



## **Translational Research Platform for Veterinary Biologicals (TRPVB)**

*(A partnership initiative between DBT, GoI and TANUVAS, A State Veterinary University)*

The Translational Research Platform for Veterinary Biologicals (TRPVB) is a partnership initiative between the Department of Biotechnology (DBT), GoI and TANUVAS, to facilitate a collaborative and coordinated approach for the translation of technologies in the area of veterinary vaccines and diagnostics. Several universities and research institutions are performing research on the development of animal vaccines and diagnostics, but very few products have been commercialized in this sector. TRPVB was created with the vision to foster 'Productization' in the field of Veterinary Biologicals by converging the presently distant academic research, industry and pathways of regulatory compliance. TRPVB works towards to achieve the mission of translating of veterinary vaccines, diagnostics and other Biologicals for field application and harness their benefit to improve animal health and productivity thereby augmenting the economic status of farmers.

Over the past 8 years, TRPVB has become a centre of reference to strengthen national, regional and international linkage and collaboration for animal vaccine and diagnostics development, exchange of materials, technology assessment, regulation, and knowledge sharing to support training, consultation and commercialization of technologies. TRPVB has several 'achievements' to its credit

- ✓ **First translational platform** in animal sciences dedicated to develop and convert laboratory technologies for field use
- ✓ **Housed in a premiere veterinary university** that provides support in terms of sample generation, validation requirements, complement expertise, provide animal experimentation facilities, farm facilities etc.
- ✓ **Evolution of six different commercialization strategies** to suit particular types / requirements of technology transfer
- ✓ Availability of a **clean-room facility in an academic institute**
- ✓ **cGMP licensed manufacturing facility** in an academic institute
- ✓ **NABL accredited diagnostic services** for livestock diseases
- ✓ **Unique amalgamation of academic, industry and regulatory expertise under one umbrella**
- ✓ The **technology of thirteen products were transferred** in a period of eight years with 4 products available at market shelf
- ✓ Development of **unique products fulfilling unmet needs of animal sciences sector**
- ✓ **Catering to national requirements** – antibiotic resistance, farm-gate technologies, brucellosis, tuberculosis control, etc.,
- ✓ Offering various **animal disease diagnostic services** on clinical, regulatory and biotech based requirements at state and national level
- ✓ **Fostering interdisciplinary research** leading to the development of newer technologies fulfilling unmet needs for the animal science industry.
- ✓ Creating the **participatory ecosystem and handholding** the industry during technology development and transfer.
- ✓ Providing **industry ready trained manpower**.
- ✓ **Technology incubation** and many more.....

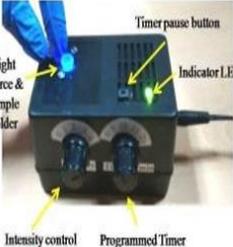
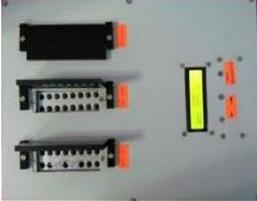
In 2011, when TRPVB was created as a partnership programme between DBT and TANUVAS, the academic, industry and the regulatory requirement were distantly apart. The activities of TRPVB during the last 8 years brought them closer which are evident by various achievements of the TRPVB in the area of technology development, technology commercialization, supply of in-house manufactured products, and offering high end biotechnology services to the farming community.

The following products / technologies / services developed at TRPVB have dramatically changed the landscape in this sector

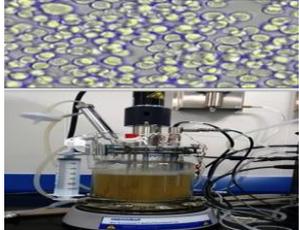
### Technologies developed and commercialized at TRPVB

S.No	Name of the Technology Developed	Technology details	Transferred details
1	<b>Quick Heal</b> 	Collagen based wound healing cream for wounds such as cracks in teats, chronic and deep wound, maggot wounds.	M/s Sihil Pharma Companion Health Division, Chennai
2	<b>Nano NDV</b> 	Beta Cyclodextrin and calcium Phosphate coupled Newcastle Disease Virus used as a vaccine was better than the commercial vaccine when given oculonasally during the first two weeks post vaccination. The birds vaccinated with the above nano-NDV vaccine were completely protected against virulent NDV challenge. Beta Cyclodextrin–CaP-NDV delivery of vaccines is a potential method for enhancing the immune responses of existing commercial vaccines.	M/s Hester Biosciences, Gujarat
3	<b>ABT Choice</b> 	The kit employs a novel concept of using a magnetic nanoparticle mediated entrapment of the bacteria and avoids pre-enrichment. Test results are read visually by colour change (colourless indicates resistance and blue colour sensitivity). Test results are available within 11 h and hence can be carried out at field level on wide variety of clinical samples. The kit also provides flexibility in the choice of antibiotics.	M/s Genomix Molecular Diagnostics Private Limited, Hyderabad

<p>4</p>	<p><b>Bovine Masticure PGF</b></p> 	<p>A freeze dried preparation of “bovine platelet lysate” (BPL) which can be used as an alternate complementary therapy for mastitis along with antibiotics. BPL has been shown in the literature to</p> <ul style="list-style-type: none"> <li>i) Accelerate healing of mammary gland parenchyma of mastitis affected animals.</li> <li>ii) Limits tissue damage and fibrosis</li> <li>iii) Reduce mastitis recurrence rates.</li> </ul>	<p>M/s Hester Biosciences, Gujarat</p>
<p>5</p>	<p><b>Collagen Beads</b></p> 	<p>Collagen beads were used to formulate a lentogenic-live New castle Disease vaccine for oral delivery. The bead preparation can be done at the farm by farmer using freeze dried commercial vaccine vial and collagen solution. The virus was viable in the collagen for more than 2 hrs at room temperature without any reduction in virus titer. The vaccine delivered through collagen beads elicits similar levels of HI titers compared to commercial vaccine.</p>	<p>M/s Hester Biosciences, Gujarat</p>
<p>6</p>	<p><b>Endomet B-PB</b></p> 	<p>Endo Met-PB is also intended to treat mild and moderate case of endometritis in bovines. It is also advised for usage as a post insemination supplement. Results showed significant decrease in nature of vaginal discharge in mild and moderate cases and in white side test &amp; significant reduction in leukocyte infiltration when evaluated on animals with different degrees of endometritis.</p>	<p>Commercialized to: M/s Genomix Molecular Diagnostics Private Limited, Hyderabad</p>
<p>7</p>	<p><b>Bovine TB Alert</b></p> 	<p>The OIE recommends use of sero diagnosis of BTB using bovine and avian protein purified derivatives in combination with TB specific proteins to increase specificity and sensitivity. TRPV/B Bovine TB alert kit™ is a rapid immune-chromatographic test for TB antibody detection with defined bovine TB specific antigens and crude Mycobacterium specific proteins meant for use in BTB sero-diagnosis.</p>	<p>Commercialized to: M/s Genomix Molecular Diagnostics Private Limited, Hyderabad.</p>

8	<p><b>Photolyser</b></p> 	A low-cost device, an indigenous alternate to a commercially available Photolyser.	Commercialized to: M/s. Endhiram Innovations, Chennai
9	<p><b>Portable Incubator</b></p> 	A low-cost device, as a supportive device for use in areas where the temperature is low (especially with the ABT choice kit)	Commercialized to: M/s. Endhiram Innovations, Chennai
10	<p><b>LAMP device</b></p> 	A low-cost battery-operated device. Enable performance of LAMP in field conditions	Commercialized to: M/s. Endhiram Innovations, Chennai
11	<p><b>CPV- VLP vaccine</b></p> 	Canine Parvoviral enteritis is one of the fatal diseases of dogs and many carnivores. The virus like particle based vaccine for CPV using baculovirus expression System (BEVS) was developed. The VLPs present authentic surface epitopes to immune cells, unlike sub-unit vaccines. The VLP purified proteins do not replicate the immunized animals unlike the conventional live virus vaccines.	Commercialized to : M/s Palamur Biosciences, Hyderabad

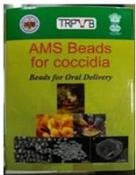
## Technologies under validation

S.No	Technologies	Utility
1.	<p><b>Sure Heal</b></p> 	<p>Sure heal is a collagen base wound healing base encapsulated with Gentamicin Sulphate for animal dermal applications is an unique combination of non-toxic and biocompatible ingredients that exerts multilevel antibacterial and antifungal effects which also enhances the re epithelialization, reduced inflammation, applied for oozing wound.</p>
2.	<p><b>Nano Herbal Methicon Lotion</b></p> 	<p>Nano Herbal Methicon lotion is formulated especially for companion animals. The active compound, Dimethicon oil and poly herbals are encapsulated in nanoform to increase their stability and minimize the dosage. This lotion is useful for the control of external parasites (ticks and Lice) and this lotion provides relief of irritation from dermatosis, such as allergic contact dermatitis.</p>
3.	<p><b>PCV LFA kit</b></p> 	<p>Porcine circo virus detection 2, a virulent strain detection using lateral Flow technique was developed using a recombinant protein at TRPVVB as a field-based technique. PCV2-associated reproductive disease seems to occur very sporadically under field conditions, but it has been characterized by late-term abortions and stillbirths, extensive fibrosing and/or necrotizing myocarditis in fetuses and the presence of moderate to high amounts of PCV2 in these lesions.</p>
4.	<p><b>Ketoquant</b></p> 	<p>Ketoquant, a rapid sensitive detection kit for ketosis is a colorimetric test which measures ketone bodies. It is an enzyme-based test that accurately detects ketone bodies in any biological sample. It is point of care diagnostic kit for the detection of increased ketone bodies that appear in the early lactating cows.</p>
5.	<p><b>Sarcoid cream</b></p> 	<p>Sarcoid gel is topical chemotherapy treatment with the active ingredient being 5-fluorouracil and zinc oxide. The use of intratumoural 5-fluorouracil compares favourably with other treatment modalities for sarcoids, with a long-term successful resolution rate in horses. The present gel is formulated for the smaller sarcoid equivalent to <math>\leq 2</math>cm.</p>
6.	<p><b>CPV2b Vaccine</b></p> 	<p>Low passage High titer vaccine developed for Canine Parvo enteritis in dogs. The virus was adopted in A72 cells and subcultured for 66 passages. The virus was up scaled at 45<sup>th</sup> passage, freeze dried and characterized. The safety studies in dogs are under progress at M/s Palamur biosciences.</p>

7.	PPRV BHK <sub>21</sub> suspension vaccine 	A BHK <sub>21</sub> adapted PPR vaccine was developed and experimentally tested in goats as per Indian Pharmacopoeia. The 0.1 x and 1x dose of the vaccine resulted in anti-PPRV antibodies by 14 <sup>th</sup> day post vaccination which increased significantly on 21 days post vaccination.
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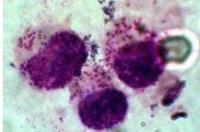
### Technologies Ready for commercialization

S.No	Technologies	Utility
1.	Nano ivermectin shampoo 	A novel nanotechnology-based ivermectin compound are encapsulated to increase the stability, reduce dosage to minimize toxicity with extended activity. It has antiparasitic and antimicrobial activity to prevent attack of parasitic diseases. This can be applied for dog infestations with ticks, fleas, mites and lice. It has acorus calamus and vertex negundo with added essential oil to promote the growth of fur coat. Commercialization negotiation with: M/S Indriyam Biologics Pvt, Ltd., SCTIMST – TIMED, Kerala.
2.	Nano Ivermectin spot on 	This is novel nanotechnology based Ivermectin Spot-On that can be applied for dogs. Ivermectin is a member of the macrocyclic lactone class of parasiticides. It is commonly used as a heartworm preventative in small animals and for the treatment of certain types of external (e.g., mites) and internal parasites in dog infestations with ticks, fleas, mites and lice.
3.	ABT Detect 	A simple, ready-to-use broad spectrum microbial screening assay kit containing freeze dried <i>Geobacillus stearothermophilus</i> as test organism was developed for preliminary screening of antibiotic residues in meat and milk samples.
4.	A1/A2 milk testing kit 	Cow's milk protein constitutes around 30% of $\beta$ -casein. It has been classified into two genetic types as A1 and A2. The A1 variant of $\beta$ -casein upon digestion leads to the formation of beta casamorphin. The A2 variant has been shown to have a positive association with milk yield and protein content. This kit provides the ingredients that can be used to perform the assay at small scale lab set up.

5.	<p>Lepto LAT</p> 	<p>Leptospirosis is a zoonotic disease of humans, domestic and wild mammals that poses a great threat to the public and personnel involved in their management. This Latex bead agglutination Test was developed as a quick preliminary field test to enable screening of suspected samples in field conditions. The recombinant antigen developed at our facility was coated on to latex beads and enables in testing the sera using agglutination as a criterion for serum positivity. The test is highly sensitive when compared with MAT test which is the gold standard for Leptospirosis detection.</p>
6.	<p>TRPVB – Classic Dog Shampoo</p> 	<p>TRPVB classic shampoo is a cocoamido propyl betaine-based formulation with more effective ingredients such as decylglycosidase, PEG 7 glycerolcocoate, poly quaternium, HPMC for easy penetrating in the skin for the purpose of cleaning and maintaining healthy skin. It contains natural moisturizing agents that hydrate the coat and skin and aid in preventing dryness and irritation. Benzoyl Peroxide Shampoo is ideal for conditions where a keratolytic vehicle may be beneficial and is an excellent degreaser for problem coats.</p>
7.	<p>Medicated gauze</p> 	<p>This nano medi gauze is primarily for the wound healing applications. This product contains chlorhexidine/silver nanoparticles coated with cotton gauze. This chemical constituents in the form of nanoparticles exhibit bactericidal effect against Gram positive and Gram-negative bacteria. This product tested on mice model indicated that the wound healing process was hastened by nanoparticles doped gauze significantly compared to open wounds.</p>
8.	<p>Metrozinc Gel</p> 	<p>Metronidazole gel prepared as a topical preparation (applied to the skin) of the antibiotic metronidazole and zinc oxide in the final formulation. It is an antibacterial and antiprotozoal formulation found to be effective against anaerobic bacterial infections including clostridium and fusobacterium species. It is used for reducing the swelling and redness caused by acne rosacea. It is also used to treat inflammatory bowel diseases, skin allergies and infection on animals which is caused by Bacteriodes and Clostridium species.</p>
9.	<p>AMS beads</p> 	<p>This formulation contained enteric coated cellulose which retains the gastrointestinal microbiome and improves the immunity against the infections in chickens. The developed formulation with the applicability on chickens produced significantly reduced fecal oocysts compared to E. maxima-infected group fed standard diet.</p>
10.	<p>Probeads-EC</p> 	<p>Unique polymer based enteric coated probiotic beads. Targeted delivery of probiotic supplement for poultry birds so as to maintain gut health in chicken by competitive exclusion of pathogens.</p>

11.	<p>AMS green tea</p> 	<p>This aluminum magnesium silicate is used as an antacid and this formulation have been shown to significantly inhibit the sporulation process of coccidian oocysts while the selenium and polyphenolic compounds in green tea are thought to be active compounds to inactivate the enzymes responsible for coccidian sporulation while protecting the intestinal architecture.</p>
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### Technologies under development

S.No.	Technologies	Utility
1.	CaniCHEW	A starch based chew with anti-tartar agents for maintaining the oral hygiene of dogs
2.	CaniPRO gel	A probiotic incorporated oral gel for ensuring oral hygiene and prevention of halitosis in dogs
3.	<p>Freeze dried egg yolk for semen extender</p> 	<p>A freeze-dried form of egg yolk which could be used as an alternate for the routinely used fresh egg yolk-based semen extender at bull stations. The product is formulated as a ready to use egg powder instead of fresh yolk to avoid the tedious process of fresh egg procurement and yolk separation, which involves skilled personnel which is a time-consuming process.</p>
4.	<p>Pan ABT detect</p> 	<p>Antibiotic residue in meat is a most important health concern due to its harmful effects on health of consumers. There are different classifications of antibiotics used in poultry farms, continues use of antibiotics leads to presence of trace amount in meat. ABT Pan Detect kit quantitatively detects the antibiotic residues present in the sample by colour reaction. Bacterial growth aids in color change from blue to yellow,</p>
5.	<p>CPV and Rabies antibody dual kit</p> 	<p>A lateral flow assay (LFA) kit is developed to identify Rabies virus and CP V specific antibodies simultaneously in dog sera</p>
6.	<p>Cysticercosis LFA kit</p> 	<p>A lateral flow based diagnostic kit for the detection of Cysticercosis (Neurocysticercosis) inhuman and animals.</p>
7.	<p><i>Theileria annulata</i> Vaccine</p> 	<p>Cell culture based Live attenuated <i>Theileriaannulata</i> schizont infected lymphocyte vaccine for tropical bovine theileriosis is being developed at TRPVB. Five different <i>T. annulata</i> isolates are being continuously passaged more than 160 times and verified for virulence. <i>Invitro</i> studies confirmed that three <i>T. annulata</i> isolates are showing the signs of attenuation.</p>

## Regulatory services offered by TRPVB

S. No.	Test Performed	Regulatory Status
1.	<p><b>Semen station bulls tested for brucellosis</b>                      Monoclonal antibodies-based blocking ELISA for Brucella antibody detection in Bovine serum                      This test is required for regulatory compliances as per the minimum standard protocol for semen station bulls, GOI.</p>	Accredited under NABL, ISO/IEC 17025; 2017
2.	<p><b>Trichomonas</b>                      Identification of Trichomonas Foetus using Inpouch kit.                      This test is required for regulatory compliances as per the minimum standard protocol for semen station bulls, GOI.)</p>	Accredited under NABL, ISO17025:2017
3.	<b>Infectious Bovine Rhinotracheitis (IBR)</b>	
a.	Screening of Infectious Bovine Rhinotracheitis (IBR) viral genome in bull semen using Real-time PCR. This test is required for regulatory compliances as per the minimum standard protocol for semen station bulls, GOI.	Not Accredited
b.	Infectious Bovine Rhinotracheitis (IBR) gB Antibodies detection by ELISA: ELISA testing for detection of IBR gB antibodies in Bovine serum is provided as a service from TRPVB. This works on principle of anti-gB monoclonal antibody blocking immunoassay.	Not Accredited

## Other Biotech Services Offered by TRPVB

S. No.	Test Performed
1.	Johne's Disease antibodies detection by ELISA
2.	EVANS Syndrome Testing
3.	A1/A2 genetic screening services for cows
4.	Detection of canine haemoprotozoan parasites
5.	Flow Cytometry

## Human Resource Development at TRPVB

S. No.	HRD ACTIVITIES
1.	Animal Biotechnology Career Enhancement Programme (ABCEP)
2.	Internees at TRPVB
3.	PhD / M.Tech Students