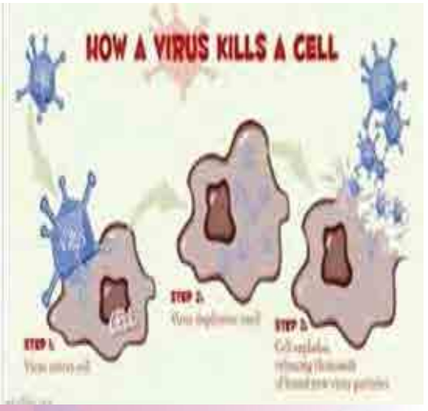

Seagull BioSolutions

The Innovation

Immunopotentiating Oncolytic Measles Virus For Treatment Of Prostate Cancer.

Development Stage Proof-of-Concept

Brief Description
Developed a versatile mammalian expression system called "The eSAME system" useful for production of recombinant protein, viral vaccines and therapeutic agents. This technology platform was used to produce a recombinant Measles vaccine virus (SBPL-0100) that also expresses a cytokine and a tumor specific antigen. SBPL-0100 exhibits a anticancer effect against prostate cancer, glioblastomas and lymphomas and will be useful to induce tumor specific immunity in patients.

Innovative Element(s)
A novel proprietary eSAME technology is used (PCT/IN2012/000405) and will replace the recently approved "Provenge" which is costly ($93000/- per treatment) and be manufactured cost effectively as it will use the technology identical to Measles vaccine manufacturing.

Market Potential
$ 2 Billion (projected market for Provenge). It is a fast follower of the T-Vec (from Amgen) and the MV-CEA & MV-NIS being developed by the Mayo Clinic.

National/ Societal Relevance
First broad spectrum anti-cancer biological that will have no toxic side effects. At present, equivalent therapies are only being developed by Amgen.

Project Deliverables
Progress vis-a vis objectives
Large scale synthesis of SBPL-0100 and Efficacy testing against a panel of cell lines have been completed. Nude mouse studies to demonstrate the efficacy of SBPL-0100 are under way. In parallel, SBPL has also synthesized Dengue Virosomes – non-replicating measles virus that codes for Dengue VLP.

Technology/Product developed
SBPL-0100 – a recombinant measles vaccine virus that codes for a cytokine & a tumor specific antigen is synthesized. This will be useful as a broad spectrum anticancer therapy that will have not toxic side effects.

IP generated/Potential for IP generation
A patent application is under preparation.

Resources Generated
Trained manpower, Technology for production of recombinant viruses established & standardized, Infrastructure for the above work.

Plans to take innovation further
Seeking a strategic partner for further development of SBPL-0100. Open to out licensing SBPL-0100. Further in-house development uptoPhase I clinical trials.

Risks Envisaged
Paucity of financial support. Any innovative drug candidate has a risk of not fulfilling its therapeutic potential in clinical trials.

Innovator Team
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Serum Institute Of India

The Innovation

Clinical Development of Polysialylated Erythropoietin (PSA-EPO).

Development Stage Proof of Concept / Clinical development

Brief Description
The objective is to develop long acting Erythropoiesis Stimulating agent (ESA) with a better therapeutic index as compared to existing ESAs like Mircera (Pegylated Erythropoietin) and Aranesp (Darbopoietin alfa) at an affordable cost.

Innovative Element(s)
SIIL in collaboration with Xenetic Bio has developed innovative technology to produce an improved and long acting form of Erythropoietin which has advantages of Preservation of functionality on conjugation, improved stability in vivo, prolonged pharmacological action. Thus reducing frequency and amount of dosage, Preservation of biological activity, reduced antigenicity, Biodegradable unlike Pegylated EPO which is non-biodegradable.

Market Potential
Current World market of ESA's is approx. 12-15 billion USD.

National/ Societal Relevance
CKD is 12th leading cause of death and 17th cause of disability. The population of India exceeds one billion and is projected to become the major reservoir of chronic diseases like diabetes and hypertension. The development of improved therapy like polysialylated erythropoietin which has potential to improve the convenience of administration, improve patient compliance, potentially to increase the efficacy and reduce adverse events is desirable for patients and health care providers.

Project Deliverables
Progress vis-a vis objectives
SIIL has completed long term toxicity studies of PSA-EPO at Advinus. Presently PSA-EPO is under Phase –II Clinical Trial through Intravenous route in India. On the basis of completed long term toxicity studies, phase –II/III trial is already started in Russia and Phase –II trial in Australia and New Zealand.

Technology/Product developed
The product will be ready after successful completion of clinical study.

IP generated/Potential for IP generation
PSA-EPO technology is already protected through IP co-owned by SIIL and its collaborator Xenetic bio, UK.

Plans to take innovation further
After completion of ongoing trials in India and abroad, SIIL plans to take this molecule further in comprehensive phase-III licensure trial in India and abroad.

Innovator Team
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Serum Institute of India

The Innovation

Development of HPV vaccine.

Development Stage: Preclinical

Brief Description
The Hansenula expression system involves a high copy number genome integration leading to increased expression of the desired protein. The Hansenula has an added advantage of allowing the natural formation of VLPs.

Innovative Element(s)
Generic.

Market Potential
Approx. 50 million doses annually..

National/ Societal Relevance
Prevention of cervical cancer which has high levels of persistence in Indian population.

Project Deliverables
Progress vis-a vis objectives
The project is entering preclinical development and the objectives outlined in the proposal are reaching the desired objective.

Technology/Product developed
Quadrivalent and Bivalent HPV vaccine.

Resources Generated
The project has generated skilled manpower with exposure to product development. Scaled up technology is established and scientific connectivity with organizations like CDC, NIH, NIBSC etc. established to provide know-how and guidance.

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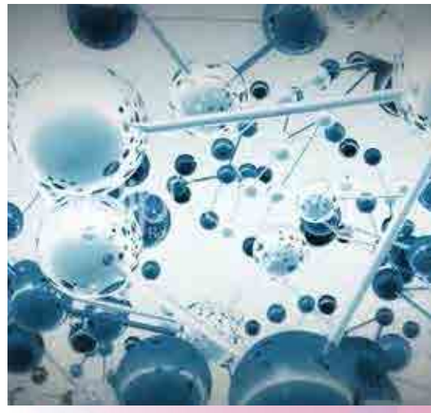
Stempeutics Research



The Innovation

A parallel group randomized open blinded end point evaluation, multicentre, dose escalation, phase – II study assessing the safety and efficacy of intra-arterial (Hepatic) ex-vivo cultured adult Allogeneic Mesenchymal stem cells in patients with Alcoholic Liver Cirrhosis.

Development Stage: Phase II clinical trial is ongoing

Brief Description
The standard treatment for advanced decompensated liver cirrhosis is Orthotopic Liver Transplantation (OLT). However, potential benefits are hampered by many drawbacks such as relative shortage of donors, operative risk, post-transplant rejection, recidivism of the pre-existing liver disease, high cost and several complications. Adult stem cell therapy may offer a cure or regression of the disease for such group of patients. It is noteworthy that our ongoing phase II clinical trials using allogeneic MSCs (stempeucel) in critical limb ischemia and osteoarthritis have shown that MSCs are safe and may likely to be efficacious.

Innovative Element(s)
Stempeutics has the technology to upscale the bone marrow derived allogeneic mesenchymal stem cells derived from few donors and produce stem cell product (stempeucel) sufficient for 10000+ patients.

Market Potential
Liver Cirrhosis has no definitive cure as of now, and available treatment options are only symptomatic. If this therapy becomes successful, it will open up a novel treatment option for these patients, addressing the core pathology of the illness.

National/ Societal Relevance
Alcoholic cirrhosis develops in 15% of individuals who drink heavily for more than a decade. Prevalence of alcoholics in India is found to be 21% in adult males. This ranges from as low as 7% in western state of Gujarat to 75% in northeastern part of the country. The standard treatments available do not offer a cure for the disease. Hence, if this type of treatment is successful it will be a big boon for these patients.

Project Deliverables
Progress vis-a vis objectives
The progress of the trial is satisfactory. The recruitment of the patients has been completed and the patients are being followed up. The data will be evaluated after six months follow up completion.

Resources Generated
The existing resources of the company are being used.

Plans to take innovation further
If the product is safe and shows positive trend in efficacy, we plan to apply for conducting phase III clinical trial in this indication.

Innovator Team
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Sun Pharmaceutical Industries

The Innovation

Bevacizumabupto Pre-clinical studies.

Development Stage: Proof of Concept

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 ™. Avastin ™. Sun pharmaceutical Industries Ltd. is developing similar biologic of Recombinant Bevaizumab 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 ™).

Innovative Element(s)
The cell line is developed using the Proprietary expression vector of Sun Pharma. The preliminary characteristics of the cell line have been studied. The lab 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 and biological characterization of the product have been studied. The Bio-similarity studies with reference to the innovator's product has been studied.

Market Potential
The sale of the product in 2013 was $ 6.74 billion. 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. Small scale process developed. The product was found physico-chemically and biologically comparable to the Innovator's product. Process-scale up to be done. Animal safety to be established. PK / PDand immunogenicity to be studied.

Technology/Product developed
The biosimilar will be ready after completion of the studies.

IP generated/Potential for IP generation
IP will be generated as the project progresses.

Risks Envisaged
Making the product Biosimilar to the reference drug in terms of Physico-chemical, Biological, PK/PD, Immunogenecity.

Innovator Team
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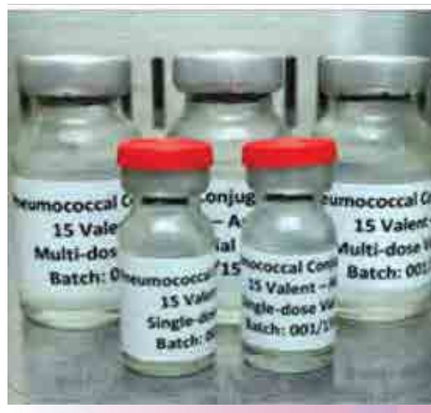
Tergene Biotech



The Innovation

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

Development Stage: Validation

Brief Description
Tergene developed a multivalent Pneumococcal Conjugate Vaccine (PCV- 15) with a cost effective production technology for CRM-197, the safest carrier protein and a key ingredient in the development of PCV-15. It also finds application in other therapeutic vaccines against cancer and allergy. Cost effective production of carrier protein and Pneumococcal Polysaccharides, highly efficient conjugation protocol and affordable India specific Vaccine formulation are the critical elements of the innovation.

Innovative Element(s)
Cost effective production of CRM 197. Cost effective production of Polysaccharides. Highly efficient conjugation protocol. Affordable and India specific Vaccine formulation.

Market Potential
Annually India witnesses 45 million pneumonia cases among children under 5 years of which 370,000 die due to the disease. There is a huge open market in India itself.

National/ Societal Relevance
Increasing incidence of streptococcal infection in the young and elderly and wide spread antimicrobial resistance (AMR) and diversity in the serotype distribution necessitate the need for the development of an Asia specific, indigenous and cost effective vaccine for S.Pneumoniae.

Project Deliverables
Progress vis-a vis objectives
Completion of production, purification of 15 types of capsular polysaccharides and their characterization. Completion of Scale-up and process optimization for CRM 197 in 10L fermentation scale. Completion of final vaccine formulation and immunogenicity in lab animals.

Technology/Product developed
Technology developed for a commercially viable CRM 197 production.

IP generated/Potential for IP generation

Production technology of CRM 197 and the conjugation protocol merit patenting.

Resources Generated
Manpower employed and trained: PhD's - 1, M. Tech's – 2, MSc's – 4
Facility Created: Microbiology, Cell Culture, Fermentation & Downstream Processing.

Plans to take innovation further
Production of GMP grade Polysaccharide and CRM. Formulate the final vaccine and conduct stability studies. Conduct pre-clinical studies. Phase II & III clinical trials.

Risks Envisaged

There are possibilities of Protein antigens being developed as alternate vaccine candidates.

Innovator Team
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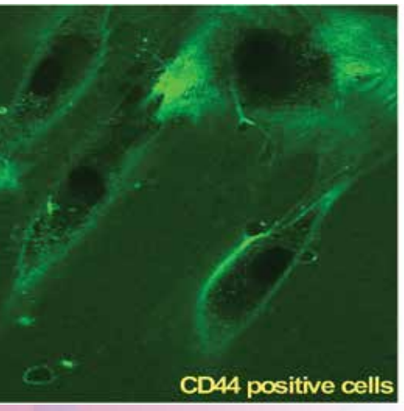
Total Potential Cells



The Innovation

Differentiation of Human Adipose tissue Derived Stem Cells to Islet cell mass Aggregates and its preparation for Clinical Application (Phase I).

Development Stage: Proof-of-Concept

Brief Description
To Differentiation of ADMSCs into islet like cell aggregation (ICA).

Innovative Element(s)
Translation of Stem Cells of Mesodermal Origin to Endodermal End stage.

Market Potential
High.

National/ Societal Relevance
National Priority.

Project Deliverables
Progress vis-a vis objectives
Isolation and culture of ADMSCs from 22 specimens obtained: Achievement 110% ii. ICA obtained in 4 experiments: Achievement 66%; shall cross 100% by the end of the grant year.

Technology/Product developed
ICAs obtained in the lab; Insulin Secretion being verified with marker studies; DTZ staining.

IP generated/Potential for IP generation
Process of expansion of MSCs and translation to ICAs would qualify for IP generation.

Resources Generated
Manpower employed-Three; Manpower trained –Ten; Facility Created, GMP Cl V lab; Enterprise Created-Osteoarthritis Project Successfully presented before Technical Screening Committee at BIG-DBT.

Innovator Team

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Dr. AnantMarathe

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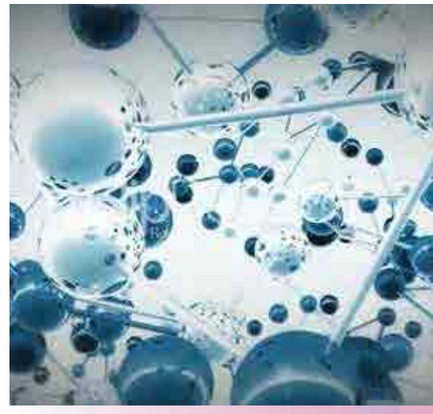
Unichem Laboratories



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.

Development Stage: Validation

Brief Description
Sclerotium rolfsii, a soil borne plant pathogenic fungus secrete a developmental-stage specific lectin (SRL) exhibits strong antiproliferative activity towards human colon and breast and ovarian cancer cell lines. SRL at non toxic concentrations completely inhibits tumour growth in HT29 xenografts in mice model. We have made two recombinants of SRL which showed better stability and similar anticancer effects in in vitro studies. Hence, the project aims to develop cost effective and commercially viable process for production of recombinant lectins in the required quantity and purity in E. coli.

Innovative Element(s)
The project aims to exploit anticancer potential of recombinant Sclerotium rolfsii lectins.

Market Potential
The market for world cancer therapies continues to gain attraction and propel sales in global cancer therapies market to $162.5 billion by 2015.

National/ Societal Relevance
In India, the cost of cancer therapy is unaffordable by the patients. Developing recombinant fungal lectins as an anticancer drug is highly relevant.

Project Deliverables
Progress vis-a vis objectives
Shake flask experiments with recombinant E. coli for optimum growth and protein expression have been completed. Fermentation process has been developed at 3L scale. Preliminary downstream processing scheme has been developed for getting > 95 % pure recombinant Lectin. Protocols have been standardized for toxicity and efficacy studies using SCID mice bearing colon cancer xenografts for native lectin. To be initiated for recombinant lectins.

Technology/Product developed
Under development.

IP generated/Potential for IP generation
PCT/IN2009/000306,
WO 2010/095143 and
09840273.8-2403/2430041.

Resources Generated
One scientist is already working on the project and two more personnel to be recruited under the project. The collaborator has one part-time trained personnel to handle project related activities and one more personnel to be recruited for the project.

Plans to take innovation further
Project will be taken to preclinical and clinical phases to establish efficacy and non toxicity.

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

Innovator Team

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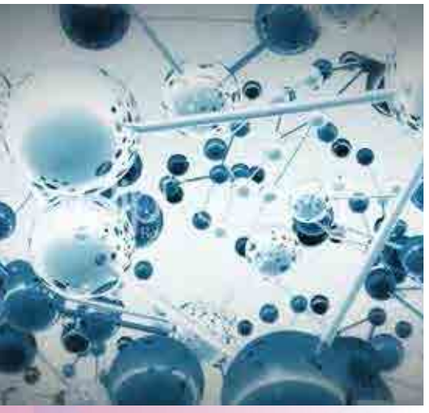

VB Medicare

The Innovation

Development and characterization of lipid carrier based nanogel formulation for 5– fluorouracil (Phase-I).

Development Stage Proof of Concept

Brief Description

Development of carrier based nanogel formulation for skin targeting of an anti-cancer drug 5-Fluorouracil (5-FU). Carrier approach has dual advantages in topical delivery, first it reduces the direct contact of drug to skin surface so will minimize the skin irritation potential that is the major limitation of conventional 5-FU formulation and secondly, it increases the skin permeation and deposition of drug due to penetration enhancement effect and depot forming ability of carrier.

Innovative Element(s)

The lipid nanocarrier based nanogel formulation shall target the 5-FU to affected skin tissue and will reduce the toxicity, minimize the metabolic degradation and provide the sustained release of drug that would enhance the therapeutic utility and minimize skin irritation. Poor skin permeation and skin irritation are the main drawbacks associated with commercial conventional gel formulation.

Market Potential

5-FU is the gold standard drug for the treatment of Actinic keratosis (AK) and Basal Cell Carcinoma (BCC). In India only one Pharmaceutical company Shalaks Pharmaceuticals Pvt. Ltd., New Delhi, India is manufacturing and marketing the 5-FU conventional cream formulation ((5% w/w Flonida)). In International market low dose Microsponge technology based formulation Carac® is available but due to its high cost USD 500 for one tube limiting its usage. So development of low cost carrier based nanogel formulation of 5-FU has very bright market potential.

National/ Societal Relevance

The number of cancer deaths worldwide is projected to rise to over 13.1 million in 2030 . Development of formulation for skin targeting of drug candidate used in skin cancer is highly desirable due to poor skin permeation and high skin irritation potential of currently available formulation.

Project Deliverables

Progress vis-a vis objectives
Efforts are underway as per the objectives.

Technology/Product developed
Product development is underway.

IP generated/Potential for IP generation
Patent filed.

Resources Generated
Two Scientists are working in this project.

Plans to take innovation further

Planning for scale up and commercialization of product after performing mandatory studies as per regulatory guidelines.

Risks Envisaged

Presently development phase is going on smoothly.

Innovator Team

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Vegrandis Therapeutics

The Innovation

Delivery and Retention of Drug Loaded Magnetic Nanoparticles for Brain Tumors.

Development Stage Proof-of-Concept

Brief Description

Delivery of anticancer agents to the brain is currently difficult due to lack of drug penetration and retention in the brain. We will synthesize Drug-loaded Magnetic Nano Particles containing that can penetrate the blood brain barrier. After penetration, they will be retained in the brain under the influence of a magnet in the vicinity of the head region of a patient (e.g. using MRI equipment). This technology will improve the therapy for brain tumour, overcome existing limitation of delivery of anticancer agent and will allow affordable and non-invasive treatment for brain tumours.

Innovative Element(s)

The composition of themagnetic nanoparticles is a novel and patentable. Apart from that, we came up with an innovative concept to retain nanoparticles in the brain under the influence of a magnet for time long enough to release therapeutic agent.

Market Potential

Global data has estimated the global brain tumor market to be worth $1.094 billion in 2009 and forecasts it to reach $1.3 billion by 2016. There are currently only three products approved for the treatment of brain tumors, and there is a strong potential opportunity for pipeline products to enter this market.

National/ Societal Relevance

Every day about 650 people globally are diagnosed with a malignant brain tumour. Efficacy of existing cancer drug is Ltd. as most of them are not designed to cross the blood brain barrier, even if they enter brain, retention is difficult due to active transport proteins. Therefore, there is an urgent need for novel and effective therapy to treat the malignant brain tumour.

Project Deliverables

Progress vis-a vis objectives
Magnetic nanoparticles are being synthesized.

Plans to take innovation further

After obtaining the proof-of-concept in mouse xenograft models, the next steps in the development and commercialization.

Risks Envisaged

Additional funding to carry out detailed pharmacology and toxicology evaluation before license the technology.

Innovator Team

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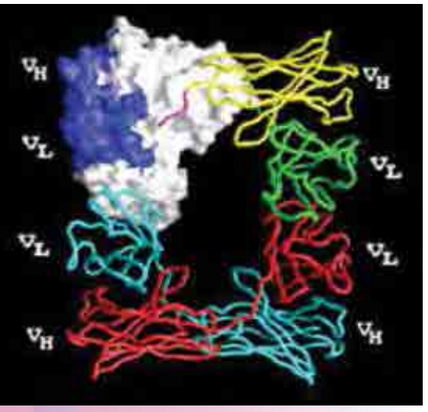

Vikas Mehra-C CAMP

The Innovation

Expression of therapeutic diabody against TNF-alpha and IL-17R.

Development Stage Proof-of-Concept

Brief Description
To develop a novel biologic for inflammatory diseases particularly for psoriasis. The said molecule will have a typical monoclonal antibody structure, but will have a single chain variable fragment (ScFv) format. We will be expressing this biologic in microbial systems.

Innovative Element(s)
The biologic will have a combination of 2 targets which have an established role in disease and thus produce synergistic effects. It will also allow the therapy duration to be relatively shorter and will have a better safety profile. Further, expressing scFv in microbial system will have a greater impact in bringing down the production costs associated with larger biologics.

Market Potential
Approximately 3.1% of world population is affected with psoriasis and current psoriasis market is worth ~ US$ 3.6 billion. There is a high growth predicted and the proposed biologic will have greater market potential.

Project Deliverables
Progress vis-a vis objectives
Developed and isolated and screened ScFv binders already against TNF- α and IL-17R. scFv against human TNFα and IL17R has been isolated and the affinity of these binders has been improved. In vitro neutralization potential of these binders was confirmed by cell based assays.

Technology/Product developed
Fusion of anti TNF- α& anti IL-17R scFv to create a diabody and its expression to get the therapeutic protein is in process.

IP generated/Potential for IP generation
We will be filing a provisional specification for our molecule soon.

Resources Generated
We have formed a company and registered by the name of Parizat Healthcare Pvt. Ltd in the year 2013.

Plans to take innovation further
We want to validate our hypothesis after proving the efficacy of diabody in *in-vivo*.

Innovator Team
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Vitas Pharma

The Innovation

Novel Inhibitors of fatty acid biosynthesis for the treatment of drug resistant S.aureus bacterial infections.

Development Stage Proof-of-concept

Brief Description
This project aims to identify a novel drug to treat skin infections, pneumonia and bacteremias caused by S.aureus. Highly resistant S.aureus, also known as MRSA, is the most commonly isolated Gram positive pathogen from hospital acquired infections. To address this issue, we have identified a novel optimized series of compounds targeting fatty acid biosynthesis in S.aureus. The patented series is orally bioavailable with pharmacokinetic features suitable for IV/oral dosing. It has shown potent anti-Staphylococcal activity, target specificity and efficacy in primary and secondary infection models. The activity is conserved across MDR clinical isolates, validating our hypothesis that a novel chemical scaffold overcomes existing resistance.

Innovative Element(s)
To address the issue of multidrug resistant, our strategy has been to focus on a novel chemical scaffold targeting a critical mechanism in S.aureus. No drugs targeting this mechanism are currently in the market or in late stages of clinical development.

Market Potential
Peak sales expected to be $ 200-300 million.

National/ Societal Relevance
This work addresses an issue of serious public health concern, namely the emergence of multidrug resistant S.aureus in India and other parts of the world, leading to considerable morbidity, mortality and economic burden. By focusing on novel therapeutic interventions, the goal of this work is to improve health outcomes for the nation in the fight against infectious diseases.

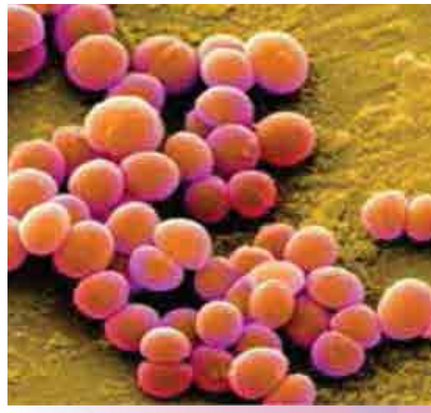
Project Deliverables
Progress vis-a vis objectives
We have met the goals of identifying a novel chemical series, with oral bio availability, potent activity and *in vivo* efficacy.

IP generated/Potential for IP generation
IP has been generated and Indian/ International patents have been filed.

Resources Generated
We have trained medicinal chemists and microbiologists in the course of this project.

Plans to take innovation further
We intend to complete IND enabling studies to initiate clinical development for the chemical series.

Risks Envisaged
The safety of the scaffold both in terms of safety pharmacology and acute toxicity have not been comprehensively evaluated. Nevertheless, a thorough review of the literature relating to chemical structures and their properties has not identified any overtly toxic features in the chemical series.



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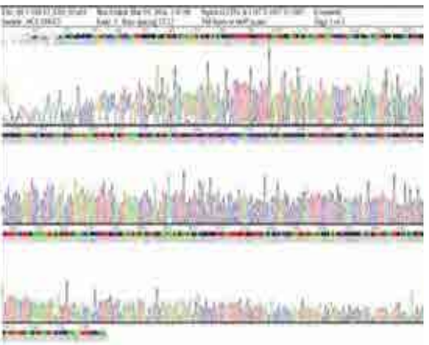
Wobble Base BioResearch



Electropherogram generated by DNA sequencing of a ribosomal RNA gene section to identify a fungal isolate.

The Innovation

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

Development Stage: Proof of concept stage

Brief Description

This is a novel product of fungal origin for controlling gastrointestinal parasites in cattle, buffalo and lower ruminants because it is in the form of desiccated spores and is intended for use as feed supplement for the animals. It reduces worm burden in the ground by a sustained and eco friendly method unlike its chemical counterpart.

Innovative Element(s)

This product relies on the concept of biological mode of control of worms by employing nematode-destroying fungi. The technology is immune to the phenomenon of drug resistance unlike the case of chemical drugs. Here, both the predator and the prey grow simultaneously on the faecal pat and before the larvae can escape to the grazing ground, is trapped and killed by specialized structure of fungal mycelia.

Market Potential

The annual cost associated with parasitic diseases in sheep and cattle in developed countries has been estimated at 1 billion dollars and are proposed to be over 10 billions of dollars worldwide. Thus, there are major economic gains to be made in agriculture by enhancing the control of key parasitic diseases.

National/ Societal Relevance

The proposed product will reduce dependence of chemical drugs for controlling cattle worms and enhance eco-friendly and sustainable nematode control in the country.

Project Deliverables

Progress vis-a vis objectives

Nematophagous fungi has been successfully isolated, purified and maintained in the laboratory as pure strains. Gastrointestinal worms from cattle were cultured in vitro in the laboratory. The growth of the fungi in various growth media were studied in detail.

Technology/Product developed

A method of generating fungal spores with high level of viability has been developed.

IP generated/Potential for IP generation

A method for cryopreservation of spores as well as a molecular biology-based method for estimation of nematode trapping potential has potential for IP generation.

Resources Generated

Manpower by way of technical personnel recruited under the BIG project is being trained.

Plans to take innovation further

Developing a formulation which shall consist of more than one fungal spores.

Risks Envisaged

Functioning of the fungi in the field. Scaling up of the spore generation system using large scale solid state fermentation process.

Innovator Team

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Zephase Therapeutics

The Innovation

Creation of Genetically Engineered Zebrafish as Cancer Models.

Development Stage: Proof-of Concept

Brief Description

The use of TALEN and CRISPR/Cas9 technology for targeted gene deletions, and the use of Tol2 transposon-based gene overexpression is being done to target specific tyrosine kinase genes in zebrafish that are involved in cancer mechanisms and are potential candidate for cancer drugs. Tyrosine kinase-mutant zebrafish with characterized cancer phenotypes will allow drug screening at a higher throughput than currently possible.

Innovative Element(s)

Our work has resulted in the first identification of conserved tyrosine kinase genes in the zebrafish genome. Based on findings we are performing targeted genetic manipulation to make tyrosine kinase mutant zebrafish as cancer models. No such models are reported in the research or patent literature thus far.

Market Potential

Given the problems in translation of preclinical data to the clinic, a strong need to improve preclinical cancer studies exists. Zebrafish cancer models will be able to meet this opportunity quite well, and the potential market for such models would be all organizations involved in animal cancer studies.

National/ Societal Relevance

Zebrafish models are relevant to preclinical cancer drug discovery and in making in vivo cancer research more accessible to researchers in India ranging across industry and academia.

Project Deliverables

Progress vis-a vis objectives

DNA construct generation and microinjections have been Completed. TALEN constructs were designed and generated. RNA synthesized from the constructs were microinjected into zebrafish embryos at the single-cell stage were performed. Growth to founder adults and obtaining F1 embryos have been Completed.

Technology/Product developed

Zebrafish lacking a conserved tyrosine kinase gene have been generated, and thus far found to be non-viable.

IP generated/Potential for IP generation

Patenting of this technology is feasible currently.

Resources Generated

Basic equipment needed to generate transgenic zebrafish has been set up. Two Master's level students have been trained in zebrafish maintenance, cancer phenotype analysis, basic molecular biology and genetic engineering of zebrafish for the last year.

Plans to take innovation further

Forming collaborations to hasten experimental model generation and testing. Discussions with potential users to perform feasibility studies.

Risks Envisaged

Competition from academic laboratories and companies involved in zebrafish research.

Innovator Team

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Collaborating Partner(s)

Dr. Reddy's Institute of Life Sciences

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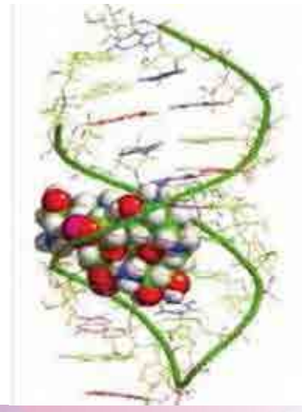
Innovation Profiles

Healthcare
Devices & Diagnostics



Achira Labs

The Innovation

Development of an aptamer-based platform to detect novel Tuberculosis markers in human serum.

Development Stage: Proof of concept

Brief Description
We propose the development of an aptamer platform (aptamers are 60-100 base long DNA molecules selected from a 1013 large, random oligonucleotide library) that can be used to quickly and reliably produce binders against new markers. In addition, these aptamers are cheaper to produce and show robust reagent stability when compared to antibodies. These binders can then be the basis of POC (point-of-care) diagnostic tests for TB and other diseases.

Innovative Element(s)
The novelty is two-fold: first the isolation of DNA aptamers against a set of new antigen markers for TB diagnosis and second the porting of these aptamers onto a highly sensitive, fluorescence-based novel microfluidics platform previously developed by us. Aptamer based TB test on microfluidics platform will have unique characteristics like low sample volume requirement, quick turn-around time (30 min), automated fluid movement control (no need of trained technician), low reagent consumption, and sensitive fluorescent readings.

Market Potential
The size of the addressable market is at least $75-100 million. The availability of the right tests can significantly reduce burden and costs in terms of saved DALYs.

National/ Societal Relevance
To have the greatest impact, a test that combines the simplicity of lateral flow tests with the sensitivity of lab-tests like culture or PCR would be the ideal combination and aptamer based test can offer exactly these advantages.

Project Deliverables
Progress vis-a vis objectives
Completed Cloning, expression and purification of ESAT-6 and CFP-10, DNA aptamers against ESAT-6 and CFP-10. Ongoing MTB antigen detection using aptamers on hydrogel platform.

Technology/Product developed
At the end project, a proof of concept will be ready.

IP generated/Potential for IP generation

This project will result in IP on the aptamer sequences and IP related to combining aptamers with proprietary microfluidic chip platform.

Resources Generated
One senior level doctorate and two entry level scientists were employed. 9 instruments were procured to create the facility in 590 sq feet space along with mobilizing VC funds.

Plans to take innovation further
Looking for VC and Govt. funds to take innovation further.

Risks Envisaged
To test and validate the diagnostic. In Sufficient geographic diversity amongst TB and HIV-positive patients.

Innovator Team
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Achira Labs

The Innovation

To develop a novel, low-cost electrophoretic pre-concentration-enhanced immunoassay sensor for rapid, high-sensitivity detection of thyroid hormones.

Development Stage: Proof of concept

Brief Description
Propose to develop a novel, low-cost electrophoretic preconcentration-enhanced immunoassay sensor for rapid, high-sensitivity detection of thyroid hormone-TSH in human serum. The microfluidic lab-on-chip sensor will have applications in point-of-care settings for early diagnosis without dependence on highly trained operators. We will develop ultra-fast, easy to use and highly sensitive immunoassays for use in resource-Ltd. settings.

Innovative Element(s)
Our portable, pre-concentration based immunosensor will employ over 10,000-fold pre-concentration of protein markers to enhance hybridization with relevant antibodies and achieve detection of clinically relevant concentrations of thyroid hormones (order 1 pM) within 5 minutes.

Market Potential
Current global market for immunoassay based tests is on order $10 billion and Indian immunochemistry test market is valued at $200 million of which is accounted for by Thyroid function tests. The requirement for thyroid testing remains through the life of a patient diagnosed with thyroid disorders and hence the market potential for these tests is immense.

National/ Societal Relevance
The current cost of a thyroid panel (FT3, FT4 and TSH) is upwards of Rs. 500 per sample, much beyond the reach of most patients in India. The technology has the potential to significantly reduce this burden and can be extended to a wide variety of nationally relevant clinical areas.

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

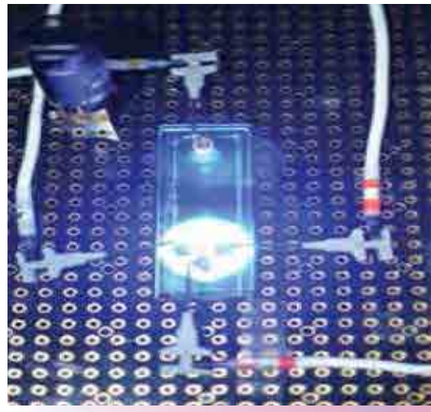
Technology/Product developed
The microfluidic lab-on-chip sensor once developed will have applications in point-of-care settings and allow early diagnosis of disease without dependence on highly trained operators.

IP generated/Potential for IP generation
New IP will be generated as the project progresses.

Resources Generated
Employed one Senior level doctorate, experienced engineer, one entry level scientist and an entry level engineer. Created the facility by installing the necessary Instruments.

Plans to take innovation further
Exploring the possibilities of building multiplex immunoassay system for multiple markers detection in parallel.

Risks Envisaged
A possible risk will be in developing an appropriate electrolyte system for ITP which enables selective pre-concentration of hormones and labeled-antibodies in a single ITP zone while preventing focusing of unwanted impurities.



Innovator Team
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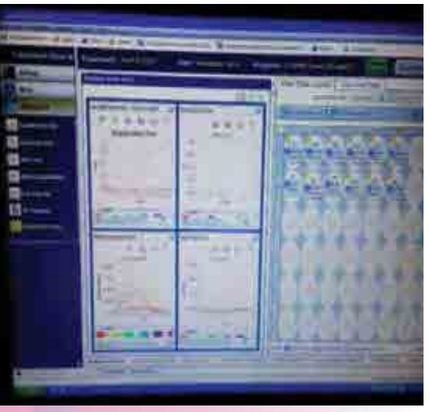

AIIMS-Khanna's Path Lab

The Innovation

Validation of a rapid diagnostic method for the detection of HLA allele and its association with cutaneous drug reactions in persons with epilepsy.

Development Stage: Proof of concept and validation

Brief Description
There is an urgent need to detect the HLA allele in persons with epilepsy before the start of the medication. A traditional HLA genotyping method is long, time taking, expensive and available only in few major specialized centres. We plan to test the feasibility of simple diagnostic method like the Loop mediated Isothermal Amplification (LAMP) based approach to test the particular HLA subtype. If the patients are screened for the presence of the particular HLA allele against which the reactions develop before the start of the medications many serious adversities may be avoided. We plan to identify the HLA alleles associated with the drug reactions in epilepsy patients.

Innovative Element(s)
This will be a novel technique in Indian population which will help to identify the alleles present and responsible for the adverse reactions and will also help to avoid the severe life threating reactions caused by the antiepileptics.

Market Potential
LAMP technology will save time of patient and the clinicians as the results will be obtained quickly and the treatment of the patient can be started without delay. Hence market potential is anticipated for this technology.

National/ Societal Relevance
This technique has high societal relevance to Indian population as it is a novel technique to detect HLA allele.

Project Deliverables
Progress vis-a vis objectives
7 PCR primers sets for detection of HLA-B 1502 have been designed, synthesized and shortlisted the two best primer pair sets that gave results in concordance to the RT-PCR based assay as well as Luminex technology. We have standardized the LAMP PCR based assay for HLA-B*1502 detection using extracted DNA as template.

Technology/Product developed
We are in the process of designing a technology/kit for rapid detection of the HLA allele in persons with epilepsy.

IP generated/Potential for IP generation
Investigation is Ongoing.

Resources Generated
Employed One Senior Research Fellow (SRF), two technicians, one data entry operator and one attendant in the project. One technician and one attendant have been employed with the industrial partner.

Innovator Team
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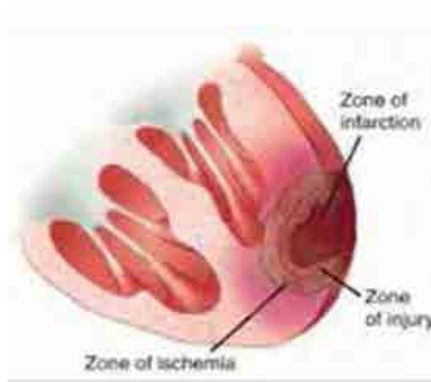
GM Biotech



The Innovation

Development of Diagnostic Reagents for Acute Myocardial Infarction.

Development Stage: Discovery / Proof-of-Concept

Brief Description
Identified a series of peptide sequences which can act in recombinant or synthetic form as diagnostic reagents for the cardiac marker H-FABP. The recombinant peptides can successfully detect H-FABP from human serum in various novel formats. Since H-FABP is found in the blood or serum only in the case of acute myocardial infarction, these reagents can constitute commercial diagnostic tests for early detection of heart attack.

Innovative Element(s)
Developed a novel qualitative/semi-quantitative ELISA like format that does not require any instrument and can be operated by semi-skilled personnel.

Market Potential
With our indigenous and innovative technologies, H-FABP tests can be very affordable and can be used in any hospital or healthcare centre.

National/ Societal Relevance
Instrument-free quick (less than an hour) ELISA-like format can be used even in rural areas. H-FABP detection in blood can differentiate between a heart-attack and non-cardiovascular chest pains. Therefore, availability of these affordable H-FABP tests can save many lives by early triage.

Project Deliverables
Progress vis-a vis objectives
Developed several reagents for detection of cardiac marker H-FABP.

Technology/Product developed
Developed reagents with detection potential of H-FABP in human serum and thereby diagnose acute myocardial infarction. We also developed a novel format that can be used for diagnosis of heart attack in low-resource set-ups.

IP generated/Potential for IP generation
Newly discovered reagents and our novel formats can generate IP.

Resources Generated
During this project, we incorporated Diagnorite Innovative Healthcare Pvt Ltd, employed and trained two technicians and also enriched our facility with new equipments.

Plans to take innovation further
Apart from fine tuning and scaling up the new reagents and the new formats, we also want to put the novel reagents to existing formats like lateral flow card format and microtiter-plate formats to increase the marketability. We also want to develop similar reagents for the later cardiac marker Troponin I and make H-FABP/ Troponin I dual tests.

Risks Envisaged
Any novel healthcare product needs painstakingly long R&D and continuous funds without immediate return.

Innovator Team
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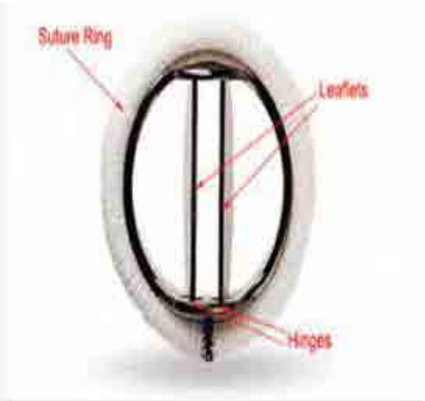
Innovator Lab Consultants



The Innovation

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

Development Stage: Discovery

Brief Description
Mechanical heart valve replacement is standard therapy for patients with aortic or mitral stenosis or regurgitation. While initially Rheumatic Heart Valve disease accounted for the majority of valve replacements, now more and more patients with degenerative heart valves undergo heart valve replacement. A major advantage of a mechanical heart valve is its longevity, if a mechanical heart valve works well, it does not require any change during the patients lifetime.

Innovative Element(s)
The Advanced technique essentially involves removal of the sewing ring and passing valve fixation sutures through the valve housing (for non-rotatable valves). Alternatively valve fixation sutures can be applied through a convexo-concave heat expanded material that contains the suture holes and guides that would provide for rotatability of the heart valve.

Market Potential
Aortic Valve segment represents 55% of the overall market. 35-50% of patients suffering from severe aortic stenosis considered at high risk for surgery. The current number of patients eligible for TAVI procedures is 200,000 worldwide. The TAVI segment thus represents a $2B market opportunity. heart valve device market—comprising sales of heart valve replacement (mechanical, tissue, and transcatheteraortic valve replacement and heart valve repair (annuloplasty) devices—was valued at nearly $180 million in 2011 and will expand through 2016, driven primarily by rising heart valve procedure volumes. Rising penetration of tissue heart valves will contribute further to market growth compared to mechanical heart valves.

National/ Societal Relevance
After the age of 75 years, 5% population is at the risk of developing a problem in their heart valve, out of which 35% are not suitable for surgery. If not treated, 50% of them will not survive for more than two years. Hence the proposed technology has relevance.

Project Deliverables
Progress vis-a vis objectives
We will be comparing the current and proposed designs through CFD simulations.

IP generated/Potential for IP generation
The first Heart valve Patent application was filed on the 14th of August 2006.

Resources Generated
A Research Associate has been employed at Technology Business Incubation Unit, IIT Delhi since 1 July 2014 for computationally verifying the new design.

Plans to take innovation further
After the numerical validation of the increased orifice area in the new design, we will be heading for prosthetic valve manufacture from TTK-Chitra Valves and do establishment of animal trails.

Risks Envisaged
The biggest challenge is to set the stage for ethics committee and future human implants.

Innovator Team
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Indio Labs

The Innovation

Novel, Percutaneous Soft Tissue Biopsy System with Assisted Hemostasis.

Development Stage: Validation

Brief Description
This device has a radical new approach to core biopsy. It has a multi-functional needle that pierces skin and cuts soft tissue in one clean "scooping" action. This technology, BioScoop™, reduces physician effort and skill by an automated tissue capture mechanism and substantially simplifies the procedure. The device provides unprecedented patient safety through the integration of the unique BxSeal™ system that concurrently delivers a hemostatic sealant directly to the site of tissue removal to prevent blood-loss. This makes the procedure safer for physicians by providing a touch-less, completely automated and contamination-free sample handling system.

Innovative Element(s)
Single needle capable of dual function of piercing and cutting, Device is semi-automated, significantly decreasing physician skill levels;

Market Potential
A We estimate that only one in 10 patients in India get definitive diagnosis with biopsy. As a result, physicians tend to treat the disease empirically which results in a corresponding increase in untreated or mismanaged cases. Hence the technology helps in definitive diagnosis.

National/ Societal Relevance
Definitive diagnosis helps to initiate the appropriate treatment and manage an eminently curable disease. The invention will add an important tool in addressing the "silent epidemic" of viral hepatitis.

Project Deliverables
Progress vis-a vis objectives
We have already developed the configuration and the test plan inquired for the project.

Technology/Product developed
Two technologies are developed and the device configuration which is being developed is integrated with both the technologies.

IP generated/Potential for IP generation
Two Indian Full Specification Applications are already filed. Two PCT applications are also filed.

Resources Generated
We have employed 3 engineers to conduct the experiments and we are developing the tissue characterisation setup.

Plans to take innovation further
Planning to launch the device in March 2016 in India and in South Asia in subsequent year.

Risks Envisaged
We envision two major technical risk factors for this project that we hope to mitigate with the work carried out in grant proposal.

Innovator Team
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Jayant Sitaram Karve–FITT

The Innovation

Intraosseous Access Device.

Development Stage Validation

Brief Description

Accessing circulatory system is critical to resuscitate patients in medical emergencies. Ozyn-D is a novel intraosseous (IO) device for emergency vascular access. It is effective, reliable and easy to use in resource-constrained settings. It will be Disposable, Insertions < 10sec, Suitable for adult &pediatric patients, Deployable in resource-constrained settings, and Usable by paramedics.

Innovative Element(s)

This device uniquely combines the lead screw principle for controlled access with rotation of the needle tip. This uses the anatomy and physiology of insertion site i.e. bones and marrow filled medullary space. The needle tip is designed in such a way that it facilitates drilling of the bone rather than the piercing. Another important issue with the device is sterility. The disposable design of Intraosseous device ensures the sterility of the needle till the point of insertion, which is important in hospital dusty environment. The device does not need any preparation and can be used by less skilled paramedics in resource- constrained environment.

Market Potential

In India, estimated 1.3 million patients need IO access annually. US market is of about 5 million patients. Besides, significant market exists globally in military and veterinary segments.

National/ Societal Relevance

Establishing access to the circulation is a critical component of resuscitation in emergency patients. Even though peripheral access (through the veins in the arm, for example) is the preferred mode of vascular access, many a time it is difficult to access veins. This can happen in patients with cardiac arrest, trauma, dehydration or obstetric emergencies. In such patient, blood volumes in the body are low because of hypovolemia, which leads to vein collapse. Precious time is wasted in trying to gain intravenous (IV) access during the "golden period" of patient care. If the vascular access is not established in time, it further leads to considerable morbidity and mortality. Thus there is the need for an alternative means of accessing the vasculature in such patients. In India alone, 1.3 million patient are deprived due to lack of any solution.

Project Deliverables

Progress vis-a vis objectives

The IO team has planned for first-in-man studies of the IO device.

IP generated/Potential for IP generation

The concept is protected via provisional patent.

Plans to take innovation further

The team intend to commercialize the technology by incorporating a Start-up company.

Risks Envisaged

Clinical Validation, - Access to capital - Access to distribution channels.

Innovator Team

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Jeevtronics

The Innovation

World's most affordable yet reliable defibrillator with built-in power source.

Development Stage Proof-of-Concept

Brief Description

Defibrillator is a device that is used to save a life of a patient undergoing a cardiac arrest. Most defibrillators work on grid electricity. Other like the AEDs need batteries which has limitation of battery failures. We will integrate a power source into the device thereby making it reliable for Indian situation. Other first of a kind features like the audio ECG etc will be added. World class innovative features will incorporate un-matched reliability, longest lasting features with affordability.

Innovative Element(s)

This patented defibrillator contains a built-in power source, which makes it more reliable than other defibrillators. This feature makes it suitable for the Rural/ Small city hospitals, Ambulances, Armed forces, Disaster relief, etc. It has an "ECG as an audio sound option" in addition to the regular display ECG. This is designed to be user friendly which could be used with minimal training in an railway station/ airport location along with extreme affordable option.

Market Potential

Highly required in Govt Hospitals in rural areas, PHC/CHC,Private Hospitals in Tier-2/3 Towns, Ambulances, Armed forces and in Disaster relief.The device effectively addresses various issues due to use of frugal yet very rugged design and could be installed across the country where infrastructure is Ltd. primarily due to cost.

National/ Societal Relevance

Heart disease is the biggest killer in India. Many a lives could be saved if an affordable defibrillator was available even to the smallest of rural/ semi-urban small hospitals. Our goal is enable the rural hospitals to have a world class yet affordable equipment locally. Armed forces, National Disaster relief organization etc. could benefit from this.

Project Deliverables

Progress vis-a vis objectives

We have met the milestones till date.

Technology/Product developed

Product development is underway.

IP generated/Potential for IP generation

Two patents: One patent granted. One filed.

Resources Generated

Company formed, incubated at Venture Center, NCL. We have an in-house R&D staff and own lab space with equipments to design and develop defibrillator. In addition, outsourced technology service infrastructure present in an around Pune for capital intensive development work.

Plans to take innovation further

Production to begin in 2015.

Risks Envisaged

Funding support to take the innovation to market.

Innovator Team

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Dr Sreeram Dhurjaty

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Karthik C. Venkateshan–C CAMP

The Innovation

3D Printer Filaments That Are Biomaterial-Based and Eco-friendly.

Development Stage: Discovery and Proof of Concept

Brief Description

Currently in the area of 3D printing, the common printing polymers that are being used are Polylactic acid (PLA, biopolymer) and Acrylonitrile-Butadiene-Styrene (ABS, petroleum based polymer). The disadvantages that are encountered with these polymers are material cost, printing difficulties, printing cost and quality and lack of biodegradability. In order to address these issues, our project focusses on the development of formulations that are biomaterial based, non-toxic and economical for producing 3D printing filaments. Further, the project also focusses on development of a bio-material specific 3D printer that will be tailored to be flexible for cost-effective and eco-friendly 3D printing.

Innovative Element(s)

The primary innovative element lies in developing novel, biomaterial based, non-toxic and economical formulations in order to process them into printable filaments which can be used for 3D printing applications. The other innovative element involves developing a 3D printed object by using a bio-material specific 3D printer that will be tailored to be flexible for cost-effective and eco-friendly 3D printing.

Market Potential

Acceleration of rapid adoption of 3D printing in India, a phenomenon that has already begun. Introduction of generic, high quality and low cost filament will free up the current constraints in terms of high cost filament that can only be bought from the maker of the 3D printer. Exploration of export possibilities of our filaments to US and EU if they meet the criteria of quality and price. Adaptation of 3D printing for prototyping wherein efficiencies in manufacturing, biomedical, diagnostics and research sectors can be improved in India. Creation of a novel engineering sector with continued demand for biomaterials due to off-shoot technologies such as, bio-medical related products.

National/ Societal Relevance

Adaptation of 3D printing for prototyping wherein efficiencies in manufacturing, biomedical, diagnostics and research sectors can be improved in India.

Project Deliverables

Progress vis-a vis objectives

Efforts are underway as per the objectives.

Technology/Product developed

Two or more optimized 3-D printed products from our indigenous tunable 3D printer and commercial 3D printers will be delivered.

IP generated/Potential for IP generation

Potential to file a suite of valuable patents covering formulations for filaments with desired characteristics.

Plans to take innovation further

Planning to take up the innovation to validation, scaleup and commercialization.

Risks Envisaged

The possibility of biomaterial 3D printable filaments not meeting the requirement of being cost competitive.

Innovator Team

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Nanosniff Technologies

The Innovation

Rapid Detection of Acute Myocardial Infarction by sensing Cardiac Markers using Micro Cantilever Technology.

Development Stage: Proof of Concept

Brief Description

Smart instrument that will rapidly diagnose Myocardial Infarction and employ a microcantilever based biosensing system to detect multiple early-cardiac-markers (eg. HFAbP, myoglobin) and one late-marker (Troponin) that are released in the blood after an MI event. The instrument will detect cardiac markers with high sensitivity and selectivity in less than 10 minutes. The instrument can be used even by a qualified nurse at a rural primary healthcare centre or in a small ambulance.

Innovative Element(s)

Integration of the sensor, fluidics & electricals as 'cartridge' that will operate on battery will be innovative feature.

Market Potential

The global market for in vitro diagnostic tests is predicted to reach $7.2 billion by 2018, at a CAGR of 12.8% over the five-year period from 2013 to 2018. Considering the need & large market size and its growth rate, we think our product has a bright scope for commercialization.

National/ Societal Relevance

In 2004, CHD was the leading cause of death in India, leading to 1.46 million deaths (14% out of a total of 10.3 million deaths). South Asians have a high prevalence of risk factors and have Ischaemic heart disease at an earlier age than people in developed countries. By 2010, 60% of the world's fresh heart disease cases were expected to occur in India. Hence the product will be of high societal relevance.

Project Deliverables

Progress vis-a vis objectives

Fabricated the micro-cantilever sensors, immobilized antibodies on the functionalized surface of the micro-cantilever. Housed the cantilever die in a rudimentary fluid cell, into which we can introduce serum using a syringe pump. Built electronics that can read the electrical signal from the cantilever and detected HFAbP in spiked serum with our cantilevers & electronic instrumentation.

Technology/Product developed

Developed micro-fabrication technology to fabricate Piezo resistive micro-cantilevers with appropriate electronics.

IP generated/Potential for IP generation

IP will be generated for the successful method.

Resources Generated

We have employed 9 technical people on this project who were trained to work in a semiconductor clean-room environment.

Plans to take innovation further

With the proof-of-concept accomplished, we will develop a prototype instrument and a prototype bio-chip.

Risks Envisaged

Risk factors are manpower and fabrication facilities uptime.

Innovator Team

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Panacea Medical Technologies

The Innovation

Development of Flat Panel Computed Tomography.

Development Stage: Proof of concept

Brief Description
The first step is to construct a CT machine with flat panel and commercialize the technology to serve the patients. This helps in capturing large areas in one single X ray exposure in one revolution and can cover area bigger than 256 slice fan beam CT machine. This will reduce the time required to acquire the images and also reduce artifacts due to high speed rotation.

Innovative Element(s)
Flat Panel based CT is a volumetric method of tomography which helps in getting better resolution of the images acquired and hence the reconstruction. This equipment aims to be one of the first few such machines addressing global market. The advantage of the system is that it can acquire a large area per exposure with high resolution of the image. The details of the reconstructed image will greatly increase considering the high resolution of the input images.

Market Potential
Flat panel CT for radiological and radiotherapy simulation will evolve into the main stay imaging product due to inherent lower patient dose. This machine will have market opportunity across the globe as Dose delivered especially for pediatric patients is of concern from a conventional CT.

National/ Societal Relevance
The product will be one of the first few commercial applications of Flat panel for CT. This new technique will result in critical technology being developed in India and is a pioneering effort . In addition, CT detector technology is closely guarded by the CT Scan machine manufacturers and hence in this system commercial flat panel is being used to achieve the CT functionality. This implies, advanced CT scan machines, based on flat panel can be manufactured in India.

Project Deliverables
Progress vis-a vis objectives
Currently, Panacea is working on designing of the machine, controller & imaging systems. The project is delivering as per schedules.

Technology/Product developed
Product is under development stage.

IP generated/Potential for IP generation
Good scope for the IPR .

Resources Generated
Manpower employed.

Plans to take innovation further
This is a unique product and has potential for developing into a product line and scope for backward integration. Panacea is planning to work on post completion of the current development.

Risks Envisaged
This product is going to compete with well established Fan beam CT and has to face stiff competition and commercial challenges.

Innovator Team
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Perfint Healthcare

The Innovation

Design and development of a SMART SENSOR SYSTEM for therapy monitoring and validation of soft tissues tumours.

Development Stage: Proof of Concept

Brief Description
The focus is to develop a cost effective, minimally invasive solution that uses optical bio-markers for in-vivo tissue characterization and differentiation. The application of this solution would be for screening, diagnosis of cancer and validation of Tumour Ablation therapy This solution is likely to be initially deployed along with our soon to be launched Ablation Assistance System [MAXIO].

Innovative Element(s)
Developing a cost effective, minimally invasive solution that uses optical bio-markers for in-vivo tissue characterization and differentiation. Needle embedded fibre optic system for validation of therapy. Algorithms for tissue characterization. Workflow integrated planning software to assess and validate therapy effectiveness.

Market Potential
Ablation therapies market is one of the fastest growing markets worldwide. India and China lead the growth rate at CAGR 25% for next few years. Tools like the one proposed here are vital for effective treatment of cancerous tumours. Nationally this smart probe system will be the 1st in the segment thus establishing innovation and Technology leadership. Globally, this smart probe system will be amongst the first few in its category and a unique one for the proposed application and can be a global winner if launched soon.

National/ Societal Relevance
The proposed invention helps surgical oncologists and interventional radiologists to access hitherto the effectiveness of cancer therapy. Thus this could serve to increase cancer prevention and treatment in India.

Project Deliverables
Progress vis-a vis objectives
The product will be committed to production with expected release in 2016.

Technology/Product developed
So far, two prototypes are developed and 2 more in development.

IP generated/Potential for IP generation
There are 5 Patent Application [3297/CHE/2010; 13/288,800; CN 201180053261; EP2011-0822810; CN2011-853261] that are related to the sensor system but conceived and filed before the funded project started.

Resources Generated
A team of 9 members of eminent specialists have been made that includes Program Management, System Architect, Clinical Lead, Technical Lead, 2 consultants, System Engineer, Contract R & D, Mfg Partner, Application Specialist.

Plans to take innovation further
To be decided post POC review.

Risks Envisaged
To be decided post POC review.

Innovator Team
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Perfint Healthcare

The Innovation

Integrated Solution to Visualize, Plan, Navigate and Target Assistance for CT Guided Interventions.

Development Stage: Discovery linked innovation, establishing proof-of-concept, Validation of existing R&D hypothesis

Brief Description

An image-guided, physician controlled stereotactic accessory to a CT system provides pre-operative planning assistance to the physician by creating a reconstructed 3D image model of received CT data, providing Image registration and overlay tools and by visually representing the planned instrument path and position(s) of one or more instruments on the model along with performance data provided. MAXIO permits physician verification of patient position prior to needle advancement and monitoring of respiratory for levels during the procedure.

Innovative Element(s)

Trajectory enforcement robotic solution for needle placement for multi tool placement. Segmentation of Liver and tumor volumes to Identify and define tumor boundaries. Multi probe planning and simultaneous probe placement to attain effective tumor ablation based on the tumor volumes.

Market Potential

Ablation therapies market is one of the fastest growing markets worldwide. Perfint achieved annual sales of INR 36 Crores in FY 13 – 14 from MAXIO. Plans to generate more than 50 crores in the coming year.

National/ Societal Relevance

Early diagnosis and treatment of cancer is the key for cure of cancer. The invention helps do this easily without need for sophisticated infrastructure for tumor ablation with minimal side effects.

Project Deliverables

Progress vis-a vis objectives

Project completed in June '12.

Technology/Product developed

Ablation station for planning and execution of ablation. Liver, Tumor volume segmentation algorithm, algorithm for thermal volume visualization. multi tool planning and placement algorithm and modules were developed. Workflow integrated planning software to perform the ablation procedure was also developed.

IP generated/Potential for IP generation

Apparatus and method for stabilizing the needle-US8613748B2. Systems and method for planning ablation procedures - App.No-13435980. Apparatus and method for stabilizing the needle– 13292186.Electronic docking system and method for robotic positioning system, awaiting publication. Targeted Anaesthesia – 617/CHE`/2009. Auto Calibration– 686/CHE/2009.

Resources Generated

12 Full time employees through the project phase and 3 part time consultants. Manufacturing facility to manufacture the product with a capacity of 5 units a month.

Plans to take innovation further

Planning to improve the features further

Innovator Team

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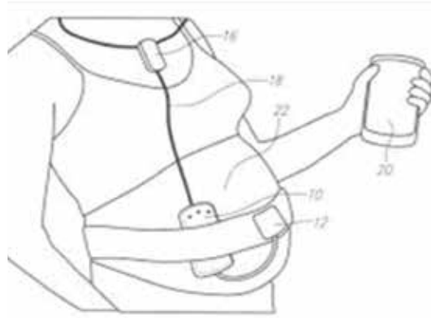
Pradin Technologies

The Innovation

Wearable Transducer less Maternal-Fetal Monitoring Device.



Development Stage: Proof-of-Concept

Brief Description

In India there is negligible presence of electronic maternal and fetal monitors in the primary/rural market and less than 2% penetration in large urban hospitals. Pradin Technologies addresses this need with a wearable, non-ultrasound,fetal/maternal monitoring device incorporating advanced adaptive algorithms for fetal/maternal ECG at 1/5th the cost of current systems. The functionality is designed for non-technical operators such as midwives and semi trained personnel.

Innovative Element(s)

We have developed separation algorithms to extract fetal components reliably from maternal ECG and combination of audio and pressure sensors for fetal heart sounds and uterine contractions. A further innovation is reducing costs and complexities of standard ultrasound fetal monitoring systems by eliminating the transducers required for acquiring fetal heart rate and uterine activity equivalent and better functionality achievement by algorithms.

Market Potential

We can conservatively estimate the market opportunity as 1 Billion US$ considering the number of primary and community health centers, private health centers, midwives and ambulances present in India.

National/ Societal Relevance

The proposed product is simple to use, midwife friendly, wearable, battery powered and at 1/5th the price of conventional systems. The device facilitates pregnant women to be ambulatory and tailored for continuous monitoring for extended periods of time in case of high & medium risk pregnancies.

Project Deliverables

Progress vis-a vis objectives

Proof of concept readiness before October 2014 end.

Technology/Product developed

Fetal ECG and Uterine contraction signals separated from abdominal ECG of the gestating pregnant woman.

IP generated/Potential for IP generation

There is scope for IP generation.

Resources Generated

Lab setup created for design verification and validation.

Plans to take innovation further

To engineer the product for market readiness.

Risks Envisaged

Getting timely DCGI approvals and to benchmark by comparing the performance side by side with conventional or traditional cardiotocographs. No technical related risk anticipated.

Innovator Team

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SG Art Heart

The Innovation

Keyhole surgery replaceable artificial heart.

Development Stage: Concept validation

Brief Description
An Artificial Heart which is flexible and collapsible enabling implantation and removal through a keyhole opening in the chest wall and further within the thorax cyclically transforms from a soft structure to a rigid structure is an innovation. The project covers selection of appropriate materials; design the final structural form and develop such a fabrication technology that the hearts withstands stress and deliver desired blood pumping for a device life time of 5 years. Circulatory system test bench to be developed for accelerated testing. Also appropriate surgical instruments for keyhole implantation to be designed.

Innovative Element(s)
Shape cyclically changes similar to the natural heart and collapsible form which can be inserted through a keyhole surgery of the chest wall. Being flexible it will form flexible-flexible interface resulting in reduced Trauma..Will be of low cost as the R&D has been done with Government Funding and will not be charged to the Product price

Market Potential
With terminal heart disease occurring at younger ages in India also there is increasing need for artificial heart. Since all physical devices has Ltd. functional life span, replaceable artificial heart has longer durability. Only about 3500 donor heart is available worldwide while the demand is for 12000.

National/ Societal Relevance
With increasing incidence of terminal heart disease in India the project is of high relevance.

Project Deliverables
Progress vis-a vis objectives
Studies on cadaver goats begun.at IIT Kharagpur and AIIMS, New Delhi.

Technology/Product developed
Physical model developed.

IP generated/Potential for IP generation
Patent granted in UK.

Resources Generated
5 young scientists being trained.

Plans to take innovation further
Plan to get to live animal studies in 6 months.

Risks Envisaged
Getting Clinical Trial approval is difficult.

Innovator Team
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Sohum Innovation Lab

The Innovation

A novel device to screen newborns for hearing loss in resource poor settings to prevent speech loss.

Development Stage: Validation

Brief Description
Sohum is a non-invasive, safe medical device and a system solution to do mass screening of newborns for hearing loss in resource constrained settings. Sohum uses brainstem auditory evoked response (BAER or ABR) technology which is the gold standard in auditory testing and is recommended as the test of choice by the American Association of Pediatrics (US) and the National Health Services (NHS-UK). Sohum uses this in an innovative way with an easy-to-use interface to meet the needs of the resource poor system.

Innovative Element(s)
Sohum has features designed specifically for the needs in resource-poor settings. Unique algorithm, Optimized product design, Re-usable disinfect-able electrodes, Tele diagnosis, Aftercare and Safety are the features.

Market Potential
In India, 26 million babies born every year, need to be screened for hearing impairment. We target screening program with institutional births, which addresses 47% of these births (12.2 million). In year one we target to screen 2% of this population, in subsequent years targets are 10%, 30% and 65% of this population through different channels. Through government run programs & local entrepreneurs we target to reach the non-institutional births.

National/ Societal Relevance
Annually, almost 800,000 babies are born with HI, with 90% of cases in resource-poor countries because of infections (rubella), Rh factor in the blood/jaundice, maternal diabetes, toxemia, anoxia, low birth-weight, parental history, & ototoxic drugs. In India alone every year 100,000 babies are born with HI. Intervention in the first year of life significantly improves outcomes and saves cost to the system.

Project Deliverables
Progress vis-a vis objectives
The project is currently on track based on the projected timelines/ objectives.

Technology/Product developed
A hardware and software solution is in progress.

IP generated/Potential for IP generation
One PCT is filed last year.

Resources Generated
Recruitment of a full-time hardware and an algorithm expert.

Plans to take innovation further
Comparative clinical validation studies are planned on infants at two tertiary level hospitals.

Risks Envisaged
The product is non-invasive measuring device and require additional resources for CE mark.

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Sushanth Poojary-FITT

The Innovation

Development of a commercial grade low cost Arterial pulse analyzer.

Development Stage: Proof of concept

Brief Description
The low cost arterial pulse analyzer can help clinicians diagnose Cardiovascular Disease (CVD) cases in a more effective manner. This will automate the process of CVD diagnosis to enable medical camps and mobile medical vans to diagnose CVDs without the need of trained healthcare professionals especially in a rural setup.

Innovative Element(s)
We have built a low cost Cardio Vascular Diseases diagnostic instrument with onboard analysis. The comparable ones available commercially are very expensive. The device is very portable, yet there is no compromise on the amount of analysis that is performed. We will also have localization and internationalization features for the user interface of the device.

Market Potential
The market potential is high considering its affordability factor.

National/ Societal Relevance
A recent report indicated that non-communicable diseases, particularly cardiovascular disease (CVD), have replaced communicable diseases as the leading cause of death in developing nations. Cardiovascular diseases are a major public health concern in India, and contribute to roughly 40 million deaths annually. Therefore it is extremely important to bring down this alarming level of mortality due to cardiovascular diseases. Diagnosing CVDs at their early stages will help doctors to be able to prevent onset of major illness and provide appropriate medications to keep the health state in control.

Plans to take innovation further
We are in the process of getting incubation at SINE, the IIT Bombay business incubator and setting up a company, which will play a key role in commercialization of the device. Once we have successfully completed the clinical trials, we plan to launch the device for clinicians.

Innovator Team
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Unilumen Photonics

The Innovation

Fibre laser for photoselective tissue ablation.

Development Stage: Validation

Brief Description
Pulsed high power lasers useful tools for surgery. Fibre lasers are more stable, require less maintenance and offer a better beam quality. Our fibre laser platform works at both infra-red and visible wavelengths and is customized for use in urology, dermatology and ophthalmology.

Innovative Element(s)
Maintenance of spatial beam quality of the laser pulses through patented fibre spool arrangement.

Market Potential
3000 crores.

National/ Societal Relevance
Laser surgery offers better patient outcomes and lower post-operational costs. This has a direct impact on the quality of healthcare that we can provide. With a high incidence diseases such as cataract and enlarged prostrates, access to indigenous and inexpensive laser systems will help us deliver better healthcare to our citizens.

Project Deliverables
Progress vis-a vis objectives
High power infra-red laser pulsed capability has been achieved. Current work is on packaging the unit, before converting it to a visible laser pulse train.

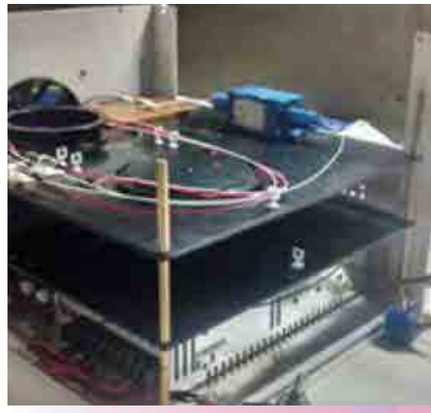
Technology/Product developed
Dual stage master oscillator power amplifier with electronically controlled pulsed seed laser and automated monitoring system.

IP generated/Potential for IP generation
Method for eliminating mode shifting in large mode area optical fibres (3596/CHE/2012). Energy-based auto correction and Repetition-rate optimization of laser pulses- System, apparatus and methods thereof (5122/CHE/2013).

Resources Generated
Unilumen Photonics Pvt. Ltd created, supports research of one M.Tech and one Ph.D. student.

Plans to take innovation further
Expand into other markets such as agriculture (laser seeding machines).

Risks Envisaged
High bill of materials which will require capital infusion to achieve economies of scale.



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W. Gowrishankar–FITT

The Innovation

mCAPD– Mobile CAPD Dialysis System.

Development Stage Proof of Concept Stage

Brief Description
mCAPD, mobile Continuous Ambulatory Peritoneal Dialysis system is a wearable device which (a) offers renal patients to carry out dialysis wherever they are; be it office, theaters, workplace etc.,and unshackles the chains from their dialysis machines. (b) offers a possibility for leading a normal lifestyle and continue with their studies, or work unhindered by their disease. (c)a simple dialysis system for patients even in remote and rural places without the need for hospitals or sophisticated equipment.

Innovative Element(s)
A miniature system with intelligent controller, peristaltic pump and sensors fitted in a belt and worn in the hips, allows patients to carry out dialysis. Better Patient monitoring, alerts of the quality of dialysis provided to patients and doctors through smartphones.

Market Potential
An estimate says there are 2 lakh patients on dialysis in Chennai alone. Dialysis is becoming very costlier and non-accesible to all. Our product offers the dialysis facility even to patients in rural and remot corners as they can carry out the CAPD themselves and anywhere, anytime. An effective alternative to auto cyclers, being touted as the next big revolution in the treatment of dialysis, and being aggressively promoted by multinationals like Baxter.

National/ Societal Relevance
Addresses the need of renal patients' dialysis in every way – being accessible, affordable, convenient and available in rural and remote corners of India. Improves lifestyle by unshackling the renal patients from their dialysis beds. Enables to perform their regular activities unhindered by the chronic disease. Thus the proposed system has high societal relevance.

Project Deliverables
Progress vis-a vis objectives
Design Documents submitted, Development Work – In Progress.

Technology/Product developed
Under Development.

IP generated/Potential for IP generation
Sterile Connector – Patent pending; mCAPD system – Provisional patent, PCT applied

Resources Generated
Masters Solutions Pvt. Ltd an enterprise created for commercialising mCAPD.

Plans to take innovation further
Launch at all major metros in India. Develop an herbal alternate fluid for CAPD, making the system even more cost effective.

Risks Envisaged
Protecting the idea and at the same time reaching the market as widely as possible.

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Innovation Profiles

Agriculture

Advanta

The Innovation

"RNAi and other cutting edge technological interventions to develop insect-pest, diseases & viruses tolerant tomato hybrids for Indian & International markets

Development Stage: Validation

Brief Description
The project makes use of molecular markers and transgenic technologies to develop broad spectrum disease tolerance in tomato hybrids. Using MAS, host plant resistance genes for fungal (Verticillium and Fusarium wilt), nematodes (Root knot) and viral (TMV, ToLCV) diseases were introgressed in parents of Advanta tomato hybrids. Transgenic technology was used to develop RNAi-mediated dual resistance to ToLCV and GBNV viruses in transgenic tomato and; sucking paste tolerance in transgenic tomato by using Ginger Lectin (GL) gene. High degree of ToLCV tolerance in RNAi-transgenic tomato was observed using Agro-inoculation based virus assay.

Innovative Element(s)
A RNAi-Hair-Pin gene construct has been designed to develop dual resistance to GBNV and ToLCV viruses in transgenic tomato.

Market Potential
The disease causes huge monetary losses in the vegetable crop Protection. Hence huge market potential is expected from the proposed tomato hybrid.

National/ Societal Relevance
Since tomato is very important vegetable crops in India, any improvement in yield will benefit farmers as well as consumers.

Project Deliverables
Progress vis-a vis objectives
Natural host plant resistance genes for Fusarium wilt (I2), Verticellium wilt (Ve), Root Knot nematodes (Mi2.3), TMV (Tm2) ToLCV (Ty1 and Ty3) were introgressed in A line of tomato hybrids showing significant tolerance to these diseases across the locations.

Transgenic tomato events developed using RNAi-Hair Pin construct (ToLCV-GBNV) showed very good tolerance to ToLCV while GL gene in transgenic tomato confers tolerance to whitefly transmission of ToLCV.

Technology/Product developed
Disease tolerant tomato hybrids.

IP generated/Potential for IP generation
PVP registration of EDVs and Patent filing for transgenic events are under process.

Resources Generated
Instruments were purchased and transgenic Greenhouse was developed

Plans to take innovation further
Bio safety studies and field evaluation of transgenic tomato events resistant to ToLCV and GBNV viruses.

Risks Envisaged
Lack of proof for GBNV tolerance in transgenic tomato may pose a risk.

Innovator Team
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Ankur Seeds

The Innovation

Third generation RNAi for engineering Tomato leaf curl (ToLCV) and tospovirus (GBNV) resistance in tomato.

Development Stage: Proof of Concept and validation

Brief Description
ToLCV and Tospoviruses are two most important viruses in tomato which can cause a yield loss of up to 100%. No breeding lines are known that resist pan-Indian ToLCV species and this fact assumes significance as the ToLCV species are still evolving. The proposal uses a novel method based on artificial microRNAs (amiR) and transacting siRNA (tasiRNA) to stop the infection of virus. The project also includes construction of battery of new constructs against various conserved ToLCVORFs. These transgenics would give immunity level resistance. The company also plans to target conserved regions of N and NSs genes of GBNV- the major Tospoviruses of tomato in India.

Innovative Element(s)
The goal is to apply gene silencing properties of artificial microRNAs (amiRNAs) and trans-acting siRNAs (tasiRNAs) in engineering transgenic resistance against tospovirus and leaf curl virus in tomato. We have solid leads for potential of amiRNAs.

Market Potential
The market requirements include tomato hybrids with resistance to major tropical diseases like bacterial wilt, tomato leaf curl virus (ToLCV) and groundnut bud necrosis virus (GBNV). There is a need for ToLCV resistant and cold tolerant hybrids.

National/ Societal Relevance
Tomato is being cultivated in India for last 200 years and constitutes an inseparable part of Indian culinary spectrum. The average productivity of tomato in India is 19.331 t/ha (NHB, 2010) and there is a substantial scope to increase it further just by reducing yield losses to biotic/abiotic stresses.

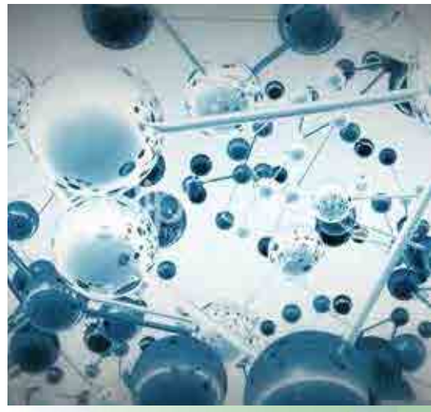
Project Deliverables
Progress vis-a vis objectives
Leaf curl and tospovirus resistant marker-free tomato transgenics are in progress. Also an efficient methodology of screening plants for virus resistance

Technology/Product developed
Transgenic Tomato with artificial microRNA

Resources Generated
Virus Challenge facility developed, Real Time PCRand liquid handler were procured.

Plans to take innovation further
We will take this innovated product i.e. Transgenic Tomato with artificial miRNA against ToLCV for regulatory process.

Risks Envisaged
Risk factors for this type of work are fairly high. .The next generation gene silencing technologies are embryonic and largely unproven. There are no earlier reports of efficacy of amiRNA strategy for tospoviruses.



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Bejo Sheetal Seeds

The Innovation

Development of 'Herbicide and Stress tolerance' Transgenic Onion.

Development Stage: Validation of the Technology

Brief Description
In the present proposal plant based mutant EPSP's gene has been cloned and transformed in Onion plant to develop herbicide/glyphosate tolerant trait. Plant helicase gene PDH45 conferring tolerance to salt and draught stress, is cloned in plant expression vector along with EPSP's gene and transformed in Onion for developing the stress tolerance.

Innovative Element(s)
Technology development is using natural sources of genes from plants and transferred to Onion crop plant with significant level of gene expression. Development of transgenic onion is also utilizing natural system of Agrobacterium mediated genetic transformation independent of plant selectable antibiotic gene and without selectable marker gene also.

Market Potential
In India Onion plays an important role as Social/Political culture. Weed emergence in onion growing fields is major problem is India. Manual weeding is labour intensive and high cost investment. Hence onion seeds having herbicide & stress tolerance trait would be value addition for improved productivity.

National/ Societal Relevance
In India Onion plays an important role as Social/Political culture, India is one of the major producer and exporter of Onion. The presence of onion is seen in almost every kitchen of Indian family.

Project Deliverables
Progress vis-a vis objectives
Achieved all objectives, last objective to be completed by March 2015.

Technology/Product developed
Genetically modified onion development technology is developed

Resources Generated
Two Post graduate students trained and employed

Plans to take innovation further
Promising event will be further used to develop the Transgenic Hybrid Onion.

Risks Envisaged
Lack of social awareness about technology, time and investment required to reach the commercial stage.

Innovator Team
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Geo Biotechnologies

The Innovation

Association Mapping and Whole Genome Marker Assisted Recurrent Selection for Development of Abiotic Stress Resilient Maize.

Development Stage: Discovery and proof of concept

Brief Description
In the present study 325 inbred lines from CIMMYT Asia and 75 elite lines from Geo Biotechnologies Program were crossed to two common testers CML451 and CLO2450. The test crosses were evaluated in 5 well watered and 3 managed drought locations. Common SNPs were identified across testers and analytical models

Innovative Element(s)
The innovation is in sync with the objectives where association panel will be developed from CIMMYT and GEO seeds germplasm for rapid development of drought tolerant elite lines using genomic selection.

Market Potential
The drought tolerant maize hybrids will be of relevance in the rainfed cultivation zone which is a significant part of the 8.12mHa in India. The current maize seed market in India is valued at Rs. 3500 crores of which nearly 2000 crores is of the rainfed maize seed sales. The introduction of drought tolerant maize hybrids will enable capturing a significant part of this market.

National/ Societal Relevance
Introduction of drought tolerant maize hybrids will protect farmers from inadequate rainfall as the genetics of the hybrid will enable it to sustain and give a guaranteed yield while performing very well under good rainfall conditions.

Project Deliverables
Progress vis-a vis objectives
Identification of novel sources of stress tolerant Germplasm, and association mapping for drought stress in Maize- well watered trials have been completed. Three managed drought trials and a few trials to be conducted during Rabi season of 2014.

Technology/Product developed
Germplasm/ lines have been identified with more favourable alleles. Significant SNPs identified for drought tolerant trait in maize and best test crosses have been identified for MLT trails for further commercialisation

Resources Generated
Training of scientists as per the requirements of the project.

Plans to take innovation further
Large scale testing of selected shortlisted CIMMYT X GEO seeds drought hybrids through multi location trialing and root phenotyping of selected sub panel for structural and functional studies and also association studies.

Risks Envisaged
An erratic rain/s during drought phenotyping during rain free period is the only risk envisaged for accurate phenotyping/data collection. Unforeseen disease pressure in some locations could lead to inaccurate data collection.

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GEO Biotechnologies

The Innovation

Development of F1 hybrid Tomato with high shelf life

Development Stage: Validation

Brief Description
The company has crossed L121 (high shelf life parent) and Vaibhav (University released high yielding variety) and carried out phenotyping and genotyping of F2 cross between L121xVaibhav. L121xvaibhav population has been forwarded up to F7 generations. Phenotypic data and SSR markers were used for screening the RIL's with extended shelf life.

Innovative Element(s)
The proposal has identified a tomato germplasm having shelf life of 40 to 100 days and transferred the trait to commercial variety using molecular markers. This technology will serve as a boon to farming community.

Market Potential
Since there are no varieties breeds through molecular markers for extended shelf life, this technology has great potential to develop F1 hybrids using these RILS. The company has already sold some selected lines to two seed companies.

National/ Societal Relevance
Tomato is highly perishable and losses are upto 40% due to excessive softening, during peak season of Tomato. The production is so much that there is glut in the market and farmers have to leave the tomato without harvesting. The present technology will solve the problem of perishability and also the farmer or the merchant can send the tomato to far of places where there is good price since those tomato lines have long transportation capability.

Project Deliverables
Progress vis-a vis objectives
Recombinant inbred lines (RILs) have been crossed with elite varieties and F1 hybrids developed were sown and will be transplanted to main field for evaluation .

Technology/Product developed
Developed the tomato lines with shelf life of 40 to 100 days at room temperature. These lines are used for developing F1 hybrids with extended shelf life.

IP generated/Potential for IP generation
The variety developed has potential for variety registration.

Resources Generated
One Research Associate and one Senior Research Fellow have been employed in the project, besides providing employment for computer assistant and also labourers. Trained MSc and Ph.D students in molecular markers. Transferred the technology to two seed companies and earned 1.0 lakhs. The seed companies have to pay 2% royalty after selling F1 hybrids.

Plans to take innovation further
The company plans to incorporate Bacterial wilt and leaf curl resistance to the extended shelf life Tomato lines.

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Global Transgene

The Innovation

Generation, evaluation and regulatory appraisal of selected transgenic events for enhanced tolerance against lepidopteran insect pests in cotton, rice and brinjal (Phase – 1 and II)

Development Stage: Proof of concept to validation

Brief Description
The main objective of the project is to develop transgenic technology especially in cotton, so as to develop two-gene Bt-cotton transgenic events without having to license from Monsanto or any other multinational corporation.

Innovative Element(s)
Majority of the known transgenic events of Cotton are based on Coker Somatic Embryogenesis-mediated regeneration system. Coker is an American genotype, having many undesirable traits for Indian crop conditions. In view of this the proposed project is focused on the development of transformation protocols in elite cotton breeding lines of Nath {NathBiogenes (I) Ltd}.

Market Potential
The indigenous technology being developed in the project can play a very important role in Indian Bt-cotton seed market as also in promoting the application of transgenic technologies in other important crops.

National/ Societal Relevance
The success story of Bt-cotton in India is abundantly clear. The gains accrued to the farmers have been validated for about 10 years.

Project Deliverables
Progress vis-a vis objectives
A high frequency multiple-shoot regeneration system has been standardized for specific cotton and rice parental lines. Similarly, highly reproducible Agrobacterium-mediated transformation protocols have been developed for elite cotton as well as rice cultivars.

Technology/Product developed
Two-gene Bt-brinjal transgenic events developed for Fruit and Shoot Borer. Cotton and Rice transformation protocols have been developed to generate transgenics for enhanced tolerance against lepidopteran insect pests.

IP generated/Potential for IP generation

The selected transgenic events will be processed for IP generation.

Resources Generated
Manpower employed/trained: 6

Facilities created: Rice transformation laboratory, Cotton transformation and Molecular Biology Laboratories upgraded to accommodate large scale transformation experiments. And poly-houses for transgenic events maintenance and evaluation.

Plans to take innovation further
After demonstrating the technology convincingly, we shall swiftly go through the process of validation and eventual mobilization into cotton cultivars of choice, on a fast track basis.

Risks Envisaged
Regulatory appraisal and approval is the major constraint/risk.

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Indian Agricultural Research Institute

The Innovation

Validation of serological diagnostic reagents and kits for plant viruses affecting horticultural crops

Development Stage: Validation

Brief Description
The product and technology involve expression construct, polyclonal antibodies, monoclonal antibodies, gold conjugates, ELISA kits and lateral flow immunoassay kits for 14 different plant viruses affecting potato, banana and orchids.

Innovative Element(s)
Development of indigenous diagnostic kits (ELISA kits and lateral flow immunoassay kits) for plant viruses suitable for commercial purposes for the first time in India.

Market Potential
ELISA and strip based kits have great market potential for indexing and certification of tissue cultured potato, banana, orchids which are growing rapidly in India and in other countries.

National/ Societal Relevance
Currently indigenous capability for antisera and ELISA/strip based kits for viruses are not available in India. Once indigenous capability for antisera and ELISA/strip based kits are available, it will help manage viral diseases and yield loss caused by them in different crops.

Project Deliverables
Progress vis-a vis objectives
Expression construct of six potato viruses (PVA, PVS, PVM, PVX, PVY, PLRV) and two banana viruses (BSV and BBTV) has been made. Expression and purification of BBTV and two potato viruses has been successfully done. Immunization of two potato viral coat protein has been done.

Resources Generated
Two SRF have been recruited

Plans to take innovation further
The company plans to incorporate Bacterial wilt and leaf curl resistance to the extended shelf life Tomato lines.

Innovator Team
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Indo-American Hybrid

The Innovation

Utilization of marker assisted selection for development of salt tolerant hybrids in rice (Oryza sativa)

Development Stage: Proof-of-Concept

Brief Description
Through marker assisted breeding desired saltol Qtl will be introgressed into two maintainer line (B). The plants selected by genotyping were phenotyped in saline micro-plots. With MAB, breeding cycles were cut shorted to 3 years and come up with a salt tolerant line. The foreground and background markers will assist in speedy selection of desirable plants at seedling stage.

Innovative Element(s)
The company could successfully introgress the saltol Qtl from the donors to two maintainer (B) lines through MAB using SSR markers. Foreground and background selections were followed by phenotyping the selected progenies along with susceptible and tolerant checks in the saline micro-plots at EC 6.5 dS/m2, pH-8. Seeds were collected from tolerant lines having high fertility from saline micro plots and were grown in Inland saline hot spot locations ranging EC: 7-10 dS/m2 and pH: 9-10.5 during the growth stages. Plants were observed to tolerate the salinity stress having good fertility.

Market Potential
Inland salinity areas

National/ Societal Relevance
Hybrids can grow in inland saline targeted areas

Project Deliverables
Progress vis-a vis objectives
Recurrent and donor parental lines were genotyped with SSR markers linked to saltol Qtl. Identified polymorphic markers were used as foreground markers.

The advanced backcross population was genotyped with foreground and background specific markers and phenotyped intensively under moderate saline micro plots (Ec 6.5 dS/m, pH 8.0) for tolerance and yield attributing traits.

The selected homozygous families were phenotyped under control (EC 2dS/m, pH-8), moderate saline (EC 6.5dS/m, pH-8) and high saline (EC 10dS/m, pH-8) micro plots.

Technology/Product developed
Saline tolerance maintainer lines were developed

Resources Generated
We trained manpower to for genotyping and phenotyping under saline soils

Plans to take innovation further
The company would like to convert respective CMS lines as followed in maintainer line conversion. Popularising the hybrid at saline targeted areas with more extension activities

Risks Envisaged
Public support in evaluating our developed salt tolerance hybrid and further notification.

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Kaveri Seed

The Innovation

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

Development Stage: Proof Of Concept

Brief Description

To ensure food security for the ascending population it is imperative to raise productivity and increase production of our most important food basket crop-rice. Further raise in productivity of rice is immediately possible through large scale adoption of hybrid rice. Is it possible to give hybrid rice a big push on lines of hybrid Bt cotton through biotechnology intervention? - is the question being addressed though this project. As biotechnology steers the breeding process, by conjunct use of DNA marker technology and hybrid technology it should be feasible to develop value added new generation rice hybrids.

Innovative Element(s)

The hybrids per se outperform varieties due to inherent phenomenon of heterosis or hybrid vigour. Hybridity, however, also imparts greater genetic buffering capacity to withstand stress environs (abiotic stress). Built in genetic resistance to major pests in the hybrids adds a third dimension advantage.

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 36 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

Phenotyping facility created for screening of brown plant hopper and blast resistance at kaveri seeds, Hyderabad.

Plans to take innovation further

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

Risks Envisaged

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

Innovator Team

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Kaveri Seed

The Innovation

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

Development Stage: Discovery

Brief Description

The current project aims to improve maize productivity under drought stress through an integrated approach of deploying molecular markers with conventional breeding process. The strategy is to identify genes underlying yield under drought stress via QTLs by tagging with markers through association mapping. The QTLs/genes tagged with markers are enriched among inbreds by marker-assisted recurrent selection (MARS) strategy. Finally, using the improved inbreds, propose to develop high yielding drought tolerant maize hybrids.

Innovative Element(s)

Molecular markers can be effectively deployed to dissect the genetic basis of yield under drought stress and 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

For maize yields can be pushed anywhere close to global average, India will have sustained maize production; and also scope for export prospect. Therefore, improving maize productivity in drought prone regions is of national relevance in terms of providing adequate grain to the poor farmers and land less 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 is fulfilled successfully and the company initiated Improving parental lines using MARS method.

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 hybrid developed will be registered with PPV & FR for proprietaries of the product.

Resources Generated

Manpower employed as per the project provision

Plans to take innovation further

Execution of the project is as per the concept and design.

Risks Envisaged

Failure to develop competitive hybrids could adversely affect seed business and depends on the product value and performance which is why a plethora of hybrids in the assembly line will be tested.

Innovator Team

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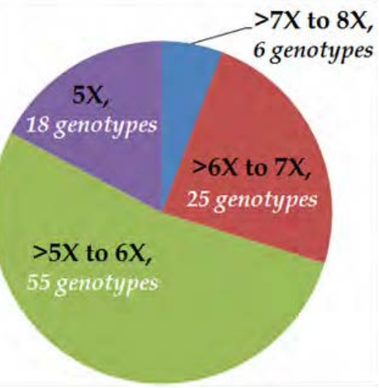

Krishidhan Seeds

The Innovation

Genomics assisted accelerated product development of high yielding pigeonpea hybrids

Development Stage: Validation

Brief Description
The project is aiming to relate genomic information that was generated based on next generation sequencing of top parents of pigeonpea hybrids with the likely contribution of genomic segments or blocks that might define heterotic patterns observed in the F1 hybrids derived from them. Tag fertility restorer genes using the same genomic information to hasten the development of fertility restorer lines to create better hybrids.

Innovative Element(s)
Based on the genomic data generated from next generation sequencing of a number of parents of top F1 hybrids, the data will be aligned to discover a large number of genomewide SNPs. The identification of molecular markers tightly linked to fertility restoration loci would further enhance the breeding efficiency by enabling for the classification of inbred lines or germplasm as either maintainer (B-line) or restorer (R-line) without field evaluation of their test crosses; and it would also permit their rapid backcross transfer of fertility restoration genes in elite inbred lines.

Market Potential
Assuming that 20% of the area under pigeonpea is brought under hybrids in the near future, i.e., in 1.00 mha, the hybrid seed market itself will be of the order of about Rs. 100 crores. The benefits to the society however will be much larger. Assuming an incremental yield of about 250Kg/ ha it turns out to be Rs. 1000 crores.

National/ Societal Relevance
In India and other countries of the region, pigeonpea provides a significant part of the protein needs of the vegetarians and the poor as a part of the daily diet (DAL). High yields through better heterosis will allow more to be produced from the same piece of land, thus either increase food availability or affordability through higher production or release land for cultivation of other crops.

Project Deliverables
Progress vis-a vis objectives
A set of 110 non-redundant lines (10A-, 13B- and 87R-lines) have been assembled and genomic DNA has been isolated from 110 parental lines. Phenotyping of the diverse panel for yield related traits is being carried out.

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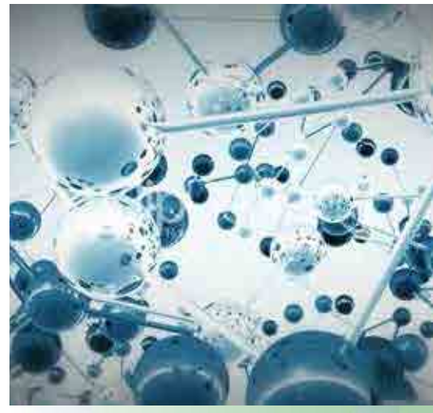
Maharastra Hybrid Seeds



The Innovation

Development of Sucking Insect Pest tolerant Rice and Cotton

Development Stage: Proof-of-concept and validation

Brief Description
The insecticidal efficacy of the plant-derived ASAL (Allium sativum agglutinin from leaf) gene has been demonstrated in different species of sucking pests. Mahyco has obtained the license to use ASAL technology from Bose Institute, India. Genetic engineering approach was used to generate transgenic ASAL-rice and ASAL-cotton lines and events demonstrating enhanced tolerance to brown plant hopper in rice and whitefly in cotton were identified through gene efficacy testing.

Innovative Element(s)
The inventive step would be to validate gene efficacy in rice and cotton against their target sucking pests (brown planthopper and whitefly) through robust plant bioassays for the identification of event(s) showing optimum levels of insect resistance phenotype.

Market Potential
Considering the high levels of losses (up to 60-80%) in rice and cotton crops due to sucking pests, there is a crucial need to develop crops tolerant to these insect pests, which presents a huge potential market.

National/ Societal Relevance
Developing lines tolerance to sucking pests and managing virus transmission has direct relevance to increasing national food/fibre production and also would provide farmers with better quality product and higher returns on investment.

Project Deliverables
Progress vis-a vis objectives
Validation of insecticidal gene activity of ASAL by in vitro insect bioassays, development of gene cassettes for rice and cotton transformation

Generation of marker-free transgenic lines (expressing ASAL gene) in rice and cotton and evaluation of gene segregation and efficacy

Molecular and functional evaluation of transgenic lines for event selection and the selection of best performing event for product development

Technology/Product developed
Developed genetically modified rice and cotton lines expressing plant-derived ASAL gene that confers enhanced tolerance to sucking insect pest damage.

IP generated/Potential for IP generation
Incorporating ASAL gene into elite varieties and hybrids of rice and cotton will allow generation of new IP.

Plans to take innovation further
Commercialization.

Risks Envisaged
ASAL protein has moderate antibiosis-like activity against insect herbivores and therefore the possibility of commercial success of this technology may be Ltd..

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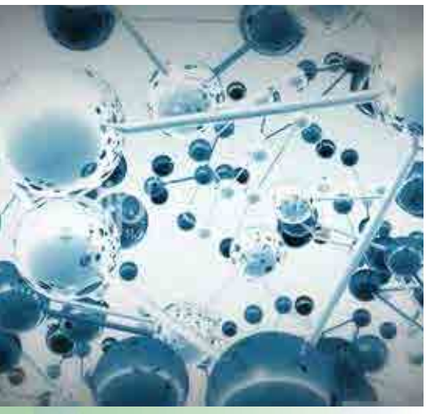

Maharashtra Hybrids Seeds

The Innovation

Stress tolerant rice

Development Stage: Proof of concept and validation

Brief Description
It has been demonstrated that expression of specific classes of genes (transcription factors, ion transporters etc.) in rice and other crops results in increased abiotic stress tolerance. In this proposal, we are testing and validating a number of such candidate genes developed through in-house research or licensed from others. Appropriate promoters are also tested for efficacy. Proof of concept is being established for some of these genes, while for others this needs to be done during the proposal period. Finally, genes will be deployed in combinations to achieve the optimum level of drought and salinity tolerance. This proposal will generate novel rice lines with single and stacked genes, conferring tolerance to multiple abiotic stresses. At the present time, such lines are not available

Innovative Element(s)
Novel combinations of genes effective against multiple stresses would be the innovative elements.

Market Potential
Rice is grown over 43 m ha in the country. At least 25-30% of these areas are affected by drought and/or salinity every growing season. Therefore, there is a crucial need to develop rice lines to address this problem, and this presents a huge potential market.

National/ Societal Relevance
Abiotic stresses are major yield constraints in rice. Developing lines tolerant to drought and salinity has direct relevance to national food security needs, and also would provide farmers the assurance of returns on investment in adverse conditions.

Project Deliverables
Progress vis-a vis objectives
Efforts are underway as per the objectives which includes generation of primary transgenic lines incorporating genes and promoters conferring tolerance to drought and salinity, their molecular characterization and green house evaluation of selected events

Technology/Product developed
Stress tolerant hybrids of rice are expected at the completion of the project.

IP generated/Potential for IP generation
Novel combinations of abiotic stress tolerant genes in rice will allow generation of new IP. Further IP will result by incorporation of these traits in elite varieties and hybrids.

Plans to take innovation further
The events which show potential in terms of tolerance to drought and salinity will be inducted in the breeding program of Mahyco to develop hybrids (products) which are tolerant to abiotic stresses.

Risks Envisaged
Results obtained in controlled conditions may not always translate to the field.

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Metahelix

The Innovation

Deregulation trials of transgenic rice events expressing Metahelix synthetic Cry1C, Cry1Ac and Cry1Ab genes for tolerance to rice yellow stem borer, Scirpophagaincertulas

Development Stage: Validation

Brief Description
The project aims to achieve identification of two most efficacious events for Cry genes. Stabilization of each transgenic event in potential hybrids, bio-efficacy against the yellow stem borer, and confirmation of protein expression levels, and inheritance of the trait are envisaged in the proposal.

Innovative Element(s)
Genes used in this project are Metahelix owned and designed, codon-optimized for rice, express specific insecticidal proteins in the events derived, that have been shown to offer durable tolerance across multiple generations to rice yellow stem borer.

Market Potential
The rice hybrids or varieties tolerant to YSB will be preferred by the farmers as they will not only bring in yield benefits, but also reduce the usage of pesticides thus helping to maintain environmental quality. Since events carrying different Cry genes are singly generated it allows the opportunity to develop a stacked gene product.

National/ Societal Relevance
The transgenic crop tolerant to yellow stem borer will result in reduction in pesticide use and a consequent increase in yield due to prevention of loss caused by the insect.

Project Deliverables
Progress vis-a vis objectives
Event selection trial conducted and report submitted to RCGM.

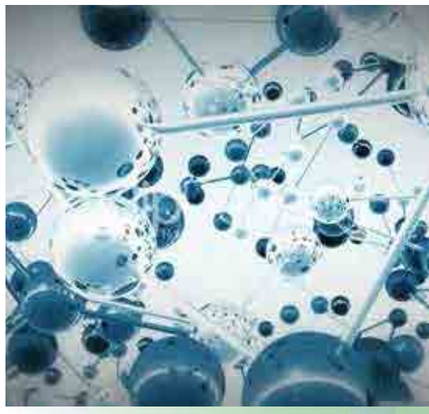
Technology/Product developed
A total of 566 events were generated and tested in the field trial during 2011. Ten of the most efficacious events expressing Metahelix designed and developed Cry1Ab and Cry1Ac genes independently have been shortlisted for BRL-1 trial.

IP generated/Potential for IP generation
Metahelix has complete freedom to file patents on the three genes.

Resources Generated
Manpower training, equipment and technical infrastructure related facility development

Plans to take innovation further
To conduct the BRL-1 trial and subsequently to commercialize the rice transgenic events expressing Metahelix designed genes namely Cry1Ab and Cry1Ac.

Risks Envisaged
None – as the proposal is for funding of Phase I of deregulation trials which are already well defined and streamlined by Government of India procedures.Delay due to regulatory hurdles from government agencies.



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Metahelix

The Innovation

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

Development Stage: Validation

Innovator Team

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Principal Investigator
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M. J. Vasudev Rao
Gautham Nadig

Brief Description

The Bt. Maize Events which are generated and screened at deregulatory trials at BRL-I stage with a long term objective of achieving environmental release of the transgenic Bt. maize events leading to their commercialization have inbuilt resistance to stem and cob borers viz.,Helicoverpaarmigera, Chilopartellus and Sesamiainferns. Pesticide sprays for these target pests are not required so that farmers will get quality products and further fetch higher returns.

Innovative Element(s)

Genes used in this project are Metahelix owned and designed, codon-optimized for Maize, express specific insecticidal proteins in the events derived, that have been shown to offer durable tolerance across multiple generations to maize stem and cob borers.

Market Potential

In view of the extensive occurrence of SCBs, the products emanating from this project are expected to have a significant market relevance and potential in India.

National/ Societal Relevance

Conventional genetic improvements have resulted in Ltd. control levels of SCBs. The transgenic crop resistant to SCBs will result in reduction in pesticide use and a consequent increase in yield caused by the insect pests have a high relevance

Project Deliverables

Progress vis-a vis objectives

Metahelix has identified Cry1Ac efficacious event resistance to Helicoverpaarmigera and Chilopartellus in *in vitro*.

Technology/Product developed

A total of 107 events were generated and screened in vitro and identified one efficacious event in Cry1Ac construct against Helicorpaarmigera and Chilopartellus. In Cry1Ab, ten events have been generated.

IP generated/Potential for IP generation

Metahelix has complete freedom to file patents on the genes.

Resources Generated

A total of 20 members were employed in the project, besides and 6 contract labourers have been engaged. Necessary equipments were procured.

Plans to take innovation further

Event selection trial needs to be conducted in June 2015 to select one most efficacious in each constructs.

Risks Envisaged

None – as the proposal is for funding of Phase I of deregulation trials which are already well defined and streamlined by Government of India procedures.

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Nirmal Seeds

The Innovation

Development of nutritionally improved mustard (Brassica juncea) Varieties/ hybrids having low erucic acid and low glucosinolate Content using marker assisted selection

Development Stage: Proof of Concept and validtion

Brief Description

Seed yield and oil content has been major targets for genetic improvement of Indian mustard so far. In this proposal, we additionally aim to improve the nutritional quality of the oil and oilcake by developing double low varieties and hybrids (low erucic acid and low glucosinolate content). The product developed in this project will have wider acceptability not only in India but also internationally and will ultimately benefit Indian farmers.

Innovative Element(s)

The proposed work would utilize gene based molecular markers already known to be linked to low erucic acid and glucosinolate content in mustard seeds in a backcross breeding strategy. This variety (ies) would be utilized to develop double low CMS lines to develop double low hybrid varieties.

Market Potential

India holds premiere position in rapeseed-mustard economy of the world. At present the cultivation of canola varieties accounts for less than 1 per cent of the total area under rape-seed and mustard in India. Development of canola quality varieties would therefore, increase its market significantly and enhance the cultivation of the crop.

National/ Societal Relevance

The double low variety is expected to have wider acceptance and increased utility both as edible oil and cattle feed. This would ultimately benefit Indian farmers.

Project Deliverables

Progress vis-a vis objectives

The mustard lines were screened through phenotyping. Marker assisted introgression of loci was carried out to confer double low trait into elite mustard varieties.

Technology/Product developed

Raising of BC3 plants to obtain homozygous lines for low alleles of all four glucosinolate loci and two erucic acid loci and developing haploids from Brassica Anther culture

Resources Generated

Scientists were trained in relevant area of microspore culture and anther culture at various relevant institutes .

Plans to take innovation further

Field trial of the developed Double low NML-100 variety will be conducted in four different states of India.. After confirmation of nutritional enhancement and yield parameter the variety will be released for commercial sale.

Risks Envisaged

The biggest challenge is to combine the double low characteristics with good yielding capability, as some of the loci associated with low glucosinolate content are negatively associated with yield loci.

Innovator Team

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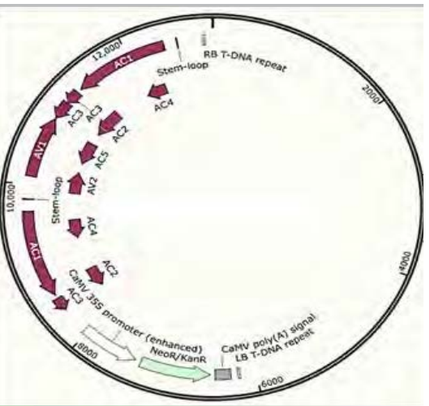

Nirmal Seeds

The Innovation

"Development of Viral resistant okra using RNAi approach".

Development Stage: Validation

Brief Description

Okra crop is being severely affected by viruses with significant yield losses. Currently, no genetic resistance is available against these viruses for Indian conditions in the varieties screened. Development of resistant lines will increase the yield of okra. The proposal will also develop efficient inoculation procedures, which can be independently used for the screening of the available germplasm for resistance genes.

Innovative Element(s)

Several RNAi constructs will be evaluated for resistance. The best combination or individual gene will be used for okra transformation. Infectious clones of geminviruses will be constructed for agro inoculation of okra.

Market Potential

YVMV is the major crop disease in okra resulting heavy yield losses. No strategy is available to control the spread of virus. Development of YVMV resistant okra using RNAi approach is a strategy which will increase the Value of this crop. Genotypes developed in this way will be preferred by the farmers and ultimately increasing cultivation and production of crop.

National/ Societal Relevance

Abelmoschus esculentus (okra) is cultivated throughout the tropical and warm temperate regions of the world for its fibrous fruits or pods containing round, white seeds. Okra is most widely cultivated in India. Okra is affected by yellow vein mosaic virus .YVMV infection at 50 to 65 days after germination results in heavy yield losses of 64 to 49 percent. YVMV resistant genotypes developed using RNAi approach will have wide acceptance and increased utility both as nutritional and medicinal crop. This would ultimately benefit Indian farmers and society.

Project Deliverables

Progress vis-a vis objectives

Identified Gemini viruses of Okra and developed Agro infectious clones. Carried out development of regeneration and transformation protocol for elite line of Okra and standardized regeneration and Transformation protocol for elite line of Okra.

Technology/Product developed

Agro infectious clones and RNAi construct developed.

Resources Generated

Company has developed capabilities in the area of transformation and RNAi technology.

Plans to take innovation further

Method of regeneration and transformation will be developed to transform the most recalcitrant crop okra.

Risks Envisaged

The level of resistance may be low or the inoculation procedure may not be robust for large-scale testing for resistance.

Innovator Team

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Nirmal Seeds

The Innovation

Development of Okra varieties resistant to YVMV using Marker assisted selection

Development Stage: Validtion

Brief Description

The current proposal aims to develop molecular markers linked to YVMV resistance which is the first step towards development of YVMV resistant varieties of Okra using marker assisted breeding.

Innovative Element(s)

Major efforts towards developing YVMV resistant varieties in Okra are being made through a genetic transformation route using virus coat protein or RNAi approach for HIGS. This is because very few sources of YVMV resistance are available in Okra. We propose to use available YVMV resistant lines to develop PCR based markers for application in marker assisted breeding.

Market Potential

Product developed through present proposal will significantly increase okra production in India via saving damages due to YVMV and will meet out market demands and industrial needs.

National/ Societal Relevance

The YVMV resistant genotypes developed using MAS approach could ultimately improve its agronomic value and benefit Indian society and farmers.

Project Deliverables

Progress vis-a vis objectives

Two resistant and two susceptible lines established by using AFLP analysis. Crossing between resistant and susceptible lines and harvesting of F1 hybrids completed.

Technology/Product developed

Molecular markers linked to YVMV resistance in okra lines will be developed which can be used in marker assisted introgression of this trait in other okra varieties.

Resources Generated

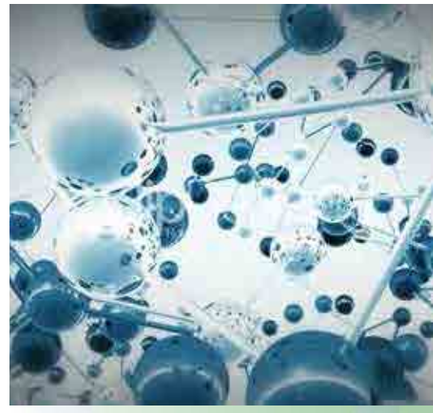
Generated enough manpower strength for marker assisted breeding.

Plans to take innovation further

Identification and validation of markers linked to YVMV resistance will be done and the genotype and phenotype data so generated will be used to identify markers linked to YVMV resistance.

Risks Envisaged

The strategy proposed in this research is very straight forward and the required materials and techniques are already available with the industrial and collaborating partner. However, the okra genome is very large with large number of chromosomes with polyploidy. This could pose some difficulties in linkage mapping



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Collaborator Key Investigators
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Sri Biotechnolgy Laboratories

The Innovation

"Development of Actinomycetes based metabolites as delivery systems for soil health management in Groundnut (ArachishypogaeaL.)".

Development Stage: Validtion

Brief Description

Identification and formulation of actinomycetes strains with potential antifungal abilities against important groundnut soilborne pathogens along with plant growth-promoting activities are the deliverable technologies of this project. The final project outcome would be a sustainable, ecologically safe technology using bio-based actinomycete formulation along with its metabolites for the better management of important soilborne groundnut diseases.

Innovative Element(s)

The project involves identification of elite Streptomyces strains against groundnut soilborne pathogens, their characterization for plant growth-promoting and disease suppressing abilities and identification of the metabolite responsible for disease suppressiveness.

Market Potential

The metabolite based formulation and the developed package will be of immense use in improving groundnut production.

National/ Societal Relevance

Development of an eco-friendly, sustainable bio-based product which enhances soil health by reducing the load of harmful organisms in the groundnut rhizosphere is more important to benefit the groundnut farmers.

Project Deliverables

Progress vis-a vis objectives

The two high efficacy strains of actinomycetes were isolated and used for metabolites extraction. The metabolite was identified as Dibutylphthalate. Fermentation conditions were optimized for large scale production of secondary metabolites from both strains. A powder formulation with whole microbe was developed and its efficacy was tested under greenhouse and field conditions along with their crude metabolites.

Technology/Product developed

The technology is being developed.

IP generated/Potential for IP generation

The partial sequences of two potential strains have been submitted to NCBI gene bank {SBTA 23 (KF551595) and SBTA 32 (KF551596)} and also deposited under Budapest treaty and designated numbers are MTCC 5901 (SBTA 23) and MTCC 5909 (SBTA 32) .

Resources Generated

Manpower training

Plans to take innovation further

The project deliverables such as metabolite based Streptomyces strains will further be screened against major soilborne diseases of groundnut at multi-locations of important groundnut growing regions where these diseases limit its productivity.

Innovator Team

Dr. K R K Reddy,
Dr. Hari Kishan
Dr. K R N Reddy

Collaborating Partner(s)

"International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT)"
Hyderabad

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Sri Biotechnolgy Laboratories

The Innovation

"Control of shoot and fruit borer insect pest(Leucinodes orbonalis)in Brinjal throughRNA interference".

Development Stage: Discovery

Brief Description

Cloning and sequencing of vital genes Chitin Synthase (CHS), Chitinase (CHI), Acetylcholinesterase (AChE) and Cathepsin (CTSL) from an important insect pest of Brinjal (Leucinodes orbonalis). Development of Hair-pin RNAi constructs for these genes and brinjal transform-ations via Agrobacterium-mediated transformation. Generation of brinjal transformants, and subject to them for molecular analysis for transgene integration and expression and testing for insect resistance. The final outcome of the project would be development of transgenic brinjal resistant to shoot and fruit borer insect pest through RNAi technology.

Innovative Element(s)

Cloning of vital genes of target insect pest of Brinjal and development of transgenic Brinjal plants for resistance to shoot and fruit borer insect pest.

Market Potential

The developed insect resistant Brinjal without fruit damage would be of great demand in the market and the farmers can significantly reduce the pesticide sprays..

National/ Societal Relevance

TThe damaged brinjal fruits are unfit for human consumption. Therefore, the developed insect resistant brinjal without fruit damage would be preferred for human consumption. In addition, the farming community would benefit economically due to increased fruit yield and quality. Pesticide residues on the harvest will be reduced heavily.

Project Deliverables

Progress vis-a vis objectives

Cloned vital genes Chitin Synthase (CHS), Chitinase (CHI), Acetylcholinesterase (AChE) and Cathepsin (CTSL) from an important insect pest of Brinjal L. orbonalis. Hair-pin RNAi constructs for these genes were prepared and transformed to Brinjal plants through Agrobacterium-mediated transformations.

Generated handful of putative transgenic brinjal plants with the hair-pin RNAi constructs pMVRhp-LoCHS, pMVR-LoCTSL, pMVRhp-LoAChE&pMVR-LoCH and subjected them molecular analysis for showing transgene integration and expression.

IP generated/Potential for IP generation

The cloned insect genes were deposited in the NCBI data base, and the accession numbers are JX461234 (for CHS gene), JX44553 (for AChE), JQ756160 (for CHI) and KC514167 (for CTSL)

Resources Generated

Recruited project staff and procured instruments/equipment.

Plans to take innovation further

Further will take up to development of insect resistant brinjal and commercialization.

Innovator Team

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Prof. M.V. Rajam
Dr. K. R. N. Reddy

Collaborating Partner(s)

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Tata Chemicals

The Innovation

Inorganic and polymer nano-composites for micronutrient & pesticide delivery: Boosting crop health and yield.

Development Stage: Proof-of-Concept

Brief Description
The company has developed following products in this project: a) Nanotechnology based Zinc micronutrient formulations b) Slow release imidacloprid formulation. They are globally new and cost effective and highly effective. These products help in reducing the environmental burden (reduced dosage), reduced input costs to the farmer and improves the nutritional value of the crops (crop nutrition products).

Innovative Element(s)
The project is centered on using nanotechnology based delivery vehicles to supply micro-nutrients & pesticides for crops so as to boost crop health, quality and yield, reduce/control the amount of pesticides. For this the company has developed two different particle systems: a) Nano-silica based delivery vehicles; b) Inorganic complex based delivery systems.

Market Potential
Micronutrient (India) : 1000 Cr; Microbooster: 280 Cr; Pesticide: 200-400 Cr

National/ Societal Relevance
Nanotechnology being an enabling technology would help to significantly enhance productivity and protect the environment from deteriorated soil health, unbalanced use of fertilizers, use of organic chemicals, toxic pesticides, and ground & drinking water contamination.

Project Deliverables
Progress vis-a vis objectives
Project completed in June 2014.

Technology/Product developed
Nanotechnology based zinc formulation, Inorganic complex based slow release imidacloprid formulation.

IP generated/Potential for IP generation
Nutritional composition for plants and a method of preparation thereof [2461/MUM/2013]. A process for chemical synthesis of hopeite [2135/MUM/2014]]

Resources Generated
Project associates were employed on this project and are now trained in this area. Small equipment was purchased under this project.

Plans to take innovation further
Crop Nutrition: Carrying out multilocation trails and validation of crop response. Commercial launch in selected market and crops and feedback on performance.

Crop Protection: Having additional in-house trials and carrying out regulatory studies. Obtaining Central insecticide board (CIB) approval and having a commercial decision involving Manufacturing, S&M and launch.

Risks Envisaged
No guidelines for nanotechnology based products may lead to delay in getting regulatory approvals

Innovator Team
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Collaborating Partner(s)
Outsourcing partner:
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Xcelris Labs

The Innovation

Development of drought and saline tolerant high biomass yielding Bamboo plants as energy crop

Development Stage: Validation

Brief Description
This proposal embarks upon selection, evaluation and screening of abiotic tolerant variety of bamboo and mass propagating them for commercial use.

Innovative Element(s)
This proposal embarks upon selection, evaluation and screening of abiotic tolerant variety of bamboo and mass propagating them for commercial use.

Market Potential
Using bamboo biomass, one can produce 4000 kcal of energy per kilo of dry biomass. This means that 70 hectares of bamboo farm will be sufficient to generate 5 MW electricity every day, making it green coal. Generating power from bamboo is unique and has not been tried commercially. Successful completion of the project will not only grant a global leadership position but also generate significant employment in remote areas.

National/ Societal Relevance
The development and availability of improved variety of bamboo capable of growing naturally in wasteland will have tremendous impact on the socioeconomic of people in those regions as well as providing a much needed source for energy, paper, pulp and construction industries in addition to offering carbon credits

Project Deliverables
Progress vis-a vis objectives
About 100 germplasm belonging to 10 different bamboo genera has been collected from all over the India and stationed at Modasa farm.

Technology/Product developed
The large number of transcripts or gene expression data generated from the current study will serve as an invaluable genetic resource for crop improvement in Bamboo.

IP generated/Potential for IP generation
Potential is to generate the gene based marker for screening of high yielding and tolerant variety in bamboo

Resources Generated
Xcelris has recruited one qualified and experienced part- time scientist and one full-time Jr. Scientist who are working particularly in Bioinformatics and screening of suitable genotype respectively. Abellon Agrisciences and Abellon Clean Energy have recruited one experienced part-time Scientist and one full-time RA for the propagation of bamboo respectively.

Plans to take innovation further
Large scale cultivation on waste lands to create green cover and biomass for energy production

Risks Envisaged
Government permission to use waste land.

Innovator Team
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Innovation Profiles

Industrial Biotechnology

Anthem Biosciences

The Innovation

Generation of an E. coli K12 strain for extracellular production of industrial enzymes

Development Stage: Discovery

Brief Description
The objective of the proposal was to create a highly efficient production strain of E. coli K12 which can be used for highly efficient secretion of a wide variety of recombinant proteins of industrial and therapeutic importance into the culture medium, facilitating easier purification and reducing costs of process and product.

Innovative Element(s)
This proposal aimed to combine the efficiency of signal peptides and their respective chaperones together with the appropriate E. coli gene deletion mutant which render the bacterial outer membrane leaky. Together, the novel bacterial strain/s will serve as powerful tools for highly efficient production and purification of recombinant proteins.

Market Potential
The expression system thus developed has immediate and significant relevance to large-scale production of biologics, industrial enzymes and other recombinant molecules.

National/ Societal Relevance
The proposed technology would greatly reduce the processing steps as target proteins would be secreted directly into the culture. Protein yields would be further improved upon by deleting the ompT and lon proteases. Thus the technology developed will increase the yield of recombinant proteins from a safe and fermentable micro-organism.

Project Deliverables
Progress vis-a vis objectives
An E. coli expression vectors carrying three different signal peptides belonging to the Sec or Tat pathway and a combination thereof to direct heterologous proteins to the periplasmic space has been generated. E. coli mutants with gene deletions in key proteins that are critical for the maintenance of cell wall integrity for their ability to leak out periplasmic proteins expressed using vectors have been evaluated.

Technology/Product developed
Successfully developed an E. coli K12 strain that can secrete maltogenic amylase into the culture supernatant.

IP generated/Potential for IP generation
Indian Provisional to Complete Patent Application No. 1238/ CHE/2011 Filed on: 8th April 2011 Title: Novel expression and secretion vector systems for heterologous protein production in E. coli Applicant: Anthem Biosciences Private Ltd.

Resources Generated
Four scientists were trained. Equipment such as electrophoresis set up, laminar flow hood, electroporator and thermal cycler were procured.

Innovator Team
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Codon Biosciences

The Innovation

Enzymatic Maceration of Mango Pulp to Produce Quality Wine

Development Stage: Validation (Ready for manufacturing)

Brief Description
A Mango wine has been developed exclusively from Mango juice. The wine has low sugar content and a very characteristic flavour. The product complies with EP/USP/ IP specifications.

Innovative Element(s)
Developed a technology to produce clarified juice and clear wine from viscous mango pulp.

Market Potential
Wine market in India is about Rs. 1000 crore. However, Fruit wine is a new trend in India. It is usually lighter and goes well with Asian spicy food. The product could have Domestic market in metropolitan cities with Export opportunities in Europe, Australia and other Asian countries.

National/ Societal Relevance
There is scope for revenue generation for the Country through the export of this unique product. At the societal level, farmers will get good returns as mangoes will be used to develop value added product

Project Deliverables
Progress vis-a vis objectives
Selection of mango varieties and different commercial enzyme preparations have been completed. Enzyme treatment to produce clear juice from each of the selected variety has also been carried out. Production and physico-chemical characterization of juice is also completed. Standardization of the fermentation process for each of mango variety has been done at 5-10 L. Quality testing of wine and stability studies have also been done.

Technology/Product developed
A Mango wine has been developed.

IP generated/Potential for IP generation
Filed a provisional patent on mango wine

Resources Generated
DSIR recognised R&D laboratory of the company is developed for fruit wine research. Manpower trained in fruit wine research and analysis.

Plans to take innovation further
Company is planning to manufacture this product and launch during up-coming tourist season in Goa

Risks Envisaged
Shortage of raw material for mass production of the wine

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Codon Biosciences

The Innovation

Studies on bioconversion of glycerol, a byproduct of Biodiesel industry, into a economically important 1,3- propanediol, its purification and scaling up.

Development Stage: Proof of concept

Brief Description
The present project deals with development of commercially viable process for bioconversion of glycerol, a byproduct of Biodiesel industry into a economically important 1,3 propandiol and its purification.

Innovative Element(s)
A novel process has been developed using a mutant Enterobacter aerogenes strain for bioconversion of biodiesel waste glycerol into 1,3- propanediol. Mutants of E. aerogenes showed high production of 1,3- propanediol in microaerobic condition. The study resulted in development and standardization of optimum media and conditions for cost effective 1,3 Propanediol production. The bioconversion is about 0.63 mol/mol glycerol to 1,3 Propanediol conversion. The productivity is 1.28 gm/L/h. Finally an aqueous two phase extraction and purification method was developed to provide cost effectiveness to the whole process.

Market Potential
There is a rise in the demand of bio-based products like 1,3- propanediol. The 1,3- PDO market was estimated to be $157 million in 2012 and estimated to be $560 million in 2019. Polytrimethylene terephthalate (PTT) production is the largest application of 1,3- PDO which is utilized in the manufacturing of carpet and textile to cosmetics, personal, and home care industry. At present DuPont Tate & Lyle in U.S and Huamei Biomaterial in China are major producers of 1,3 PDO. Thus, there is a requirement of indigenous production of 1,3 propanediol which could be made available at lower costs.

National/ Societal Relevance
This project and the future development of pilot study would lead to ecofriendly removal of industrial waste and its conversion to industrially important compound. Commercial development would lead to employment generation in the field of Biotechnology research and industry.

Project Deliverables
Progress vis-a vis objectives
The project has been successfully completed.

Technology/Product developed
A technology for 1,3- propanediol from waste glycerol has been developed.

IP generated/Potential for IP generation
The study has led to the development of IPR for both the novel production as well as purification process.

Resources Generated
Manpower has been trained.

Plans to take innovation further
Scale-up and further optimization of purification process is intended.

Risks Envisaged
There might be risks during scale-up studies.

Innovator Team
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Embio Ltd.

The Innovation

Demonstration of conversion of Benzaldehyde to Phenylacetylcarbinol (PAC) with improved efficiency on a scale of 4 KL (Phase –II)

Development Stage: Validation

Brief Description
As an outcome of a DPRDP Program in IIT Powai, genetically modified yeast was obtained with promising industrial significance (PCT/IN2010/000511). The SBIRI project is aimed at establishing techno-commercial feasibility.

Innovative Element(s)
By modification of allosteric site in enzyme of interest (PDC) the synthetic capacity for formation R-PAC has been improved. Reduction in Km value in-vitro, has translated to in-vivo reduced feed stock requirement, leading to reduced effluent load.

Market Potential
Company is already making this product. This is a cutting edge technology. If commercialised, it would consolidate position of the company in this segment in world market. There would be increased throughput per batch and decreased effluent per Kg of product.

National/ Societal Relevance
Leadership of an Indian company in this segment. Reduced environmental impact due to effluent reduction.

Project Deliverables
Progress vis-a vis objectives
Proof of concept achieved at 100 L scale. Utility optimisation and scaleup to be studied.

Technology/Product developed
Genetically engineered enzyme expressed in a suitable host for whole cell biotransformation.

IP generated/Potential for IP generation
PCT/IN2010/000511 in National Phase

Resources Generated
Facility for scale up created as a separate block housing 50L, 1KL, 2KL, 4 KL fermenters and downstream area.

Plans to take innovation further
Possibility of coupling with transamination would be investigated.

Risks Envisaged
Commercial viability is dependent on optimisation of utility costs per Kg of output. This needs to be achieved. Regulatory approvals are needed as the output is an intermediate for API manufacture.

Innovator Team
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GPS Renewables

The Innovation

Biochemical Research & Development to Improve the Efficacy of a Dry, Thermophilic, Anaerobic Reactor

Development Stage: The efforts to increase the efficacy of the system are in progress.

Brief Description

The BioUrja is a high rate biomethanation reactor having a 10 times smaller footprint than conventional biogas plants. It does not require additional water and has two times higher energy productivity. The BIG project focuses on improving the efficacy of the BioUrja system by decreasing the initial bootup and reboot time in case of (potential) breakdowns and proposed to be done by a bacterial consortium.

Innovative Element(s)

The innovative factor is the BioUrja's diagnostics methodology. Every BioUrja has an integrated RMS (Remote Monitoring System) which sends data about the health of the system in an automated fashion to GPS' command centre in Bangalore. The communication channel is bidirectional, enabling the GPS team to keep track of the health and performance of the system at minimal operational cost.

Market Potential

The market for biowaste-to-energy in India is greater than $10 billion which is yet to be tapped.

National/ Societal Relevance

Due to rapid urbanization, there has been an increase in waste generation and dump yards. Thus, a product such as BioUrja will have a very high national and societal relevance.

Project Deliverables

Progress vis-a vis objectives

Functional group cultures have been developed and the final stages of individual strains are in progress

Technology/Product developed

Functional group cultures (including syntrophic acetogenic/methanogenic cultures, fermentation cultures and hydrolysis) have been developed Mixed cultures with focus on propionic acid degradation to enable faster recovery of "upset" anaerobic digestor systems were tested on mini-reactors to identify the pace of recovery.

IP generated/Potential for IP generation

The scope for IP generation is high.

Resources Generated

Two resources have been trained on Anaerobic culturing techniques.

Plans to take innovation further

Further work is being done in improving the cultures with respect to ammonia inhibition. Adoption of annamox process and trace element based intervention strategies to enhance the hydrogenotrophic bacterial process route are being explored.

Risks Envisaged

Cheaper immobilisation techniques are essential for effective adoption of the new cultures in existing biomethanation systems as lyophilisation is expensive.

Innovator Team

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Hi Tech BioSciences

The Innovation

Development of platform technology for nitrilase catalysed biotransformation processes

Development Stage: Proof of concept

Brief Description

The main objective of this project is to develop platform technology for nitrilase catalyzed biotransformation processes for synthesis of chiral compounds.

Innovative Element(s)

Development of platform technology for nitrilase catalysed biotransformation processes for the synthesis of chiral compounds

Market Potential

Nitrilases are being demonstrated on a commercial scale, e.g., conversion of prochiral 3-hydroxy glutaronitrile to (R)-3-hydroxy-4-cyanobutyric acid, an important intermediate of Atorvastatin. The estimated market only for atorvastatin intermediate in 2005 was estimated to be more than 220 tons per year with monetary value of USD 500 Million.

National/ Societal Relevance

Access to a platform technology consisting of a diverse set of improved nitrilases is a pre-requisite for commercial success in biotransformation. This platform will facilitate the development of biotransformation processes for various chiral molecules.

Project Deliverables

Progress vis-a vis objectives

Microbial nitrilase genes with sufficient diversity were selected using bioinformatics approach and were cloned in bacterial expression system. The characteristics of the selected nitrilase enzymes were improved using directed gene site saturation mutagenesis. The mutants were screened by high through put assay which was developed in house. A mutant with high enantioselectivity and substrate tolerance was selected. The biotransformation process using whole cells as a biocatalyst was standardized.

Technology/Product developed

A library of nitrliases with different substrate specificities and improved properties has been created.

IP generated/Potential for IP generation

Research on Nitrilase enzymes with improved properties and Method for one pot nitrilase assay may be pursued for patenting

Resources Generated

Approximately 25 people have been involved in this development project.

Plans to take innovation further

Based on the library that will be generated in this phase, enzyme panels will be created that will help to screen for multiple applications, based on the market requirements.

Innovator Team

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ImTech Chandigarh

The Innovation

Development of a Novel reactor for production of laccase and verification of commercial viability of IMTECH-laccase.

Development Stage: Validation

Brief Description

A process for production of a novel laccase with 15,000 Units L-1 has been developed at IMTECH, Chandigarh. This is a low cost process and overcomes some of the existing difficulties in the production of laccase. The present project seeks to implement the fed batch fermentation, its scale up and techno-economic evaluation for determining the commercial viability of the process.

Innovative Element(s)

Delayed onset of laccase synthesis increases the operational cost of the reactor and the specific yield of enzyme remains low which contributes to the poor productivity of the process making the enzyme expensive. The proposed design of the novel reactor is expected to allow low cost operation of the fed-batch process with precise nutrient and pH control thereby improving the process yield.

Market Potential

Laccase is expensive enzyme and an import commodity. Availability of indigenous process will help to reduce the cost of the enzyme in the domestic market. The export potential for laccase is high as there are very few manufacturers of this enzyme. Textile processing industry including high end enzymatic denim bleaching, bioremediation and fuel cell technology involves use of laccase enzyme.

National/ Societal Relevance

Development of indigenous process for laccase production is expected to lead to the reduction of the cost of laccase in the domestic market thereby making laccase based processes viable. Apart from being an import substitute, indigenous laccase has potential to be exported.

Project Deliverables

Progress vis-a vis objectives

The fermentation parameters for production of laccase have been determined and enzyme is being produced in lab at flask level. The 1st batch of the enzyme produced in lab has been supplied to the collaborator for testing.

Innovator Team

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Lablinks Biotech

The Innovation

Development of methods for large scale growth, characterization and applications of anchorage dependent cell cultures in the torocell disposable bioreactor systems using macrocarrier matrices

Development Stage: The anchorage matrices and SS 316 housing vessels have been developed and are being evaluated to maximise the anchorage surface area.

Brief Description

Lablinks has developed a disposable bioreactor system called TOROCELL which offers substantial advantage over conventional fermenters and also over other existing disposable bioreactor systems. The technology has been perfected to make the system fully automatic with all controls, making it versatile, user friendly and economical.

Innovative Element(s)

The Torocell disposable bioreactor system is a very economical, user friendly and convenient system to grow a variety of cells. Using the Torocell system, anchorage dependent mammalian cell production is a very novel attempt to produce large quantity of cells by maximising the surface area. It has the potential to set the standards for the industry for production of vaccines and metabolites.

Market Potential

The system can be deployed at a short notice and is economical and likely to have a good market potential.

National/ Societal Relevance

It helps to produce the much desired volumes of vaccines in the country at a very economical rate.

Project Deliverables

Progress vis-a vis objectives

The development of the SS 316 vessels and the plastic matrices is now completed. Designs are finalised. Trials are underway with 10L vessels. Trials with 25L vessels still to be done.

Technology/Product developed

Torocell systems with Stainless steel vessels and disposable anchorage matrices for mammalian cell cultures.

IP generated/Potential for IP generation

The patenting of the Torocell system has already been undertaken and is in process. The present study will be patented after generation of sufficient data with all details.

Resources Generated

Full fledged Lab Facility has been created with Company and SBIRI funding with a total project cost of Rs.180 lakhs

Plans to take innovation further

Full scale commercialisation of the process and protocols will be undertaken.

Risks Envisaged

A delay of 6-12 months is expected due to minor problems in procurement of certain consumables.

Innovator Team

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Nagarjuna Fertilizers

The Innovation

Development of Technology Platform for Rare Sugar Production Phase 1

Development Stage: Proof of concept

Brief Description
The current method/process for producing rare sugars is inadequate for commercial exploitation. Under the BIPP scheme, a technology platform developed for production of rare sugars using recombinant enzymes and successfully demonstrated the proof of concept for production of D-psicose, Isomaltulose and Trehalulose.

Innovative Element(s)
Strains developed carrying modified gene sequences for production of recombinant enzymes in heterologous expression system like E. coli and P. pastoris. The recombinant enzymes were produced at higher levels compared to native hosts. Partially purified and/or purified enzymes were immobilized and used for bioconversion of natural sugars into rare sugars.

Market Potential
The consumption of synthetic sweeteners in the world around is $ 28 billion. Non calorie sweetener market in India is around 1000 crores and the market is growing at an average of 20 % per year.

National/ Societal Relevance
Natural sugar substitute as non diabetic, non corcengic for artificial sweeteners. The product has application in agriculture and pharmaceuticals and will add value to sugar industry.

Project Deliverables
Progress vis-a vis objectives
The technology platform developed for production of rare sugars, D-Psicose, Trehalulose and Isomaltulose has now entered phase II for process optimization and scale up as a pre commercialization step.

Technology/Product developed
Recombinant protein based technology platform for the production of Rare Sugar such as Psicose, Isomaltulose and Trehalulose.

IP generated/Potential for IP generation
WO/2013/156940A1,WO/2013/156939A1

Resources Generated

Scientists and technicians were recruited at different levels. Students were trained under BCIL training program. A lab scale production facility was developed for production of rare sugars.

Plans to take innovation further
Under BIPP programme Phase II of the programme intended.

Risks Envisaged
High input and production cost are the major risks. Regulatory approvals will be required.

Innovator Team
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Nagarjuna Fertilizers

The Innovation

Transformational Technology Platform Development for Biological Hydrogen

Development Stage: Proof of Concept/Proof of Value

Brief Description
An end to end technology platform has been developed utilizing renewable raw material (lignocellulosic biomass) for the biological production of hydrogen. The process has been demonstrated in the multi-ton pilot plant facility.

Innovative Element(s)
An indigenous technology has been developed, which consisted of designing and implementation of the facility starting from the lab level to pilot level. The technology involves successful integration of molecular, chemical and electro biochemical tools for producing Hydrogen as a feedstock for various chemicals. Organisms have been engineered to optimize Hydrogen production both in heterotrophic and photohetertrophic fermentation.

Market Potential
Hydrogen being the backbone of both chemical and energy sector, there is no limitation of its demand in the market.

National/ Societal Relevance
Hydrogen whether used for energy or as raw material is at present produced from petrochemical route in India. India imports around 85% of its petrochemicals. Therefore, biological hydrogen production is the vehicle to embark upon hydrogen economy. It will provide some respite from the importing of petrochemicals and may offer several opportunities in the entire value chain of agriculture sector.

Project Deliverables
Progress vis-a vis objectives
Project successfully completed.

Technology/Product developed
The end to end technology platform for the production of biological hydrogen from lignocellulosic raw material successfully completed.

IP generated/Potential for IP generation
A strong Patent (Approved / filed) portfolio of international patents (over 12 PCT applications and over 56 country filing) encompassing all the modules of the platform technology.

Resources Generated
Scientists and technicians were recruited at different levels. Students were trained under BCIL training program. Pilot plant facility was developed for production of Biological Hydrogen.

Plans to take innovation further
The company intends to build semi commercial demonstration plant for biological hydrogen production.

Risks Envisaged
Complete end to end integrated technology not available. Continuous availability and high cost of raw materials is another problem. Technology available is not optimized for maximum product rate and yield.

Innovator Team
Dr. Banibrata Pandey (PI)
Dr. Samir Kumar Roy
Dr. Sarvanakumar Iyyappan
Mr. Samuel Sudhakaran
Mr. Suresh Naik.

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Orbit Biotech

The Innovation

Development of reuterin based biopreservative as an alternative to harmful sodium nitrite & sodium nitrate based chemical preservatives; for use in packaged meat food products.

Development Stage: Proof of concept

Brief Description
The technology uses the bacteriocin based approach to develop a reuterin based biopreservative released by Lactobacillus reuteri which can be used as an alternative to the sodium nitrite and sodium nitrate based harmful chemical preservatives for the food industry, especially by the industry dealing in packaged meat food products.

Innovative Element(s)
The innovative element is the production and the extraction of reuterin from a GRAS status microorganism.

Market Potential
The product holds huge potential in domestic as well as in the international market. The demand is very high from export point of view.

National/ Societal Relevance
The project would lead to the development of a biopreservative that would help decrease the dependency of the food industry on chemical based preservatives that have harmful effects on human beings.

Project Deliverables
Progress vis-a vis objectives
116sRNA based identification has been done for the two isolates from L. reuteri obtained from infant fecal samples. Antimicrobial activity analysis has been done against several species of Staphylococcus, Pseudomonas, Salmonella, Bacillus, Escherichia coli and Candida albicans.

Technology/Product developed
The project is currently in its infancy stage.

IP generated/Potential for IP generation
After the completion of the project patent will be filed.

Resources Generated
Currently two scientific officers are working along with the project investigator of the research project. A facility for bacterial identification has been created using SBIRI support.

Plans to take innovation further
The company plans to take the project to the next level of production of the preservative.

Risks Envisaged
The roadblocks to the next level is to get the preservative approved by the FSSAI and other international bodies for its usage in the food products. Also work needs to be done on optimizing the production levels of the preservative.

Innovator Team
Mr. Nitin Sharma (PI)

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Oriental Aquamarine Biotech

The Innovation

Nitrifying Bioreactor Technology for the establishment of Recirculating Aquaculture Systems.

Development Stage: Commercialization

Brief Description
Nitrifying Bioreactors are self-sustaining systems that remove ammonia and nitrites generated in Aquaculture tanks and help maintain reef quality oligotrophic conditions in aquaculture systems. They have been developed and validated in field conditions and are available as Packed Bed Bioreactor and Stringed Bed Suspended Bioreactor to handle 500 L of water.

Innovative Element(s)
The Nitrifying Bioreactors are activated with a specific Nitrifying Bacterial Consortium. This consortium is available at three different salinity levels which ensures quick start-up at the site. The system can be used in freshwater, Marine and Brackish Water Aquaculture Systems.

Market Potential
The global market for fisheries and aquaculture is pegged at 123 million tons. Aquaculture contributes to over 60% of the world's demand for fish. Asia-Pacific region is the leading global region for Aquaculture and Fisheries.

National/ Societal Relevance
An indigenous technology could be brought out which would help the aquaculture industry to attain stability and sustainability.

Project Deliverables
Progress vis-a vis objectives
The project has progressed satisfactorily and all objectives have been accomplished.

Technology/Product developed
Two types of reactors namely Packed Bed Bioreactor and Stringed Bed Suspended Bioreactor have been developed

IP generated/Potential for IP generation
The technology has been patented in India (Patent no. 241648) and the PCT application (WO 02/30835 A1) has entered the national phase entries.

Resources Generated

A unit has been established. The SBSBR has been deployed in 50 locations. The PBBR is working successfully in Tamil Nadu, Kerala and Odisha.

Plans to take innovation further
The company proposes to scale up its operations in India and other countries.

Risks Envisaged
Diligently following the system protocol and proper maintenance of the reactors to ensure that they operate efficiently.

Innovator Team
Mohan Kandaswamy,
Prof. (Dr.) I. S. Bright Singh

Collaborating Partner(s)
National Centre for Aquatic Animal Health, Cochin University of Science and Technology, Kochi (Academia)

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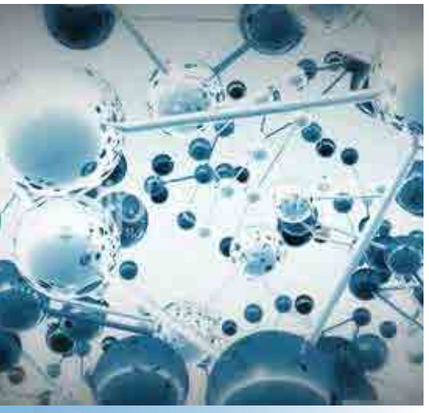

Sathyavrathan P-IKP

The Innovation

Metabolic engineering of Pseudomonas putida for 3-Hydroxypropionic acid production

Development Stage Proof-of-Concept

Brief Description

3-hydroxypropionic acid (3-HP) is one of the platform C3 green chemicals. In this work, metabolic engineering and bio-process engineering aspects were used to make use of a genetically modified Pseudomonas putida to produce 3-HP. Primarily, redox circuits of 3-HP producing pathway(s) are engineered in a novel manner.

Innovative Element(s)

The proposal involves synchronized operation of two different pathways leading to same product and utilization of metabolic features of P. putida.

Market Potential

The product has a high market potential. In a few simpler chemical steps, 3-HP can be converted to acrylic acid (for applications in paints and plastics), 1,3-propanediol (for textiles), acrylamide (for latex), propionitrile (for pharmaceuticals) and reuterin (for food and health care). Generalized market demand is around 2-3 billion pounds/year.

National/ Societal Relevance

A developing nation like India should have robust platform technologies to meet out the demand for various raw materials. For instance, the latest infrastructural development in our country has resulted in a huge demand for acrylic acid in painting and plastic industries. On the other side, the growing nano-medicines among the pharmaceuticals suffer from lack of raw material supply for various drug delivery applications. All such needs cannot be solved by means of importing activities or else by extraction from unsustainable fossil fuel derivatives as our economy currently does. One approach is to focus on indigenous production of "building block chemicals" like 3-HP amenable for diverse applications.

Project Deliverables

Progress vis-a vis objectives

P.putida strains having high yields of 3HP are being developed and metabolic flux analysis for maximising the production are under progress.

Plans to take innovation further

Complete synchronization of pathways under investigation requires synthetic biology tools. After the proof of concept, company envisages for the same through further funding sources.

Risks Envisaged

Varying 3HP yields and high cost of production

Innovator Team

P. Sathyavrathan (PI);
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String Bio

The Innovation

Economical Process for conversion of Waste to Green chemicals

Development Stage Proof of concept

Brief Description

Worldwide waste generation is increasing faster than rates of urbanization. String is developing a fermentation based process to convert waste into green chemicals and creating diversified products as well as higher value returns from waste in the process. The core technology enabled in this process is the conversion of methane to chemicals having global applications.

Innovative Element(s)

The solution enables a novel cradle-to-cradle solution for managing waste, a novel synthetic biology platform for engineering organisms for C1 metabolism and a green and sustainable source for petro-chemicals.

Market Potential

The initial targets are chemicals with an existing global market of ~$15 billion. The target market has been growing at a CAGR of 18% over the last 3 years with growth in both existing and novel applications.

National/ Societal Relevance

The technology might create higher value and diversified revenue opportunities from waste thus offsetting some of the waste management expenses for municipalities. It creates a true cradle-to-cradle solution for waste management. It will result in a positive impact on the overall quality of life, especially in fast growing urban centers.

Project Deliverables

Progress vis-a vis objectives

The project is in early stages of implementation

Technology/Product developed

In progress.

IP generated/Potential for IP generation

In progress.

Resources Generated

In progress.

Plans to take innovation further

Plan is to implement the demo scale process within 18 months. The initial demo of the process will be done using methane generated from waste sources. In parallel, the testing of the process on methane generated from other sources will also be pursued.

Risks Envisaged

One of the biggest risks of the project is economical scaling up of gas based fermentation process. There are very few companies worldwide that have successfully scaled up industrial processes with gaseous substrate. We are pro-actively working to mitigate this risk in partnership with our academic collaborators and a varied advisory board with broad experience in engineering and scale up.

Innovator Team

Ezhil Subbian (PI); Chetan Kurthukoti, Sowrabha BJ, Naga Sairam

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Sukhada Mohandas – C-CAMP

The Innovation

Up-scaling Banana Micropropagation by using Bioreactors.

Development Stage: Proof of Concept

Brief Description
The conventional micropropagation technology is slow and not efficient. Development of scaled-up liquid cultures in bioreactors in automated systems is the need of the hour. In comparison with conventional micropropagation on semi-solid medium, the bioreactors provide a superior mass balance, higher proliferation rate, improved labor efficiency and as a consequence, the cost is reduced. The proposal involves development of a technology for multiplication of banana cvs Neypoovan (AB group) and Rasthali (AAB group) using embryogenic cell suspensions which can be scaled–up using bioreactors to produce large number of planting material.

Innovative Element(s)
The conventional method of plant multiplication is time consuming and requires intensive labor and quite often limits commercial application. Bioreactors 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 Bioreactors also include low cost production and reliable safety of the product. Cost of the Elakki banana planting material per plant is around Rs 22/- which can be brought down to Rs 5.

Market Potential
Potential is very high as tissue culture companies would take up the product.

National/ Societal Relevance
This strategy can be applied for the commercialization of other fruit crops and to make large quantities of material available for planting which will result in higher production.

Project Deliverables
Progress vis-a vis objectives
Induction and multiplication of cell lines in twin flask systems are under process.

Technology/Product developed
The technology will be developed in 10-12 months.

IP generated/Potential for IP generation
There is high potential for IP generation

Resources Generated
Facility for bioreactor multiplication of banana will be created. Trained manpower will be available in the process. Enterprise will be created in the long run.

Plans to take innovation further
The technology will be commercialised.

Risks Envisaged
Higher rate of somaclonal variations are speculated in the plant population derived through cell culture. This problem can be overcome by cutting down the number of cycles of multiplication.

Innovator Team
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Swayambhu Biologics

The Innovation

Bioremediation for Agro Industrial Solid Wastes by ARBIT for Effective Management through Energy and Biomanure conversions

Development Stage: Validation

Brief Description
ARBIT (Accelerated Rapid Biological Intervention Technology) converts sugarcane waste pressmud into humus rich organic manure in 14days. Composting will enhance better soil amendment with right pH and C:N ratio achieved through biological interventions with better acceptance.

Spent ash generated during incineration of Spent wash is rich in potash and enrichment of spent ash increases the potash content present and this can be achieved through ARBIT technology.

Innovative Element(s)
ARBIT can degrade and decompose coirpith in 27 days and C:N ratio achieved is 35:1. ARBIT technology is also used for effective management of spent wash through microbial intervention.

Market Potential
220% (out of 300 facilities) of the distillery industry in India having spent wash disposal problem with each having around 3000 tonnes of wastes generated annually are potential clients for this technology. More than 50 units in Tamil Nadu are expected to be covered with this technology for coirpith composition.

National/ Societal Relevance
This technology converts agro wastes from sugar, paper and pulp industries into bio-manure which addresses industrial, agricultural, social and environmental issues and thus has high societal relevance.

Project Deliverables
Progress vis-a vis objectives
Media and methods were standardized.

Technology/Product developed
ARBIT to process pressmud and spent wash with no chemicals or synthetic compounds of any trace.

IP generated/Potential for IP generation
The company has filed Indian Patent with Application No. 5117/CHE/2012 and 2221/CHE/2014.

Resources Generated
Trained one person for carrying out the field work at site. The technology won Sankalp award 2014 under Agriculture, Food and Livelihood segment and also won Sankalp grand jury award across all segments. Won cash price of 17 lakhs.

Plans to take innovation further
To scale-up and commercialization after standardization.

Risks Envisaged
Coirpith process units are in unorganized sectors and bringing them towards the technology and acceptance is a challenge. Propagation of technology takes time.

Innovator Team
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Varuna Biocell

The Innovation

Indigenous Production of Dextranase using SSF technique – Phase II

Development Stage Proof of concept

Brief Description
Dextranase developed by Varuna under SBIRI support Phase I has been standardized and activity of 30000 du/gm has been achieved. Varuna Dextranase (Branded as Dextrasol) achieved 51% average reduction in Cane sugar production process

Innovative Element(s)
Production of Dextranase using solid state fermentation has not been done before. Moreover, this is the first indigenous production of Dextranase in the country.

Market Potential
Potential use of Dextranase in cane sugar production 2013-14 is 1185 ton in India based on estimated 237 million ton crushing @ dose of 5 gm per ton of cane crushed. Export potential of Dextranase is in Brazil, Thailand, Vietnam, East Africa is significant.

National/ Societal Relevance
The company intends to grab 10% of cane sugar production in India within 3 years which will help our nation to save US$ 4.00 million. Application of Dextrasol from Varuna will support sugar industry about Rs 10 crores by import substitution.

Project Deliverables
Progress vis-a vis objectives

Team Varuna has successfully achieved objectives of Dextranase production using SSF Phase I and have moved to Phase II for commercialization. Based on pilot scale production, the company has created customers in India and by August 2014 will be ready with commissioned plant to serve sugar season 2014-15.

Technology/Product developed
The product has already been developed in laboratory scale and many commercial trials have been done in sugar industries with good response.

IP generated/Potential for IP generation
The technology of production is unique and has potential for IP generation. We have deposited our culture in MTCC for purpose of patent procedure.

Resources Generated
Technical manpower employed/ trained for trials in different sugar industry.

Plans to take innovation further
TeamVaruna is working on purified Dextranase for application in dental plaque removal.

Risks Envisaged
Competition from China and Japan (Amano). Varuna Biocell envisages core advantage for their product.

Innovator Team

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Way Forward

The interface of BIRAC with industry, academia and other stakeholders is critical for identification of gaps that exist and fashioning solutions that can bridge the gaps.

BIRAC would continue to develop multi-prong strategies to play even a greater catalytic role in the ecosystem building upon platforms that already are in existence. These strategies will be an optimal mix of programmes containing kickstarting more transitions of ideas to proof-of-concept, support during the product development cycle including scale up and commercialisation.

An important element of the future strategy will be 'directed innovation research' that are focused and which would be instituted by identifying a critical area of national need that need urgent attention. In this regard, BIRAC has already put in the works a special call on Human Papillomavirus (HPV) through BIPP. BIRAC hopes to pull all 'directed innovation research' under the bigger umbrella of RAPID (Research Alliance for Product Innovation and Development).

Future 'directed innovation research' are being planned in the areas of 'waste to energy' and 'm-health' that would quickly identify gaps through stakeholder consultations and lay a primer for a focussed approach. Consultations on m-health have been conducted through six stakeholder meetings.

Another important step that BIRAC has taken is to initiate 'National Biopharmaceutical Accelerator Program' for accelerating research in biopharmaceuticals. This has emerged through focussed consultations that were conducted during July and December 2013 and an extensive landscaping exercise about the current situation in discovery of novel biopharmaceuticals to scale up and manufacturing. Biomanufacturing is critical to the needs of the country especially in terms of meeting local and global demands as well as its spill over on job creation and high quality biomanufacturing skilling of scientific human resources. BIRAC realises that India needs to build upon its strength in manufacturing in pharma generics and vaccines and put in place a roadmap for biopharmaceutical manufacturing. Similar such consultations are being planned for other areas of 'directed innovation research'.

Another important area for BIRAC is helping to scale up bio-entrepreneurship. Indian bioeconomy would be built upon the foundation of numerous biotech start ups who would be nimble, agile and bring in novel products and services. In this regard, BIRAC has already taken steps such as establishment of Biotech Ignition Grant (BIG) and more recently the Social Innovation programme called SPARSH which has a fellowship component. There is a greater realisation within the biotech community regarding the importance of focused mentorship that can help accelerate nascent biotech start ups. BIRAC is therefore envisaging designing and implementing a 'biotech start-up accelerator' programme in the near future. BIRAC is also planning to linking global players with national organisations such that Indian biotech organisations become globally competitive.

BIRAC values its partnerships immensely especially with Bill & Melinda Gates Foundation, Wellcome Trust, CEFIPRA, BIG partners, SIIP partners, CDSA, USAID and many others and it would continue to deepen its engagement with current partners as well seek new partnerships.

BIRAC looks to the future of Indian biotechnology with optimism and would continue to infuse dynamism into bio-innovation to establish an Indian bioeconomy.

Annexure

Companies Funded Under BIRAC Funding Schemes

Small Business Innovation Research Initiative (SBIRI)

S.No.	Title	Company	Collaborator(s) if any
1	Process research for commercial production of docosahexaenoic acid (DHA) from Schizochytrium by submerged fermentation (Phase-II)	ABL Biotechnologies Ltd., Chennai	Nil
2	Sustained delivery of MSP36 (Phase - II)	Actis Biologics Private Ltd., Mumbai	Nil
3	Identification of DNA markers linked to elite traits in micro-propagated banana plants (Phase I)	Aditya Biotech Lab and Research Pvt. Ltd., Raipur	Nil
4	Marker assisted introgression of yellow vein mosaic virus (YVMV) resistance trait in high yielding varieties of okra. (Phase-I)	Aditya Biotech Lab and Research Pvt. Ltd., Raipur	Nil
5	Pre-clinical studies of Human mesenchymal stem cells (MSCs) isolated and characterized from different sources in autoimmune disease, namely rheumatoid arthritis (RA) and type 1 diabetes (TIDM) (Phase – I)	Advanced Neuro-Science Allies Pvt. Ltd, Bangalore	Vittal Mallya Scientific Research Foundation, Bangalore
6	A computer assisted tool for identification of abnormality in retinal images: A Telemedicine Solution" (Phase-I)	Advenio TecnoSys Pvt. Ltd., Karnal	
7	Development of diagnostic tools for GMO testing and agriculture disease diagnostics (Phase I)	Amar Immunodiagnostics Pvt. Ltd., Hyderabad	Nil
8	Generation of an E. coli K 12 strain for extracellular production of industrial enzymes (Phase- I)	Anthem Biosciences Pvt. Ltd., Bangalore	Nil
9	Product development, regulatory toxicology and pharmacology and Phase 1 human clinical trial of three recombinant therapeutic proteins (Phase – I & II)	ARA HealthCare Pvt. Ltd., Gurgaon	Nil
10	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 (Phase – I)	Arbro Pharmaceuticals Ltd., New Delhi	LSR Institute of TB and Respiratory Diseases, New Delhi and AIIMS, New Delhi
11	Development of improved PCR kits with internal control for shrimp viruses WSSV, YHV, TSV and IHHNV	Aristogene Biosciences Pvt Ltd, Bangalore	Bangalore University, Bangalore
12	Detailed chemical profiling and pre-clinical evaluation of a us-patented antidiabetic plant extract (Phase-I& II)	Arjuna Natural Extracts Ltd., Aluva	Nil

S.No.	Title	Company	Collaborator(s) if any
13	Cloning and Expression of Recombinant Lipase enzyme (Phase – I)	Aumgene Biosciences Pvt. Ltd., Surat	Nil
14	Scale-up & commercialization of technology for production of recombinant lipase enzyme	Aumgene Biosciences Pvt. Ltd., Surat	
15	Detection of A1 and A2 β casein variants in cows and development of high throughput genotype screening technology (Phase I)	Auroprobe Laboratories, New Delhi	Maharshi Dayanand Gosamwardhan Kendra, Ghaziabad
16	Hepatocyte-like cells generated from human embryonic stem cells (hESC) for hepatotoxicity screening of xenobiotics in the drug discovery process (Phase –I)	Avesthagen Ltd., Bangalore	Nil
17	Scale-up and evaluation of high-value biosimilar product (Etanercept) aimed at providing cost-effective healthcare solutions to the emerging markets (Phase – II)	Avesthagen Ltd., Bangalore	Nil
18	Development of platform technology for adherent cells on microcarriers (Phase I)	Bangalore Biotech Labs Pvt. Ltd., Bangalore	Nil
19	Genetically modified vegetable crops for insect pest and disease resistance (Phase – I)"	Bejo Sheetal Seeds Pvt. Ltd., Jalna	Nil
20	Development of Dual Resistance in Tomato against virus infection & insect damage (Phase I)	Bejo Sheetal Seeds Pvt. Ltd., Jalna	Indian Agricultural Research Institute, New Delhi
21	Development and standardization of manufacturing and testing methodologies for human neonatal rotavirus vaccine candidate (Phase - II)	Bharat Biotech International Ltd., Hyderabad	All India Institute of Medical Science, New Delhi
22	"Expression of recombinant proteins for development for synthetic pulmonary surfactant for respiratory distress syndrome (Phase-I)"	Bharat Serums and Vaccines Ltd., Mumbai	Nil
23	Clinical development process development and scale-up of a commercially viable manufacturing process of recombinant Follicle Stimulating Hormone (FSH) expressed in recombinant Chinese Hamster Ovary (CHO) cell-line (Phase-II)	Bharat Serums and Vaccines Ltd., Mumbai	Nil
24	Processes for manufactue of (S)-3-hydroxybutyrolactone from biomass and (S)-4-hydroxy-2-pyrrolidinone therefrom (Phase-I)"	Bharavi Laboratories (P) LTd., Bangalore	Nil
25	HRP-II/p-LDH based diagnostic kits for the differential detection of malarial parasites	Bhat Biotech India (P) Ltd., Bangalore	Nil
26	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 (P) Ltd., Bangalore	Manipal Life Sciences Centre, Manipal University, Manipal

S.No.	Title	Company	Collaborator(s) if any
27	Development of MEMS based sensor for neutrophil gelatinase-associated lipocalin (NGAL) for diagnosis of acute kidney injury (AKI)	Bigtec Private Ltd., Bangalore	Nil
28	Development of L-arginine production process with novel genetically engineered E.coli strains" (Phase-I)	Bionary Bioproducts private Ltd., Hyderabad	Nil
29	Deuterium labeling of molecules for drug discovery and clinical research (Phase-I)	Bioorganics and Applied Materials Pvt Ltd., Bangalore	Nil
30	Development of drought tolerant genotypes of rice, corn and cotton through genetic engineering (Phase - I)	Bioseed Research India Ltd., Hyderabad	Shriram Bioseed Genetics India Ltd., Hyderabad and International Centre for Genetic Engineering and Biotechnology, New Delhi
31	Development of transgenic salinity tolerant rice hybrids (Phase - II)	Bioseed Research India Ltd., Hyderabad	Shriram Bioseed Genetics India Ltd., Hyderabad and International Centre for Genetic Engineering and Biotechnology, New Delhi and International Centre for Genetic Engineering and Biotechnology, New Delhi
32	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 & Biopharma Pvt. Ltd. Gwalior	Jiwaji University, Gwalior
33	Development of Mycobacterium w as an adjuvant for anti – rabies vaccine (Phase – I)	Cadila Pharmaceuticals Ltd., Ahmedabad	Nil
34	An Innovative, High-End, Palm Sized, Single Lead ECG Display Device for Ambulatory and Long term rhythm monitoring and On-The-Go Applications	Cardea Biomedical Technologies Pvt. Ltd., Delhi	AIIMS, New Delhi
35	Apoptosis – inducing human – origin Fce – based chimeric proteins for targeted elimination of mast cells and basophils: a new approach for allergy and asthma treatment (Phase-I)	Century Pharmaceuticals Ltd., Vadodara	Nil
36	Development of cost effective process for the production of bi-functional cellulase with endoglucanase and β-glucosidase activities from Streptomyces species	Codon Biosciences Pvt. Ltd., Goa	Nil
37	Studies on bioconversion of glycerol, a byproduct of Biodiesel industry, into economically important 1,3 propandiol, its purification and scaling up (Phase-I)	Codon Biotech Pvt Ltd., Noida	Nil
38	Development of automated bio-instruments viz. automated dispensing system and automated cell counter	Customised Technologies (P) Ltd., Bangalore.	Nil
39	Production of virus free garlic through tissue culture (Phase I)	Devleela Biotechs, Raipur	Indian Agricultural Research Institute, New Delhi

S.No.	Title	Company	Collaborator(s) if any
40	Demonstration of conversion of Benzaldehyde to Phenylacetylcarbinol (PAC) with improved efficiency on scale of 4 KL (Phase-II)	Embio Ltd., Mumbai	Nil
41	Expression of Peptidyl Amidase and Aprotinin in Baculoviral Systems and Development of Silkworm as a Bioreactor (Phase I)	Enzene Biosciences Pvt Ltd., Bangalore	Nil
42	Proposal for Low Cost Blower / BLDC Motor ICU Ventilator	Erkadi Systems, Bangalore	Nil
43	Novel tissue engineering and three dimensional cell culture technology (Phase-I)"	Excel Matrix Biological Device Pvt. Ltd., Hyderabad	National Institute of Immunology, New Delhi
44	Tissue engineering of homologous natural biomaterial for clinical use (Phase-I)	Frontier Lifeline Private Ltd., Chennai	Nil
45	Development of Bacterial leaf Blight resistant Rice Hybrids through molecular marker assisted breeding. (Phase I)	Ganga Kaveri Seeds Pvt. Ltd., Hyderabad	Nil
46	Development of blast resistant rice hybrid (GK 5017) and rice variety (GK46) through Molecular Marker Assisted Breeding	Ganga Kaveri Seeds Pvt. Ltd., Hyderabad	Nil
47	Developing sensitive, inexpensive and hand-held diagnostic point of care (POC) instrumentation to detect malaria and other pathogens	Genomix Molecular Diagnostics(P) Ltd., Hyderabad	National Institute of Malaria Research Field Station, Jabalpur & Osmania University, Hyderabad & National Institute of Malaria Research, New Delhi & Birla Institute of Technology & Science, Pilani
48	Development of F1 hybrid Tomato with high shelf life	GEO Biotechnologies India Pvt. Ltd., Bangalore	University of Agricultural Sciences, Bangalore
49	Generation, evaluation and regulatory appraisal of selected transgenic events for enhanced tolerance against lepidopteran insect pests in cotton, rice and brinjal. (Phase I and Phase II)	Global Transgenes Ltd., Aurangabad	Nil
50	Commercial scale extraction unit to produce 0-calorie natural sweetener from stevia leaves (Phase II)	GVS Biotech Pvt. Ltd., Banga, Punjab	Nil
51	Silk protein blend film development and commercialization for burn wound management (Phase-I)	Healthline Private Ltd., Bangalore	Nil
52	Silk protein blend film for wound management- Standardization of production process, clinical evaluations, value enhancement and concept establishment	Healthline Private Ltd., Bangalore	Nil
53	Developing face mask for cosmaceutical application using sericin and other natural bio-active agent on non-woven silk sheet	Healthline Private Ltd., Bangalore	Nil

S.No.	Title	Company	Collaborator(s) if any
54	Development of Silk Protein based cryopreservation medium for bovine sperm to sustain viability and motility to enhance success rate of artificial insemination	Healthline Private Ltd., Bangalore	
55	Development of platform technology for nitrilase catalyzed biotransformation processes (Phase I)	Hi Tech BioSciences India Ltd., Pune	Indian Institute of Technology, Mumbai
56	Development and Scale-up of novel biopesticides based on M. anisopliae for control of Helicoverpa armigera (Phase I)	Hi Tech BioSciences India Ltd., Pune	National Chemical Laboratory, Pune
57	PROVE IT : Promoting Rural Opportunities by value additions through extraction intervention technologies to Agri/Horti Crops- Lycopene from tomato (Phase-II)	Hydrolina Biotech Private Ltd., Chennai	Nil
58	Conversion of lactose and glucose based feedstocks to Butanol-feasibility study (Phase-I)	I Cube Nanotec India Pvt. Ltd., Noida	Institute of Microbial Technology (IMTECH), Chandigarh
59	Risk based process design for large scale manufacturing of male injectable contraceptive	IcubedG Ideas Private Ltd., New Delhi	Nil
60	Nanotechnology based delivery of peptide inhibitors for the treatment of Osteoporosis (Phase-I)	Imgenex India Pvt. Ltd., Bhubaneswar	Institute of Life Sciences, Bhubaseswar
61	Generation of induced pluripotent stem (iPS) cells from adult somatic cells using non-genomic protein transduction method (Phase –I)	Imgenex India Pvt. Ltd., Bhubaneswar	Nil
62	Discovery and Development of Novel, Selective and Potent Dihydroorotate Dehydrogenase Inhibitors in Inflammatory Bowel diseases (Phase I)	Incozen Therapeutics Pvt. Ltd., Hyderabad	Nil
63	Large scale production of curcumin-piperoyl conjugate (Phase-I)	India Pesticides Ltd., Lucknow	Nil
64	Generation of prototype lateral flow assay kit using antigen specific hybridomas to develop rapid diagnostic test for clinical diagnosis of malaria	Indian Immunologicals Ltd., Hyderabad	Indian Institute of Science, Bangalore
65	Utilization of marker assisted selection for development of salt tolerant hybrids in rice (Oryza sativa) (Phase- I)	Indo American Hybrid Seeds(india) Pvt. Ltd., Bangalore	Nil
66	Marker assisted gene pyramiding of blast and bacterial blight resistance genes into CMS & maintainer lines of rice	Indo American Hybrid Seeds(india) Pvt. Ltd., Bangalore	
67	Development of cell associated serotype 1 Marek's Disease vaccine of Poultry from an indigenous field isolate (Phase I)	Indovax Pvt. Ltd., Gurgaon	Nil
68	Development of Antibody-Platinum Conjugates for the Therapy of EGFR-overexpressing Tumors (Phase I)	Invictus Oncology Pvt. Ltd., New Delhi	Nil

S.No.	Title	Company	Collaborator(s) if any
69	Scale up and optimization of the process for production of Pneumocandin B0 by aerobic fermentation of Glarea lozoyensis	JC Biotech Private Ltd., Hyderabad	Nil
70	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., Bangalore	IISc., Bangalore
71	Evaluation of potential antagonistic microorganisms for the management of sheath blight of rice (Phase - I)	Juan Biotechnology Private Ltd., Bhubaneswar	Nil
72	Fermentation technology for entomopathogenic nematode (EPN) production, (Phase-I)	KN Biosciences (India) Pvt. Ltd., Hyderabad	Nil
73	Development of transgenic bhendi resistant to yellow vein mosaic virus (Phase–I)	Krishidhan Seeds Private Ltd., Jalna	Jawaharlal Nehru University, New Delhi
74	Development of commercially viable micropropogation protocols in potato	La Chandra Biosciences Pvt. Ltd., Ahmedabad, Gujarat	
75	Micropropagation of Jatropha curcas L. for sustainable and enhanced production of biodiesel (Phase-II)	Labland Biotech Pvt. Ltd., Mysore	Nil
76	Development of methods for large scale growth, characterization and applications of suspension and anchorage dependent cell cultures in the torocell disposable bioreactor systems (Phase I)	Lablinks Biotech Pvt.Ltd., Bangalore	Nil
77	Development of curcumin as high value phyto-pharmaceutical for treating cataract (Phase – II)	Laila Impex, Vijayawada	Nil
78	Computational design & development of inhibitors for the treatment of tuberculosis (Phase I)	LeadInvent Technologies Pvt. Ltd., New Delhi	All India Institute of Medical Science, New Delhi
79	Study, design and development of Hit Molecules for cancer targets (Phase I)	LeadInvent Technologies Pvt. Ltd., New Delhi	Indian Institute of Technology, Madras, Chennai
80	Development of affordable, toxicity free Amphotericin B loaded liposomal preparation for treatment of Kala-azar: A Pre-Proof of Concept (Phase – I)	Lifecare Innovations Pvt. Ltd., Gurgaon	Nil
81	Evaluation of transgenic cotton containing antisense AV2 gene for resistance to cotton leaf curl disease (Phase - I)	Maharashtra Hybrid seeds company Ltd., Jalna	Indian Institute of Science, Bangalore
82	Development of a cost effective process for phytase production and its application studies (Phase-I)"	Maps Enzymes Ltd., Ahmedabad	RRL Trivandrum
83	Commercial production of monoclonal antibodies, as an import substitute, with special reference to red blood cell phenotyping (Phase-II)	Mediclone Biotech Pvt. Ltd., Chennai	Nil

S.No.	Title	Company	Collaborator(s) if any
84	Development of an alternate technology to Anti Snake Venom Serum (ASVS) using monoclonal F(ab)2 cocktail (Phase – I)"	Mediclone Biotech Pvt. Ltd., Chennai	Nil
85	Design, development and clinical evaluation of implantable drug eluting cardiac pacing leads	MediVed Innovations Pvt. Ltd., Bangalore	Nil
86	Development, industrial manufacture and marketing of selected probiotic tablets containing Lactobacillus strain(s) along with polyherbal microbicide for relieving vaginosis/vaginitis and replenishment of probiotic Lactobacilli strains (Phase II)	Microbax (India) Ltd., Hyderabad in collaboration with Talwar Research Foundation (TRF), New Delhi	Nil
87	Pet animal food, fish leather and other marine biotechnology products from fish waste (Phase I)	Millennium Exports, Chennai	Aquaculture Foundation of India, Chennai
88	Enhancing the effectiveness of nucleopolyhedro-viruses of Helicoverpa armigera (HaNPV) and Spodoptera litura (SINPV) through incorporation of enhancing inclusion proteins and sun-light UV protectants in commercially produced HaNPV (Helimar) and SINPV (Spodomar) (Phase-I)	Multiplex Biot-Tech Pvt. Ltd., Bangalore	Nil
89	Synthesis of novel molecular drugs through biopolymerization of active principles from medicinal plants using the laccase enzyme (Phase – I)	Myko Tech Private Ltd., Goa	Asthagiri Herbal Research Foundation, Chennai
90	Development of a platform for production of complex peptides and proteins (Phase-I)"	Navya Biologicals Pvt Ltd, Hubli, Karnataka	Nil
91	Optimization of fermentation and purification of recombinant human serum albumin (HSA) and recombinant human thrombin produced in yeast. (Phase II)	Navya Biologicals Pvt Ltd, Hubli, Karnataka	Nil
92	Development of okra varieties resistant to YVMV using marker assisted selection	Nirmal Seeds Pvt. Ltd., Jalgaon	The Energy and Resources Institute, New Delhi
93	Stacking of candidate genes (validated in planta) addressing different moisture stress resistance strategies in maize (Zea mays) (Phase I & II)	Nuziveedu Seeds Pvt. Ltd., Secunderabad	International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi
94	Biofortification of maize with β -carotene and high quality protein using functional genomics and molecular breeding approaches (Phase-I)	Nuziveedu Seeds Pvt. Ltd., Secunderabad	Nil
95	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., Mohali	Nil

S.No.	Title	Company	Collaborator(s) if any
96	Design modification and commercialization of nitrifying bioreactor technology for the establishment of organic recirculation prawn seed production system (Phase-II)	Oriental Aquamarine Biotech India Pvt. Ltd., Coimbatore	Cochin University of Science and Technology, Kochi
97	Detailed performance evaluation and accelerated commercialization of the nitrifying bioreactor technology in Indian market" (Phase-II)	Oriental Aquamarine Biotech India Pvt. Ltd., Coimbatore	Cochin University of Science and Technology, Kochi
98	Design, synthesis, evaluation and development of the Novel H3 and other GPC receptor ligands for various therapeutic applications (Phase – I)	Oxygen Healthcare Research Pvt. Ltd., Ahmedabad	Nil
99	Radiation Field analyzer (RFA)	Panacea Medical Technologies Pvt. Ltd., Bangalore	Nil
100	Novel methods of isolation of biochemicals from crustacean exoskeleton (Phase-I)	Pelican Biotech and Chemical Labs, Kerala	Nil
101	Value added products from crustacean exoskeleton and coir pith-integrated zero discharge processing project (Phase – II)	Pelican Biotech and Chemical Labs, Kerala	Nil
102	Commercialization of PIGA – A platform of medical tool positioners for use in Image Guided Interventional Procedures	Perfint Healthcare Pvt. Ltd., Chennai	Nil
103	Design and development of a Smart Sensor System for therapy monitoring and validation of soft tissues tumors (Phase – I & II)	Perfint Healthcare Pvt. Ltd., Chennai	Nil
104	Artificial cultivation of a rare himalayan fungus Cordyceps for its medicinal use	Phyto Biotech Pvt. Ltd., Bangalore	
105	Control of White Spot Syndrome Virus (WSSV) of shrimp in the culture system by Nanoparticles/ modified nanosystem (Phase – I)"	Poseidon Biotech, Chennai	Nil
106	Enzyme catalyzed manufacture of esters (Phase – I)	Privi Organics Ltd., Navi Mumbai	University Institute of Chemical Technology, Mumbai
107	Pilot scale production of biodiesel from algae (Phase II)	Proalgen Biotech Ltd., Chennai	Nil
108	Transgenic cassava production with genes conferring resistance to Indian cassava mosaic virus disease (Phase I)	Rasi Seeds (P) Ltd., Attur	Tamil Nadu Agricultural University, Coimbatore
109	Micropropagation of date palm for sustainable agriculture and rural economic growth (Phase – I)	Reliance Life Sciences Pvt. Ltd., Navi Mumbai	Nil
110	Manufacture and clinical evaluation of Non - polymeric (Nanocarbon porous matrix) drug eluting stent (DES)	Relisys Medical Devices Ltd., Hyderbad	Nil

S.No.	Title	Company	Collaborator(s) if any
111	Design and Development of Field-testable prototypes of a Large Field of View, Battery Operated, Easy-to-Use Retinal Imaging Device for the diagnosis of Retinopathy of Prematurity (ROP) in premature infants	Remidio Innovative Solutions Pvt. Ltd., Bangalore	Nil
112	Design and development of automated in vitro diagnostic instrumentation (ELISA processor, automatic biochemistry and urine strip analysers)	Robonik India Pvt. Ltd., Mumbai	Nil
113	Value addition and waste utilization in Banana pseudostem	Rope Production Centre, Madurai	Krishi Vigyan Kendra, Madurai
114	Culture and characterization of Porphyromonas gingivalis under strict anaerobic conditions and characterization of gingipains	Samleen Bioengineering Pvt. Ltd., Bangalore	Nil
115	Cellular biomarkers of rejection and immuno-suppression in transplantation (Phase I)	Sandor Proteomics Pvt. Ltd., Hyderabad	Nil
116	Extraction, purification, stabilisation and biological studies of natural gonadotropins from urine (Phase I)	Sanzyme Ltd., Hyderabad	Institute of Chemical Technology (ICT), Mumbai
117	Research, design, engineer and manufacture Multi Deck Shaker (Phase –II)	Scigenics Biotech Private Ltd., Chennai	Nil
118	Development of single tube multi gene onco-diagnostic tests for use with next generation sequencing platforms	SciGenom Labs Pvt. Ltd., Cochin	Nil
119	Development of a novel method to identify new drug targets for type 2 diabetics treatment (Phase – I)	Shantani Proteome Analytics Pvt. Ltd., Pune	Nil
120	Validation of Small-molecule Target Identification Technology for its Versatility. (Phase- I)	Shantani Proteome Analytics Pvt. Ltd., Pune	Nil
121	Manufacturing and commercialization of a low cost and reliable clinical chemistry analyzer	Span Diagnostics Ltd., Surat	Nil
122	Production, formulation and commercialization of microbial agents for weed management in rice (Oryza sativa L.) (Phase - I)	Sri Biotech Laboratories India Pvt. Ltd., Hyderabad	University of Hyderabad, Hyderabad
123	Complete in-vitro characterization of umbilical cord Wharton's jelly – derived mesenchymal stem cells (UCMSC) (Phase - I)	Sri Raghavendra Biotechnologies Pvt. Ltd., Bangalore	Nil
124	Microbial process development for beta carotene production in Blakeslea trispora and up-scaling the down stream process (Phase-I)	Sri Surya Anjaneya Industries, Visakhapatnam	Nil
125	Continuous process for economic production of effervescent preparations of aminoacids and other supplements	Steer Engineering Pvt. Ltd., Bangalore in collaboration with	Manipal College of Pharmaceutical Sciences, Manipal University
126	Large scale expansion and characterization of human Wharton's Jelly-derived mesenchymal stem cells (Phase-I)	Stempeutics Research Pvt Ltd., Bangalore	Nil

S.No.	Title	Company	Collaborator(s) if any
127	Wound healing efficacy of novel formulation SLS-03: Pre-clinical studies (Phase I)	Sugen Life Sciences Pvt. Ltd., Tirupati	Nil
128	Production of laboratory animal feed – special feed/ diet for experimental animals (Phase-II)	Sugen Life Sciences Pvt. Ltd., Tirupati	Nil
129	Development of commercial scale micropropagation technology for elite Date palm (Phase I)	Sun Agrigenetics Pvt. Ltd., Vadodara	Nil
130	Development of commercial scale micro propagation technology for elite Red Sandalwood in India (Phase-I)	Sun Agrigenetics Pvt. Ltd., Vadodara	Nil
131	Development on formulation for oral mucositis using electroloyte + bioadhesive lipid layer with an approved active agent known as innate defense regulator peptide (IDR-1)	Suparna Chemicals Ltd., Mumbai	Nil
132	Scientific validation of Bronco-T: A polyherbal formulation for bronchial asthma in experimental models (Phase – I)	Surya Pharmaceuticals, Varanasi	Nil
133	Development of lipid lowering phytoformulations (Phase – I)	T. Stanes & Company Ltd., Coimbatore	PSG of College of Technology, Coimbatore
134	Passive Immunotherapy using Chicken IgY Consortium with Probiotics supplementation for Gastrointestinal infections in Poultry (Phase – I)	T. Stanes & Company Ltd., Coimbatore	PSG College of Arts and science, coimbatore
135	To improve and standardize protocol of prognostic clinical laboratory testing for atherothrombosis by incorporating demonstration of thrombotic platelets using the new thrombochek test (Phase-I)	Thrombochek Labs Private Ltd., Mumbai	Nil
136	Differentiation of Human Adipose tissue Derived Stem Cells to Islet Cell mass Aggregates and its preparation for clinical application	Total Potential Cell Pvt. Ltd., Vadodara, Gujarat	Nil
137	Stem Cell Implant Biocomplexes for Periodontal Tissue Regeneration	Tran-Scell Biologics, Hyderabad	Nil
138	Novel process development and optimization of process parameters for orlistat production (Phase II)	Transgene Biotek Ltd., Hyderabad	Nil
139	Development of a Vaccine capable for eliciting immunological memory for the prevention of typhoid (Phase – II)"	USV Ltd., Mumbai	Nil
140	Development and characterization of lipid carrier based nanogel formulation for 5– fluorouracil (Phase-I)	V.B. Medicare Pvt. Ltd., Hosur	Nil
141	Indigenous Production of Dextranase using SSF Technique" (Phase-II)	Varuna Biocell Private Ltd., Varanasi	Nil

S.No.	Title	Company	Collaborator(s) if any
142	Indigenous production of dextranase using SSF technique (Phase I)	Varuna Biocell Pvt. Ltd., Varanasi	Nil
143	Innovative method to extract silk grade banana fiber	Vel Natural Fibers, Thoothukudi	Nil
144	Design and development of fiber laser based portable Raman spectrometer	Vinvish Technologies Pvt. Ltd., Trivandrum	Nil
145	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., Hyderabad	Nil
146	Indigenous Development of a Recombinant Fuzeon for the treatment of AIDS (Phase – II)	Virchow Biotech Pvt. Ltd., Hyderabad	Nil
147	Process optimization for production of freeze-dried Brucella abortus Strain 19 Vaccine for veterinary use	Vivimed Labs Ltd., Hyderabad	
148	Production of recombinant exenatide (Incretin mimetic like GLP-1) (Phase II)	Vivo Bio Tech Ltd., Hyderabad	Nil
149	Development of drought and saline tolerant high biomass yielding Bamboo plants as energy crop	Xcelris Labs Ltd., Ahmedabad	Abellon Agrisciences Ltd., Ahemdabad and Abellon CleanEnergy Ltd., Ahmedabad
150	Development of highly specific immunoassays for prostrate and breast cancer through molecular characterization of existing markers and establishment of novel markers (Phase-I & II)	Yashraj Biotechnology Ltd., Navi Mumbai	Nil
151	Development of humanized monoclonal antibodies against human epidermal growth factor receptor (Phase- I)	Zenotech Laboratories Ltd., Hyderabad	Nil

Biotechnology Industry Partnership Programme (BIPP)

S.No.	Title	Company	Collaborator(s) if any
1	Project on Value Addition including potential neutraceuticals from derivatives of Rice	A P Organics Pvt. Ltd., Ludhiana, Punjab	Nil
2	Single step Extraction of cotton seed with miscella refining	Abhay Cotex Pvt Ltd., Jalna	Nil
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., Bangalore	Nil
4	Multistacking genes to develop engineered rice with enhanced drought and multiple disease and pest resistance	Advanta India Ltd., Hyderabad	Nil
5	RNAi and other cutting edge technological interventions to develop insect pest, diseases and viruses tolerant tomato hybrids for Indian and International market	Advanta India Ltd., Hyderabad	Indian Agricultural Research Institute, New Delhi
6	Percutaneous Aortic Valve Technology	Agada Medical technologies Pvt. Ltd., Chennai	Nil
7	Immunodiagnostic kits for detection of autoimmune diseases	Amar Immunodiagnostics Pvt. Ltd., Hyderabad	Nil
8	Identification and development of promiscuous anticancer compounds from microorganism	Amrita Therapeutics Ltd., Ahmedabad	National Institute of Immunology, New Delhi
9	Development of Value added Corn Steep Liquor and Powder suitable for food and fermentation Industry up to Pilot scale (1TPD)	ANIL LTD, Ahmedabad	National Chemical Laboratory, Pune
10	Third generation RNAi for engineering Tomato leaf curl (ToLCV) and tospovirus (GBNV) resistance in tomato	Ankur Seeds Pvt. Ltd., Nagpur	International Center for Genetic Engineering and Biotechnology, New Delhi
11	Ketoreductases - Whole Cell Biotransformation For Chiral Chemistry	Anthem Biosciences Pvt. Ltd., Bangalore	Cellworks Research India Private Ltd., Bangalore
12	Development And Pilot Scale Production Of ANTI-TNF-a Antibody scFv For Treatment Of Inflammatory Diseases	ARA HealthCare Pvt. Ltd., Gurgaon	Nil
13	Development of Self-glucogenic Pearl Millet adapted for marginal lands	Avesthagen Ltd., Bangalore	Nil
14	Automated Portable Epilepsy-EEG system	Axxonet System Technologies, Bangalore	NIMHANS, Bangalore

S.No.	Title	Company	Collaborator(s) if any
15	Development of 'Herbicide & Stress tolerant' transgenic Onion	Bejo Sheetal Seeds Pvt. Ltd., Jalna	International Center for Genetic Engineering and Biotechnology, New Delhi
16	Phase III Testing and Evaluation of Safety and Efficacy of Oral Rotavirus Vaccine Candidate 116E	Bharat Biotech International Ltd., Hyderabad	CMC Vellore, KEM-Pune, THSTI-Gurgaon
17	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 Serums and Vaccines Ltd., Mumbai	Nil
18	Design and Expression of humanized antibodies against soluble Interleukin-6R, soluble gp130 in Bacteria and Animal Cell lines	Bhat Biotech India (P) Ltd., Bangalore	Manipal Life Sciences Centre
19	Assay validation enabling infectious disease detection at point-of-care using bigtec's handheld micro PCR	Bigtec Private Ltd., Bangalore	Nil
20	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 Ltd., Bangalore	Nil
21	A multicentric, parallel, randomised (2:1) open label phase III clinical study to evaluate the immunogenicity and safety of BE's inactivated JE vaccine in healthy ≥1 to< 3 year old Indian subjects in comparison with purified inactivated JE vaccine (IXIARO) of intercell- An noninferiority study	Biological. E, Hyderabad	Nil
22	Development of rice hybrids with improved drought and salinity stress tolerance	Bioseed Research India Ltd., Hyderabad	International Center for Genetic Engineering and Biotechnology, New Delhi
23	Development of Process Knowhow for Butanol Production from lignocellulosic biomass	BPCL, Greater Noida	(TERI later on removed)
24	Clincial Development of Influenza Vaccines	Cadila Pharmaceuticals Ltd., Ahmedabad	Nil
25	Flow Anlayzer	C-CAMP, Bangalore	Indian Institute of Technology, Madras
26	Scale-up of Plasma Fractionation Facility for High Value Products	CELESTIAL BIOLOGICALS LTD, Ahmedabad	Nil
27	Multiplex Fast-PCR based diagnosis and prognosis of tuberculosis	Chromous Biotech Pvt. Ltd., Bangalore	Nil
28	"Multiplexed Fast-PCR based detection kit for a group of viruses affecting potato in India"	Chromous Biotech Pvt. Ltd., Bangalore	Indian Agricultural Research Institute, New Delhi
29	Production of Ranibizumab – a recombinant humanized Anti-VEGF monoclonal antibody fragment (recombinant huFab V2) expressed in Hansenula Polymorpha.	Clonz Biotech Pvt Ltd, Hyderabad Completetd	Nil

S.No.	Title	Company	Collaborator(s) if any
30	Clinical trials of novel anticancer drug cocrystal	Crystalin Research Pvt. Ltd., Hyderabad	Nil
31	Design and development of an affordable Fluorescence Reader for Point-of-care diagnostics	Design Innova, Delhi	International Center for Genetic Engineering and Biotechnology, New Delhi
32	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., New Delhi	Dr. B.R. Ambedkar Center for Biomedical Research (ACBR), Delhi University
33	Discovery and Development of Novel Bone anabolic agents for accelerated fracture healing	Enem nostrum remedies pvt ltd, Mumbai	Central Drug Research Institute, Lucknow
34	Novel Haemostasis Mechanisms	Excel Matrix Biological Device Pvt. Ltd., Hyderabad	Nil
35	Porcine Pulmonary Xenograft as a Versatile Conduit in Cardiovascular Surgery	Frontier Lifeline Private Ltd., Chennai	Nil
36	Development of a cost effective prophylactic and Therapeutic Recombinant Human Papillomavirus vaccine	Gennova Biopharmaceuticals Ltd., Pune	Nil
37	Biosimilar Interferon beta 1a: process development	Gennova Biopharmaceuticals Ltd., Pune	Nil
38	State of art cGMP production facility meeting regulatory requirement for production of recombinant Bio-therapeutics	Gennova Biopharmaceuticals Ltd., Pune	Nil
39	Association Mapping and Whole Genome Marker Assisted Recurrent Selection for Development of Abiotic Stress Resilient Maize	GEO Biotechnologies India Pvt. Ltd., Bangalore	CIMMYT, Hyderabad
40	Development of High Expression Plasmid vectors for Production of Biosimilar Herceptin and Other Recombinant Proteins and Antibodies .	Imgenex India Pvt. Ltd., Bhubaneswar	Nil
41	Bio□Process Development for Production of Biosimilar Trastuzumab (Phase II)	Imgenex India Pvt. Ltd., Bhubaneswar	Nil
42	Interferon Beta 1 b Process development	Inbiopro Solutions Pvt Ltd, Bangalore	Nil
43	Discovery and development of potent, selective and novel c-Met Kinase Inhibitors in cancer	Incozen Therapeutics Pvt. Ltd., Hyderabad	Nil
44	Setting up a 10 ton Lignocellulosic biomass/day processing plant to produce about 3000 Litre ethanol/day	India Glycols Ltd., Kashipur (Phase-I)	Nil
45	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 Ltd., Kashipur (Phase-II)	DBT-ICT Centre for Energy Biosciences, Mumbai
46	Creation of a state of art integrated facility for high end structural and functional characterization of protein therapeutics and peptides	Intas Biopharmaceuticals Pvt. Ltd., Ahmedabad	Nil
47	Mucosal Formulations of Parathyroid hormone	Intas Biopharmaceuticals Pvt. Ltd., Ahmedabad	Nil

S.No.	Title	Company	Collaborator(s) if any
48	Developing Endosulphan degrading bacteria as a commercial product.	International Panaacea Ltd., New Delhi	Nil
49	DXPhone	Janacare Solutions Pvt. Ltd., Delhi	1. All India Institute of Medical Sciences 2. Narayana Hrudayalaya Hospital City
50	Development of Bt-rice with two cry genes	Jk Agri Genetics Ltd., Hyderabad	Nil
51	Development of biotic stress resistance rice through conjunct use of Bio- and Hybrid technologies	Kaveri seed Company Ltd., Hyderabad	Nil
52	Marker-assisted dissection of genetic basis of yield and improving yield potential under drought stress in Maize	Kaveri Seed Company Ltd., Hyderabad	Nil
53	Genomics assisted accelerated product development of high yielding pigeonpea hybrids	Krishidhan Seeds Private Ltd., Jalna	Centre of excellence in genomics, ICRISAT, Hyderabad
54	Sustainable and versatile microbial polymers: a bio-based prospect for India	Kumar Organics Products Ltd., Bangalore	Nil
55	Phase I clinical Trial with poly (lactide-co-glycolide) (PLG) nanoparticles encapsulating antitubercular drugs (rifampicin, isoniazid and pyrazinamide)	Lifecare Innovations Pvt. Ltd., Gurgaon	Nil
56	Stress Tolerant Rice	Maharashtra Hybrid seeds company Ltd., Jalna	Nil
57	Development of sucking insect pest tolerant rice and cotton	Maharashtra Hybrid seeds company Ltd., Jalna	Nil
58	Hi-Fidelity Affordable Mannequin for Effective CPR(Cardiopulmonary Resuscitation) Training	MERKEL HAPTIC SYSTEMS PRIVATE Ltd., Chennai	Nil
59	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 Private Ltd., Bangalore	Nil
60	Deregul action trials phase I of transgenic maize events expressing Metahelix Synthetic Cry1C, Cry1Ac and Cry1Ab Genes for tolerance to stem and cob borers	Metahelix Life Sciences Private Ltd., Bangalore	Nil
61	Development of PAT-1102, a novel HDAC inhibitor for the treatment of cancer	Mitra Biotech Pvt Ltd, Bangalore	Anthem Biosciences Private Ltd., Bangalore
62	To conduct confined field trials and biosaftey studies on genetically engineered Brassica juncea	Mother Dairy Fruit and Vegetable Pvt. Ltd., Delhi	Nil
63	Enhanced production of extracellular melanin from various fungal sources for protection against UV and gamma radiations	Myko Tech Private Ltd., Goa	Nil
64	Transformational Technology Platform Development for Biological Hydrogen	Nagarjuna Fertilizers & Chemicals Ltd., Hyderabad	Nil

S.No.	Title	Company	Collaborator(s) if any
65	Development of Technology Platform for Rare Sugar Production	Nagarjuna Fertilizers & Chemicals Ltd., Hyderabad	Nil
66	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., Bangalore	Nil
67	Development of novel intensified technology platform for production of low cost MAbs	Navya Biologicals Pvt Ltd, Hubli, Karnataka	Nil
68	Development of nutritionally improved mustard (Brassica juncea) varities/hybrids having low erucic acid and low glucosinolate content using marker assisted selection	Nirmal Seeds Pvt. Ltd., Jalgaon	The Energy and Resources Institute , New Delhi
69	Development of Viral resistant okra using RNAi approach	Nirmal Seeds Pvt. Ltd., Jalgaon	University of Delhi South Campus
70	ONCOSCAN - Digital Oncopathology Slide Scanner	Optra Systems Pvt. Ltd., Pune	Nil
71	Scale up and validation of technology for the manufacture of DAG using Deacetylcephalosporin C synthase	Orchid Chemicals & Pharmaceuticals Ltd., Chennai	Nil
72	Development of a H1N1 pandemic influenza vaccine	Panacea Biotech. Ltd., Delhi	Nil
73	Development of Novel peptide based topical gel for the treatment of Alopecia	Panacea Biotech. Ltd., Delhi	Nil
74	Development of safe and highly efficacious 13 – valent pneumococcal conjugate vaccine against Streptococcus pneumoniae infections	Panacea Biotech. Ltd., Delhi	Nil
75	Development of Flat Panel Computed Tomography (FPCT)machine	Panacea Medical Technologies Pvt. Ltd., Bangalore	Nil
76	Solution for planning, execution and confirmation of targeted tumor ablation therapy	Perfint Healthcare Pvt. Ltd., Chennai	Nil
77	SanGeniX: A comprehensive Next Generation Sequence (NGS) data analysis solution	Persistent Systems, Pune	Indian Institute of Technology (IIT), Mumbai; Indian Institute of Science Education and Research (IISER), Pune and National Bureau of Animal Genetic Resources (NBAGR), Karnal
78	Novel Technology for Microbial Production of Paclitaxel,an anti cancer drug.	Phyto Biotech Pvt. Ltd., Bangalore	Nil
79	Lignocellulosic Biomass to ethanol technology: Stimultaneous Saccharification and Fermentation	Praj Industries Ltd., Pune	Nil
80	Evaluation of Platinum Nano Particles for the Treatment of Hormone Refractory Prostate Cancer.	Rasayani Biologicals Pvt. Ltd., Pune	Nil
81	Functional evaluation of autologous cell based therapy in cardiovascular diseases - Molecular Imaging [An innovative non-invasive technology]	Ravindranath G E Medical Associates Pvt.Ltd, Hyderabad	Nil
82	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., Bangalore	Nil

S.No.	Title	Company	Collaborator(s) if any
83	“Viable Enzymes production using Agro waste/ Produce as Raw material of Industrial/Feed and Health care use with large viable Market/Demand”	Rossari, Mumbai Completed	Nil
84	Development & building indigenous capability for Balloon Catheter Manufacturing.	Sahajanand Medical Technologies Pvt. Ltd.	Nil
85	Commercial Scale Production of Nanopesticides and Nanofungicides for Indian Agro-industry	Saveer Biotech, Greater Noida	Indian Statistical Institute, Kolkata
86	Cost-effective offshore biomass production and bio-conversion to fuel	Sea6 Energy Pvt. Ltd., Chennai Completetd	Nil
87	Design and evaluation of novel immunogens and monoclonal antibodies against pandemic H1N1	Serum Institute of India Ltd., Pune	Indian Institute of Science, Bangalore and National Instiute of Immunology, New Delhi
88	Clinical development of Polysialylated Erythropoietin	Serum Institute of India Ltd., Pune	Nil
89	Development of HPV vaccine	Serum Institute of India Ltd., Pune	Nil
90	Establishment of bioprocess facility for large scale production of Microbial antigens and monoclonal antibodies under the conditions compliant with cGMP	Span Diagnostics Ltd., Surat	Nil
91	Bioconversion of agricultural waste from mango kernel to polylactic acid a Bioplastic	SPC Biotech Private Ltd., Hyderabad	Nil
92	Novel combination therapy for treatment of resistant and nonresponsive cancers	Sphaera Pharma Research and Devlopment Pvt. Ltd., Manesar	Nil
93	Control of Shoot and Fruit Borer Insect Pest in Brinjal through RNA interference	Sri Biotech Laboratories India Pvt. Ltd., Hyderabad	Deptt of Genetics, University of Delhi South Campus Delhi
94	Development of Actinomycetes based metabolites as delivery systems for soil health management in Groundnut (Arachis hypogaea L.)	Sri Biotech Laboratories India Pvt. Ltd., Hyderabad	ICRISAT, Hyderabad
95	A parallel group randomized open blinded end point evaluation, multicentric, dose escalation, phase –II study assessing the safety and efficacy of intra-arterial (hepatic) ex-vivo cultured adult allogenicmesenchymal stem cells in patients with alcoholic liver cirrhosis	Stempeutics Research Pvt Ltd., Bangalore	Nil
96	Hepatotoxicity Prediction Platform	Strand, Bangalore	Nil
97	Bevacizumab upto Pre-clinical studies	Sun Pharmaceuticals Industries Ltd., Vadodara	Nil
98	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, Chandigarh	Nil
99	Inorganic and polymer nanocomposites for micronutrient and pesticide delivery: boosting crop health and yield	Tata Chemicals Innovation Centre, Pune	Nil

S.No.	Title	Company	Collaborator(s) if any
100	Process for Asymmetric Synthesis of Hexahydrobenzophenanthrenes, Dopamine D1 Agonists	TCG LifeSciences Ltd, Kolkata	Nil
101	Development of an Affordable, Asia Specific 15 valent Pneumococcal Polysaccharide-CRM 197 Protein conjugate vaccine	Tergene Biotech Pvt. Ltd., Hyderabad (Phase-I)	Nil
102	Development of an Affordable, Asia specific 15 valent Pneumococcal Polysaccharide - CRM 197 Protein Conjugate Vaccine.	Tergene Biotech Pvt. Ltd., Hyderabad (Phase-II)	Nil
103	Development of Anaerobic Membrane Memberane Bioreactor (An MBR) for Waste to Energy Solutions	Thermax, Pune	Nil
104	A Strategy for the Development of Alternative Treatments for Heart failure Complicated with Diabetes Mellitus	Torrent Pharmaceuticals Ltd., Ahmedabad	Nil
105	Clinical development of TRC150094, a novel Diiodothyronine (T2) analogue, for the treatment of cradiovascular (CV) risk factors defined by Metabolic syndrome (MS)”.	Torrent Pharmaceuticals Ltd., Ahmedabad (Phase-I)	Nil
106	Clinical development of TRC150094, a novel Diiodothyronine (T2) analogue, for the treatment of cardiovascular (CV) risk factors defined by Metabolic Syndrome (MS)	Torrent Pharmaceuticals Ltd., Ahmedabad (Phase-II)	Nil
107	To develop novel 3rd generation HIV (Antibody) and 4th generation (HIV Antigen and Antibody) immunoassay format using flash type chemiluminescence and magnetic particles as matrix	Transasia Bio-Medicals Ltd., Mumbai	Nil
108	Clinical investigation of Galnobax for the treatment of diabetic foot ulcers	V Life Sciences Technologies Pvt. Ltd., Pune (Phase-I)	Nil
109	Clinical investigation of Galnobax for the treatment of diabetic foot ulcers	V Life Sciences Technologies Pvt. Ltd., Pune (Phase-II)	Nil
110	Imaging device for monitoring breast tissue changes	Tuscano equipments private Ltd.	Nil
111	Design and Development of Photo Dynamic Therapy Laser System	Vinvish Technologies Pvt. Ltd., Trivandrum	Centre for Earth Science Studies, Trivandrum and Regional Cancer Centre, Trivandrum
112	Development Of A Novel Mucosal Vaccine For Hpv	Virchow Biotech Pvt. Ltd., Hyderabad	Nil
113	Novel inhibitors of fatty acid biosynthesis for the treatment of drug resistant S.aureus bacterial infections	Vitas Pharma Research Private Ltd., Hyderabad	Nil
114	Development of animal component free biosimilar recombinant protein therapeutics using mammalian platform technology	Wockhardt, Aurangabad	Nil
115	Tumor Necrosis Factor - alpha (TNFa) inhibiting compound as a first in class drug treatment for neuroinflammatory diseases.	Yasham P2D Lifesciences Pvt. Ltd.	Nil

Contract Research and Services Scheme (CRSS)

S. No.	Title of the Project	Applicants
1	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 Alzheimer's disease	Academia: University of Delhi – (Dept. Of Microbiology), New Delhi Industry: LeadInvent Technologies, New Delhi Academic partner: NBRC
2	Validation of a rapid diagnostic method for the detection of HLA allele and its association with cutaneous drug reactions in persons with epilepsy.	Academia: AIIMS, New Delhi Industry: Dr. Khanna's path lab Pvt. Ltd, New Delhi
3	Discovery of genome-wide SNPs and its use in developing a reference linkage map and association analysis in castor	Academia: Directorate of Oilseeds Research, Hyderabad Industry: Xcelris Genomics, Ahmedabad
4	Identification of Drug Candidates with Improved PK Properties Using Silicon-Switch Approach.	Academia: NCL, Pune Industry: Incozen Therapeutics Pvt. Ltd, Hyderabad
5	Validation of novel target for HIV-1: Nef-CD80/CD86 for potential therapeutic intervention.	Academia: NCBS, Bangalore Industry: cCAMP, Bangalore Academic partner: IIIM, Jammu
6	Validation of Drought Resistance Marker in Rice	Academia: UAS, Bangalore Industry: Chromous Biotech Pvt. Ltd, Bangalore
7	Validation of serological diagnostic reagents and kits for plant viruses affecting horticultural crops	Academia: IARI, New Delhi Industry: Imgenex, Bhubaneshwar
8	Lead identification and development of aza-Flavanones and triazole derivatives as new anti-cancer agents	Academia: IICT, Hyderabad Industry: GVKBio Sciences Pvt Ltd, Bangalore
9	Development of a novel bioreactor system for for production of IMTECH-laccase and verification of commercial viability of IMTECH process.	Academia: IMTECH, Chandigarh Industry: Rossari Biotech Ltd., Mumbai
10	Metabolome analysis in ginger and product development using gingerol	Academia: Kerala Agricultural University, Thrissur Industry: Arjuna Natural Extracts Ltd, Aluva

BIRAC was incorporated on 20th March 2012 as a Section 25, Not for Profit Company. 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 1st year 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.

For further information please contact:
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