Animal Biotechnology and Aquaculture Division

TECHNOLOGY PROFILING - OUTCOME OF DBT FUNDED PROJECTS

(2014-2020)

GOVERNMENT OF INDIA
DEPARTMENT OF BIOTECHNOLOGY
MINISTRY OF SCIENCE AND TECHNOLOGY
TECHNOLOGY PROFILING - OUTCOME OF DBT FUNDED PROJECTS

(2014-2020)
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Acknowledgements:

Project investigators of the DBT sponsored R & D projects for the information.
MESSAGE

India has vast livestock resources and livestock production come primarily from the existing livestock and contributes a significant share of GDP. The Livestock provides livelihood to two-third of rural community of India and also provides almost 8.8% employment to the population. Beside livestock, the Aquaculture also constitutes an important economic activity and it also has a vast potential for sustainably exploiting a wide variety of resources in the country.

Department of Biotechnology supports basic and applied research in areas of animal reproduction, molecular characterization of indigenous livestock breeds, animal nutrition, development of newer vaccines and diagnostics for diseases control. Department is also supporting research and development for improvement of feed/nutrition, health, and productivity of Aquaculture and Marine species through biotechnology intervention in the country.

It is a matter of pleasure to release the compendium which encompasses details of technologies/ diagnostic kits/ vaccines developed through support of DBT for Livestock and Aquaculture sectors. Most of these technologies/ diagnostic kits/ vaccines have been validated and commercialized, and remaining technologies also have huge potential for commercialization and application by the end users.

I would like to compliment the team of DBT Scientists, Project Investigators engaged in implementation of R&D Programs on various aspects of Animal Biotechnology, Aquaculture and Fisheries and Publication committee for their efforts in drafting the compendium. I trust this compendium of technologies developed under DBT R&D Programs will be useful for the scientists, teachers and industries involved in scientific research and management of animal health and aquaculture in the country.

(Renu Swarup)
FOREWORD

India has the largest animal husbandry sector in the world with largest livestock population to support the livelihoods of more than two-thirds of the rural population, mainly small and marginal farmers. Livestock can sustain the food demands of the rural households and also provides income sustainability at the time of crop failures. Therefore, sustainable animal production and health is important as healthy animals are closely related to healthy people and healthy environment. Similarly, Aquaculture is an important sector for food production providing nutritional security, besides livelihood support, gainful employment and its contribution towards agricultural exports.

The department has been supporting research and development activities in area of animal health, nutrition and productivity through enhancing livestock production & productivity, animal reproduction, nutrition, improving animal health through developing newer vaccines, therapeutics and diagnostics. The department is also supporting research and development activities on fish genomics & transcriptomics, developing newer diagnostics and therapeutics, marine ornamental marine bioprospecting, and improvement in aqua-feed along with low cost feed for cultivable marine and fresh water animal species.

The compendium has the details of technologies developed through DBT supported R&D projects under ‘Animal & Livestock Biotechnology’ and ‘Aquaculture & Fisheries Biotechnology’ programmes. These technologies are under various stages of commercialization. Some of these technologies have been commercialized while, remaining technologies have been validated and are under process of commercialization. The key commercialized technologies are: Brucella abortus S19Δper vaccine, ABTCHOICE Kit, EndoMet B-PB technology, IMMUZONE technology, Nitrifying Bioreactor Technology, PCR Kit for shrimp viral pathogens, Lateral Flow Immunoassay (LFIA) kit for WSSV detection, AMPLI-WSSV Kit, Aquastim MBL technology, RapiDot Kit, LUMI-NIL MBL technology.

I appreciate the efforts of Dr. Arun Kumar Rawat, Former Adviser, DBT, Dr. G. Dhinakar Raj, TANUVAS, Chennai, Dr. Manoj Singh Rohilla, Scientist – E, DBT and Dr. Lokesh Kumar Narnoliya, Scientist - C, DBT in the preparation of this informative compendium. I am sure that this compendium will be very useful for all the stakeholders engaged in the development of animal and aquaculture sector in India.

Dr. Nitin Kumar Jain, Scientist - F,
Head, Animal and Aquaculture Biotechnology Division
Department of Biotechnology
Ministry of Science & Technology
Government of India
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Subviral Particle Based Infectious Bursal Disease Vaccine
(Gumboro disease)

DBT supported Project Name
Sub viral particle based infectious bursal disease vaccine: a way forward towards translation from lab to land.

Utility
Infectious bursal disease, also known as Gumboro disease, is a highly contagious disease of young chickens and turkeys caused by infectious bursal disease virus (IBDV), characterized by immuno-suppression and mortality generally at 3 to 6 weeks of age.

Technology/ Product Description
The IBDV major capsid protein VP2 on expression in yeast, *Saccharomyces cerevisiae*, led to the formation of subviral particles (SVPs). The generated SVPs, in addition to their ability to stimulate antibody response, are highly effective in stimulating antigen specific lymphocyte proliferative and cytotoxic T lymphocyte responses. The SVP based vaccine protects the broiler birds in presence of maternally derived antibodies (MDA) and can safely be administered to day-old chicks. The efficacy of the SVPs against challenge with very virulent IBD virus has also been evaluated at a poultry vaccine company M/S Globion India Pvt. Ltd., Hyderabad and the results indicated that the vaccinated flocks did not show any clinical signs indicating complete protection against IBDV.

Commercialization status
Technology has been allocated to Agrinnovate India Ltd. by the Institute for its transfer to industry.

Institute Address
Indian Veterinary Research Institute, Izatnagar, Bareilly, UP 243164.
Early pregnancy detection in Cattle and Buffalo
(Preg-D Pregnancy Diagnosis Kit)

DBT supported Project Name
Development of early pregnancy diagnostic assay through discovery of biomarkers in cattle and buffalo

Utility
Non-availability of a suitable field based early pregnancy diagnostics both for buffaloes and cattle has huge economic consequences in dairy farming.

Technology/ Product Description
A novel pregnancy diagnosis kit named as Preg-D kit has been developed through a multicentric project funded by the Department of Biotechnology. The kit utilizes a simple thermophilic biochemical colour reaction in urine to diagnose pregnancy and can be performed at field by farmers. The kit is sensitive and can diagnose pregnancy as early as on day 18 in majority of animals. For better accuracy of results, test should be repeated after 12-15 days. With the progression of pregnancy, there is increased secretion of metabolites that give color reaction. By 150 days of pregnancy, color intensity of these metabolites is maximum which remains high till calving. Kit has also been validated successfully.

Commercialization status
Ready for commercialization

Institute Address
Central Institute for Research on Buffaloes, Sirsa Rd, Hisar, Haryana 125001.


**Brucella abortus S19Δper Vaccine**

**DBT supported Project Name**
Network Project on Brucellosis

**Utility**
Brucellosis is a zoonotic disease which causes production losses in livestock. The disease induces abortion at the last stage of pregnancy, infertility and other reproductive problem which causes losses in production of milk and meat. Globally, the disease is reported approximately half a million human population every year. In India, dairy farmers and veterinarians are at a huge risk of getting directly affected with the Brucellosis.

**Technology/ Product Description**
A novel Brucella vaccine viz. *Brucella abortus S19Δper vaccine* has been developed, through a Network project on Brucellosis supported by Department of Biotechnology (DBT), in which a gene was knocked out from *Brucella abortus* S19 strain. This vaccine has confirmed protection against virulent challenge in experimental mice model conducted at IVRI, Izatnagar and in buffalo calves conducted at National Institute of Animal Health, an institute of Department of Animal Husbandry and Dairying. The developed vaccine was also found to be DIVA compatible. *Brucella abortus S19Δper vaccine* can play an important role in National Brucellosis Control Programme initiated by Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India.

**Commercialization status**
The technology of *Brucella abortus S19Δper vaccine* has been transferred to M/S Hester Biosciences ltd on 22nd September, 2020 for commercialization

**Institute Address**
Indian Veterinary Research Institute, Izatnagar, Bareilly, UP 243164.
ABT CHOICE Kit

DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Selection of sensitive antibiotics for bovine mastitis treatment in the field conditions are difficult as bacterial colony isolation and disk diffusion test requires laboratory facility and is also time consuming. This kit is useful to choose sensitive antibiotics against the bacterial pathogens for the treatment of mastitis in cattle in field conditions and the test duration is 12 hrs.

Technology/Product description
Magnetic nanoparticle-based entrapment of bacteria from mastitis milk samples, which is then used for antibiotic sensitivity test to treat the animal. The bacteria entrapped from the mastitis milk were seeded into various antibiotic coated vials and incubated overnight in a portable incubator for growth. Colour change and turbidity are the indicators of bacterial growth. Lack of bacterial growth is an indicator of sensitivity of the antibiotics.

Commercialization status
The technology of ABTCHOICE Kit was transferred to M/s Genomix Biotech, Hyderabad on a non-exclusive basis, for a period of 5 years

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Endometritis in cow is a major reproductive problem which can lead to infertility. Uterine Probiotics can be used as a supplementary therapy for endometritis for quicker recovery. A unique combination of probiotic -Lactic acid bacteria in a spray dried form that can be used in the clinical management of clinical and sub-clinical bovine endometritis was developed.

Technology/Product description
Probiotic-Lactic acid bacteria obtained from healthy cattle was cultured and characterized in the laboratory. The cultured probiotic bacteria were spray dried and packaged for intra-uterine administration in cow.

Commercialization status
EndoMet B-PB technology was transferred to M/s Genomix Biotech, in a non-exclusive basis for a period of 5 years

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
**Teat Protect**

**DBT supported Project Name**
Translational Research Platform for Veterinary Biologicals

**Utility**
Prevention is the best treatment for bovine mastitis. Since poor farm floor hygiene and udder hygiene lead to sub-clinical and clinical bovine mastitis. Teat Protect spray formulation was proven to prevent mastitis in cattle and buffaloes and prevents economic loss to the dairy farmers. The spray provides a protective coating of teat and udder thereby preventing entry of pathogens through the teat opening.

**Technology/Product description**
A unique formulation of lanolin, collagen and other herbal product combined spray for the prevention of mastitis and teat sores.

**Commercialization status**
Ready for commercialization [Manufacturing License No. TN0004789]

**Institute Address**
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Bovine mastitis is a common disease of cattle. Increased somatic cell count is an indicator of poor udder hygiene, clinical and/or sub-clinical bovine mastitis. This test kit is an end point visual colour intensity-based method of somatic cell count (SCC) in milk. It is used as a field based quick test for estimating somatic cells in milk as a herd assay.

Technology/Product description
Esterase enzyme concentration based semi-quantification of Somatic cells in milk. The SCC is determined in the milk based on the colour intensity which directly proportional to the cellular esterase enzyme activity.

Commercialization status
Ready for commercialization. This kit is supplied along with Teat Protect to check reduction in SCC following Teat Protect sprays

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
BRU Alert kit

**DBT supported Project Name**
Translational Research Platform for Veterinary Biologicals

**Utility**
Used for the qualitative detection of antibodies against *Brucella abortus* in vaccinated or infected cattle serum. It is an OIE recommended method for the herd screening and diagnosis of bovine brucellosis.

**Technology/Product description**
Monoclonal antibody-based blocking ELISA for detection of anti-LPS antibodies against *Brucella abortus*. The kit contains, *Brucella abortus* LPS coated ELISA plates, HRP-conjugated Monoclonal antibody against Brucella LPS, Wash buffer, TMB substrate solution, positive and negative controls.

**Commercialization status**
Ready for commercialization. Presently, this kit is being supplied for research use only.

**Institute Address**
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
KETOCHEK

DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Ketosis is a metabolic disease of cattle due to negative energy balance. Quick Farm/field level diagnosis of ketosis helps the veterinarians to choose the correct line of treatments to save the animal and also to reduce the production losses. It is a field friendly kit used to diagnose ketosis in lactating cows.

Technology/Product description
It is a rapid colorimetric test which measures urine ketone bodies, especially B-hydroxy butyrate. The kit contains chemicals that quickly react with beta hydroxy butyrate and produce visible colour change and useful for field level diagnosis of ketosis.

Commercialization status
Ready for commercialization

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Anestrus in cow can lead to reduced conception rate and increased inter-calving period. Intra-vaginal and parenteral progesterone formulations that are available for estrus synchronization need the help of veterinarian to administer the drug. This product is a transdermal cream which can be applied topically on the skin of the animal for systemic absorption. True anestrus can be treated using this progesterone nanocream. Prosync-NC is useful in oestrus synchronization in cattle and buffaloes.

Technology/Product description
This product ensures non-invasive, transdermal delivery of progesterone in cow for oestrus synchronization.

Commercialization status
Ready for commercialization

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
Nano Herbal Methicon Lotion

**DBT supported Project Name**
Translational Research Platform for Veterinary Biologicals

**Utility**
An unique liquid formulation of Dimethicone oil and poly-herbals, encapsulated in nanoform. Useful in the treatment and sustainable control of external parasites (ticks, lice and fleas) of animals.

**Technology/Product description**
Encapsulated Dimethicone and herbal extracts as safe and environmental friendly acaricide. Odorless, non-toxic, non-systemic and residue-free acaricide for the control of ticks and lice.

**Commercialization status**
Ready for commercialization

**Institute Address**
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
Probeads-EC

DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Probiotic supplement for poultry birds to maintain gut health in chicken by competitive exclusion of pathogens and improve the body weight gain. Targeted delivery of probiotics inside the intestine lumen using enteric coated beads to avoid the loss of probiotic organisms in the acidic pH of the Gizzard.

Technology/Product description
Unique polymer bead based and pH sensitive enteric coated probiotic beads designed to release probiotic organisms in chicken intestine. Dose: 5 beads / bird / day

Commercialization status
Ready for commercialization

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
**TANUVAS Surgical Scrub kit**

**DBT supported Project Name**  
Translational Research Platform for Veterinary Biologicals  

**Utility**  
- Pre-operative surgical hand scrubbing/washing by animal health care practitioners  
- Highly suitable for pre-operative skin scrubbing/cleansing of animal skin  
- Nano iodine suitable for pre-operative animal washing/showering  

**Technology/Product Description**  
The TANUVAS Surgical scrub kit contains nano iodine solution, evaporating hand sanitizing gel and Isopropyl alcohol. This unique combination is ready to use in surgical theatres and provides sterile environment around the skin. The nano iodine was developed without reduction in the germicidal and the wound healing effect.

**Commercialization status**  
Ready for commercialization. Used in Department of Clinics, TANUVAS

**Institute Address**  
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
Sure Heal

DBT supported Project Name
Translational Research Platform for Veterinary Biologicals

Utility
Useful for treatment of wounds, cuts, abrasions and injuries. “Sure Heal” offers protection against bacterial and fungal infections on animal skin. Suitable for use in all domestic animal species

Technology/Product Description
Sure heal is a collagen based wound healing spray incorporated with Gentamycin Sulphate. This product can be used for fresh and infected wounds. The healing process is faster with the broad anti-bacterial spectrum of Gentamycin Sulphate

Commercialization status
Ready for commercialization.

Institute Address
Translational Research Platform for Veterinary Biologicals, TANUVAS, Madhavaram Milk Colony, Madhavaram, Chennai - 600 051
DBT supported Project Name
Developing new strategies to prevent corneal and retinal blindness in dogs

Utility
Preventive therapy for cataract in dogs. For clinical use in corneal fibrosis in dogs

Technology/Product description
Nanotechnology based drug delivery system for cataract prevention in dogs. This invention relates to a Pirfenidone composition contains Pirfenidone loaded poly lactide-co-glycolide (PLGA) nanoparticles. Apart from the nanoparticle formulation, this invention relates to the preparation of pirfenidone dispersions (nano emulsion and nanosuspension dosage form) for eye drops at a strength of 3%. It reduces corneal haze as well as the time for corneal re-epithelization following alkali burn. Pirfenidone nanoparticles improve corneal wound healing and prevents fibrosis and in treating corneal chemical burns and other corneal fibrotic diseases.

Commercialization status
Ready for Commercialization [Indian patent granted in 2020, 232/Kolkata/2013]

Institute Address
Dept of Veterinary Surgery & Radiology, West Bengal University of Animal and Fishery Sciences, Kolkata
Indigenous Nylon Fishline Sutures  
(0.90 mm & 0.85mm)

**DBT supported Project Name**  
Development of novel suture materials and plants for canine arthropathies

**Utility**  
Cost effective suture useful for joint stabilization during surgical interventions in canines. Indigenous Nylon Fishline Sutures are cost effective and are useful for joint stabilization during surgical interventions in canine arthropathies requiring high suture strength.

**Technology/Product description**  
Indigenously available Nylon fishline suture materials were collected from the local market. Analysis of physical, mechanical and histopathological parameters of sutures showed the materials to possess good load carrying capacity, no inadvertent tissue reaction and resistant to infection owing to its monofilament nature. Sutures can be easily sterilized using ethylene oxide to achieve surgical grade sterilization for aseptic surgical protocols.

**Commercialization status**  
Product is under validation

**Institute Address**  
Department of Surgery & Radiology, GADVASU, Ludhiana
DBT supported Project Name
Development of novel suture materials and plants for canine arthropathies

Utility
For repair of cranial cruciate ligament rupture for stabilization of the stifle joint in dogs. The designs were made to perform TPLO surgery for treatment of cranial cruciate ligament rupture and stabilization of the stifle joint in dogs.

Technology/Product description
Tibial Plateau Leveling Osteotomy (TPLO) plates have been designed from Stainless steel compatible to the body system showing no inadvertent tissue reaction. Plate is having combination locking and hybrid holes. Combination of locking and Hybrid plate holes provided extra flexibility for screw placement and improved the strength of the implant.

Commercialization status
Product validation is in progress.

Institute Address
Department of Surgery & Radiology, GADVASU, Ludhiana
**Toggle pin implants**

**DBT supported Project Name**
Development of novel suture materials and plants for canine arthropathies

**Utility**
For stabilization of hip joint in canines during surgical interventions. Toggle pin implants are designed for stabilization and repair of hip joint dislocation in canines. Femoral head dislocation owing to any trauma could be reposed back into the acetabular cavity, followed by securing the femur head using toggle pin implant.

**Technology/Product description**
Different sized cylindrical toggle pin implants are designed from stainless steel material with central thread hole for use in different body weight dogs. These stainless steel toggle pin implants are compatible with the body system and show no inadvertent tissue reaction. There method of application is simple, and with little expertise can be used in routine practice.

**Commercialization status**
Product is under validation

**Institute Address**
Department of Surgery & Radiology, GADVASU, Ludhiana
Suture screws

**DBT supported Project Name**
Development of novel suture materials and plants for canine arthropathies

**Utility**
For stabilization of joints in dogs during surgical interventions. Suture screws are designed for holding suture material during various joint surgical procedures. These suture screws are useful in the surgical treatment of cruciate and hip joint arthropathies in dogs. The screw placement is helpful in improving the strength of the implant.

**Technology/Product description**
Cancellous Suture screws of variable length were developed for use at diverse places. The implants possess anchoring hole at the top of the screws for anchoring the suture materials.

**Commercialization status**
Product is under validation

**Institute Address**
Department of Surgery & Radiology, GADVASU, Ludhiana
Tibial tuberosity advancement (TTA) implants

DBT supported Project Name
Development of novel suture materials and plants for canine arthropathies

Utility
For repair of cranial cruciate ligament rupture and for stabilization of the stifle joint in canines. For performing tibial tuberosity advancement of the rupture of cranial cruciate ligament. TTA cages were designed to make the surgical procedure simpler, as it obsolete the requirement of applying separate wedge and plates.

Technology/Product description
Three locking holed TTA cages having variable wedge thickness for cranial advancement of tibia, have been developed. Variable thickness is helpful for achieving variable degrees of advancement in animals suffering from cruciate ligament rupture.

Commercialization status
Product is under validation

Institute Address:
Department of Surgery & Radiology, GADVASU, Ludhiana
Acoustic sensor based portable canine pregnancy detection device

DBT supported Project Name
Development of a portable sensor based canine pregnancy detection system and biomarker based canine pregnancy test kit

Utility
This is a very simple and portable device which helps in detection of pregnancy in canines. When mounted to belly of canine, the inbuilt Bluetooth module transmits the data wirelessly to handheld device like smart phone or tablet. Subsequently, the signal received is processed by inbuilt algorithm to give information about pregnancy in canines and fetal health conditions.

Technology/Product description
A portable and affordable acoustic sensor based canine pregnancy detection system is capable of analyzing fetal heartbeats as an indicator of gestation, fetal health condition, and litter size. With inbuilt advanced signal processing circuit, this state-of-the-art device is capable of processing parallel signals sourced from multiple fetal heartbeats.

Commercialization status
Product is under validation

Institute Address
Discipline of Biosciences and Biomedical Engineering, Indian Institute of Technology Indore, Madhya Pradesh
DBT supported project Name
Developing, testing and evaluation of whole and recombinant antigen based ELISA for monitoring the health of Laboratory Animals Phase-II

Utility
The ELISA kits are intended for monitoring Sialodacryoadenitis virus and Kilham Rat Virus infections in laboratory Rat colonies. The kits does not contain infectious components and are safe for use in animal houses

Technology/Product description
Sialodacryoadenitis virus (SDAV; Rat Coronavirus) and Kilham Rat virus (KRV; Rat parvovirus) are pathogens of laboratory rats. Both SDAV and KRV are transmitted by aerosols and by direct contact with biological secretions from the animals. Infection of laboratory rats with SDAV or KRV renders the rat unsuitable for experimental purposes. Detection of serum antibodies against these viruses is a best method to screen SDAV and KRV infections in laboratory rat population

Commercialization status
Ready for commercialization

Institute address
Tamil Nadu Veterinary and Animal Sciences University, Chennai (project collaborators: Indian Institute of Science, Bangalore and National Institute of Animal Biotechnology, Hyderabad)
ELISA kits for detection of antibodies against Mouse Hepatitis virus and Minute Virus of Mice

DBT supported project
Developing, testing and evaluation of whole and recombinant antigen-based ELISA for monitoring the health of Laboratory Animals Phase-II

Utility
The ELISA kits are intended for monitoring Mouse Hepatitis virus and Minute Virus of Mice infections in laboratory Rat colonies. The kits does not contain infectious components and are safe for use in animal houses

Technology description
Mouse Hepatitis Virus (MHV; Mouse Coronavirus) and Minute Virus of Mice (MVM; Mouse parvovirus) are pathogens of laboratory mice. Both MHV and MVM are transmitted through aerosols, fomites, and direct contact with biological secretions from the animals. Infection of laboratory mice with MHV or MVM renders the mice unsuitable for experimental purposes. Detection of serum antibodies against these viruses is a best method to screen MHV and MVM infections in laboratory mice population

Commercialization status
Ready for commercialization

Institute address
Tamil Nadu Veterinary and Animal Sciences University, Chennai (Project collaborators: Indian Institute of Science, Bangalore and National Institute of Animal Biotechnology, Hyderabad)
IMMUZONE (Herbal Immunostimulant)

DBT supported Project Name
Herbal immunostimulant formulated feed to protect shrimp (*Penaeus monodon* and *Litopenaeus vannamei*) from WSSV infection.

Utility
White spot syndrome virus (WSSV) causes 100% mortality within few days in cultured penaeid shrimp and therefore any practical intervention to control WSSV in the shrimp culture systems has enormous practical benefits to shrimp farmers.

Technology/Product Description
This herbal Immunostimulant, named as “Immuzone”, has been extracted from a medicinal plant which increases defensive mechanism of shrimps by enhancing hemocytic activities. Besides improving immunity, it also helps in enhancing the growth of shrimps. Field trials and third-party validation of this immunostimulant in shrimp farms located at different parts of the country were carried out successfully. This product is having a great demand among the shrimp farmers.

Commercialization status
The technology of IMMUZONE production has been transferred to M/S Poseidon Biotech Ltd., Chennai for commercialization.

Institute Address
C. Abdul Hakeem College, Melvisharam, Tamil Nadu
DBT supported Project Name
Detailed performance evaluation and accelerated commercialization of the nitrifying bioreactor technology in Indian market – Phase II.

Utility
There has been growing concern over the environmental impacts of aquaculture operations and therefore various types of recirculating aquaculture systems (RAS) have emerged as the major environmentally sustainable solution to combat these impacts. A recirculating aquaculture facility reduces water demands and discharges by reconditioning water to be recycled, and increases food conversions and releases little or no pollution.

Technology/Product Description
A novel re-circulating aquaculture system named as Nitrifying Bioreactor Technology has been developed after intensive research and field validation. This bioreactor actively controls water quality and helps in maintaining water quality for optimum growth of fish and shrimp. The Nitrifying Bioreactor is activated with a consortium of nitrifiers by immobilizing them on an inert substratum designed as cartridge. The nitrifiers grow as a biofilm and as water passes over them nitrification is achieved. This bioreactor is suitable for establishing RAS for brood stock maintenance and larval production. This system helps to increase survival rate and enhance the growth of fish and shrimp in culture systems.

Commercialization status
The bioreactor has been patented in India and several other countries including Thailand, Japan, Philippines, South Korea, Indonesia, etc. This technology has been transferred to M/S Oriental Aquamarine Biotech India Private Limited Tamil Nadu and commercialized with the financial assistance of SBIRI program.

Institute Address
National Centre for Aquatic Animal Health, Cochin University of Science and Technology, Cochin, Kerala.
PCR Kit for shrimp viral pathogens (WSSV, MBV, IHHNV and HPV)

**DBT supported Project Name**
Development of diagnostic methods and their field evaluation and monitoring of WSSV of shrimp along coast of India.

**Utility**
White spot syndrome virus (WSSV), Monodon baculovirus (MBV), Infectious hypodermal and hematopoietic necrosis (IHHNV) and Hepatopancreatic parovirus (HPV) are important viral pathogens of shrimp and responsible for severe economic losses estimated to be about Rs. 1200 crores every year in Indian shrimp industry. In the absence of effective treatment measures, prevention of the infection becomes a key step to contain the disease. Accurate diagnosis of the virus at early stages is one of the most efficient strategies to monitor and control viral outbreak in shrimp farming systems.

**Technology/ Product Description**
A PCR based diagnostic kit to detect shrimp viral pathogens including WSSV has been developed as an outcome of DBT funded scheme and marketed under the brand name of “Dr. Sahul’s PCR kit” for the benefit of shrimp hatchery operators, farmers and shrimp diagnostic laboratories.

**Commercialization status**
The technology of PCR diagnostic kit has been transferred to M/S Poseidon Biotech, Chennai. This indigenous kit is also being marketed to many countries viz. Tanzania, Madagascar, Sri Lanka etc. and has value as an import substitute.

**Institute Address**
C. Abdul Hakeem College, Melvisharam, Tamilnadu.
DBT supported Project Name
Development of field level nanoparticles based immune-diagnostics for viral pathogens of shrimp and prawn.

Utility
Detection of White spot syndrome virus (WSSV) at an early stage is a challenge as field-based diagnostics for WSSV are not available. Laboratory based diagnostics viz. Polymerase chain reaction (PCR) and real time PCR are available which are though sensitive, specific and accurate but requires specialized equipment and skilled manpower simultaneously these diagnostics are costly and time-consuming too.

Technology/Product Description
A Lateral flow immunoassay (LFIA) for detection of WSSV has been developed through a DBT funded collaborative programme. This diagnostic is very useful to screen WSSV in shrimp post-larval stage before stocking it in a water body. If it is positive by LFIA, the seed can be discarded. If it is negative, the sample can be further tested by PCR for confirmation. It is also useful to monitor the shrimp health in ponds after stocking regularly to avoid WSSV infection.

Commercialization status
This technology has been transferred to M/S Pathgene Healthcare Pvt. Ltd., Tirupati, AP for commercialization.

Institutes Address
C. Abdul Hakeem College, Melvisharam, Tamil Nadu and Agharkar Research Institute, Pune,
DBT supported Project Name
Indo Norwegian platform on fish and shellfish vaccine development.

Utility
WSSV is a highly virulent virus which affects shrimp and disease may manifest even without clinical signs. Since there is no cure for disease, the only way is to avoid the virus. This can be done by screening the larvae for the presence of the virus before their stocking in hatchery.

Technology/ Product Description
A PCR based diagnostic kit to diagnose WSSV, even if it is in dormant stage and showing no clinical sign, has been developed through financial support of DBT. The kit employs nested amplification which is more sensitive compared to normal one step PCR. AMPLI-WSSV is suitable for detection of WSSV in animals, in water, sediment or in any other source.

Commercialization status
The technology has been transferred to M/S Mangalore Biotech Laboratory which has commercialized the kit in the name of AMPLI-WSSV.

Institute Address
College of Fisheries, Mangalore, Karnataka


**Aquastim MBL**

**DBT supported Project Name**
Indo Norwegian platform on fish and shellfish vaccine development.

**Utility**
The immune system of shrimp is primitive in nature and lacks memory component. Therefore, to maintain immune status of animal high, it is important to treat the animals with immunostimulants.

**Technology/Product Description**
An immunostimulant, named as Aquastim-MBL, containing bacterial products, yeast, glucans and antiviral herbal products has been developed which stimulates the immune system of shrimp. Use of Aquastim MBL in hatchery has shown high survival rate of shrimp by over 20%. In juvenile and adult shrimp, Aquastim MBL induces production of antimicrobial molecules which are detectable in its blood cells (hemocytes) and also plasma. Treatment with Aquastim –MBL also protects shrimp against bacterial diseases such as luminous bacterial disease and also protect against stress and improve the feed conversion efficiency and growth.

**Commercialization status**
The technology has been transferred to M/S Mangalore Biotech Laboratory and commercialized in the name of Aquastim-MBL.

**Institute Address**
College of Fisheries, Mangalore, Karnataka.
LUMI-NIL MBL

**DBT supported Project Name**
Indo Norwegian platform on fish and shellfish vaccine development.

**Utility**
Luminous bacterial disease caused by *Vibrio harveyi* is one of the greatest problems in shrimp hatcheries and farms. Antibiotics and chemicals have been found ineffective in controlling the problem due to luminous bacteria.

**Technology/Product Description**
In a project supported by the Department of Biotechnology, a bacteriophage species has been identified, tested against *V. harveyi* and luminous bacterial diseases were controlled successfully. This product can also be used as a prophylactic to prevent build-up of luminous bacterial populations in hatcheries. Lumi-Nil MBL can also treat brood stock, eggs, nauplii etc so that they do not carry luminous bacteria into hatchery systems.

**Commercialization status**
This product has been transferred to Mangalore Biotech Laboratory and commercialized in the name of Lumi-Nil MBL.

**Institute Address**
College of Fisheries, Mangalore, Karnataka.
DBT Funded Fish Cell Line Repository

**DBT supported Project Name**
National Repository of Fish Cell Lines in NBFGIR (Phase II) and access center in C. Abdul Hakeem College and research on application of cell lines virology, toxicology and gene expression studies

**Utility**
Cell lines have assumed an important role in studying physiological, patho-physiological and the differentiation processes of specific cells. Cell lines are also being used for antibody production, vaccine development, drug testing, genetic function studies, cell growth studies etc. Fish cell lines have great utility in virological, toxicological, gene expression and drug screening studies related to aquaculture system.

**Technology/Product Description**
The Department of Biotechnology has established a fish cell line repository to maintain and develop new fish cell lines required for R&D purpose. So far, forty-three cell lines have been developed from different fish species and is being maintained for various R&D applications. The activities of repository include maintenance of cell lines, conducting training program and carry out research on applications of cell lines. The repository is supplying fish cell lines to various research organization for R&D purpose and considered as one of the largest fish cell line repository in the world.

**Institute Address**
C. Abdul Hakeem College, Melvisaram, Tamil Nadu and NBFGIR, Lucknow
RapiDot Kit

DBT supported Project Name
Indo Norwegian platform on fish and shellfish vaccine development.

Utility
White spot syndrome (WSS) is a viral infection of penaeid shrimp. The disease is highly lethal and contagious, killing shrimp quickly. Outbreaks of this disease have wiped out the entire populations of many shrimp farms within a few days in places throughout the world.

Technology/ Product Description
Fisheries College, Mangalore has developed and launched RapiDot kit to detect WSSV using monoclonal antibody. This kit is an outcome of a DBT funded project and its sensitivity is close to II step PCR. This test is not only user friendly but also cost effective and useful in screening brood stock and monitoring adults in grow-out ponds.

Commercialization status
To help farmers on a large scale, the technology was transferred to a French multinational company, M/S Virbac Animal Health Care.

Institute Address
Fisheries College, Mangalore, Karnataka.
Mass scale production of triploid Rainbow Trout

**DBT supported Project Name**
Protocol for mass scale production of triploid Rainbow Trout.

**Utility**
The benefits of using triploids for production purposes are twofold. First, since triploids are sterile, losses due to early reproductive maturation are largely eliminated and additional growth is achieved when growing larger fish. With rainbow trout, some of the loss due to sexual development in males can be overcome by utilizing all-female populations. Second, the problems associated with escapement and reproductive interactions with natural populations are minimized with sterile fish.

**Technology/Product Description**
A mass production technology of triploid Rainbow has been developed to enhance the productivity of this cold water trout species. The technology is directly applicable for the commercial production of triploid rainbow trout to achieve better growth and to reduce environmental risks in hilly and cold conditions. A new method to confirm triploidy by silver staining has also been developed.

**Institute Address**
ICAR-DCFR, Bhimtal, Uttarakhand
Photobioreactor

**DBT supported Project Name**
Nutritional evaluation, segregation and production optimization of novel marine microalgae for establishment as live feeds in fish and shellfish culture.

**Utility**
Micro Algae have attracted much interest not only for production of foods, bioactive compounds and also for their usefulness in cleaning the environment but also as live feeds for fish and shellfish culture. In order to grow and tap the potentials of algae, efficient photobioreactors are required. Although a good number of photobioreactors have been proposed, only a few of them can be practically used for mass production of microalgae.

**Technology/Product Description**
National Centre for Aquatic Animal Health, Cochin has developed a photobioreactor of 500L capacity for large scale high density production of marine microalgae to fulfill nutritional requirement of fish and shellfish culture. The nutritional evaluation, segregation and production optimization of novel marine microalgae has been standardized successfully which has wide application in aquaculture hatcheries.

**Commercialization status**
The reactor has been scaled up to 500 litres and validated. The technology is ready for commercialization.

**Institute Address**
National Centre for Aquatic Animal Health, Cochin University of Science and Technology, Cochin, Kerala.
Captive rearing technology of marine ornamental shrimps

DBT supported Project Name
Establishing germplasm resource centre for marine ornamental Invertebrates: Harmonizing biodiversity conservation and promoting livelihood to the islands of the Lakshadweep

Utility
Marine ornamental aquaculture is impetus to generate employment, livelihood and earning high foreign exchange. Hence, captive rearing technology on marine ornamental shrimps has been developed and being transferred. Following, the beneficiaries will be motivated to establish backyard rearing units.

Technology/Product Description
At present the marine ornamental trade is depending wild caught, casing negative impulsion to the reef system. Hence, the captive production technology for such demanded organisms help in conserve biodiversity, besides support in livelihood to the coastal and island communities.

Commercialization status
The ornamental shrimp rearing technology package (first of its kind in India/International) has been transferred to end users.
Department of Biotechnology

Ministry of Science & Technology

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