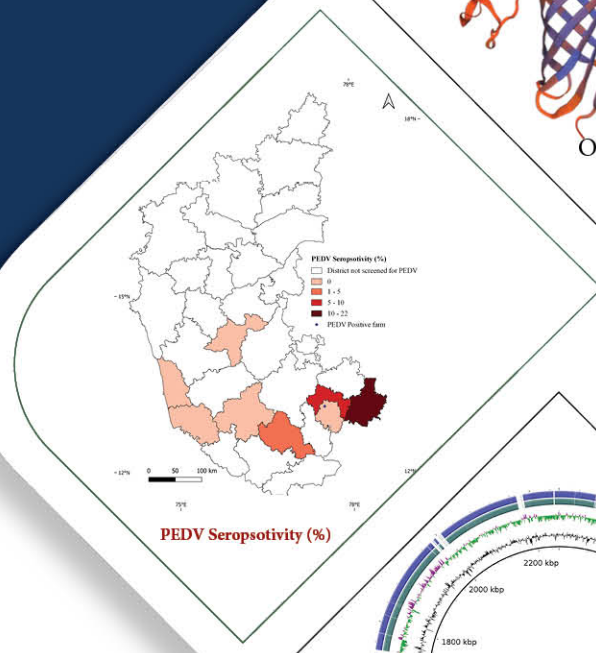
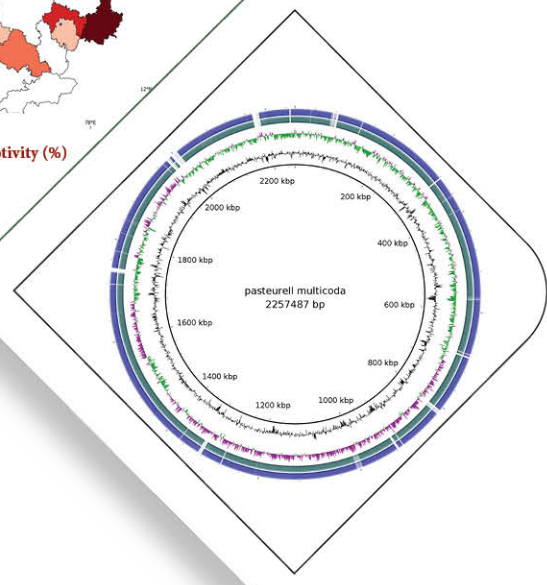


OmpA protein
Pm 19



PEDV Seropositivity (%)



pasteurell multocoda
2257487 bp

वार्षिक प्रतिवेदन

Annual Report

2023

ICAR-National Institute of Veterinary Epidemiology and Disease Informatics - Annual Report 2023

ICAR-National Institute of Veterinary Epidemiology and Disease Informatics



Celebration of 36th Foundation Day of ICAR-NIVEDI on 1 July 2023



वार्षिक प्रतिवेदन 2023

Annual Report 2023

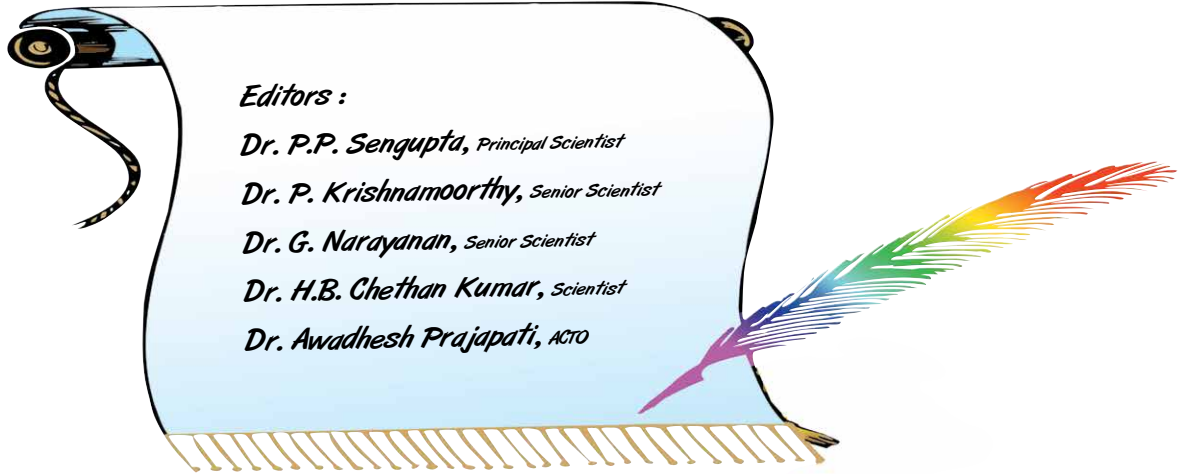
ICAR-National Institute of Veterinary Epidemiology and Disease Informatics

Post Box No. 6450, Ramagondanahalli, Yelahanka, Bengaluru-560064, Karnataka, India

Ph: +91 80 23093100; 23093110; 23093111 Fax: +9180 23093222

Website: www.nivedi.res.in





Editors :

Dr. P.P. Sengupta, Principal Scientist

Dr. P. Krishnamoorthy, Senior Scientist

Dr. G. Narayanan, Senior Scientist

Dr. H.B. Chethan Kumar, Scientist

Dr. Awadhesh Prajapati, ACRO

Copyright © 2023 ICAR-National Institute of Veterinary Epidemiology and Disease Informatics.
All rights are reserved by the Organization.

Citation:

*Sengupta PP, Krishnamoorthy P, Narayanan G, Chethan Kumar HB, Awadhesh Prajapati (2024).
ICAR-National Institute of Veterinary Epidemiology and Disease Informatics, Annual Report 2023.
Pages vi+118*

Designed by :

*Dr. P.P. Sengupta, Dr. P. Krishnamoorthy, Dr. G. Narayanan, Dr. H.B. Chethan Kumar,
Dr. Awadhesh Prajapati*

About the cover page :

Front cover page : Images depicting various activities of ICAR-NIVEDI, Bengaluru

Back cover page : Independence day Celebration at ICAR-NIVEDI, Bengaluru

Published by

The Director

ICAR-National Institute of Veterinary Epidemiology and Disease Informatics
Post Box No.6450, Ramagondanahalli, Yelahanka, Bengaluru - 560064, Karnataka.
Email:director.nivedi@icar.gov.in Website:www.nivedi.res.in
Phone: 080-23093110, 23093111, 23093100

Follow us on  @icar_nivedi  /icarnivediofficial  @icarnivedi3383

Disclaimer :

The trademark, proprietary product or firm mentioned in the report does not constitute an endorsement or rejection of other suitable products or firms.

Printed at: CNU Graphic Printers, Bengaluru. Mobile : 9880 888 399

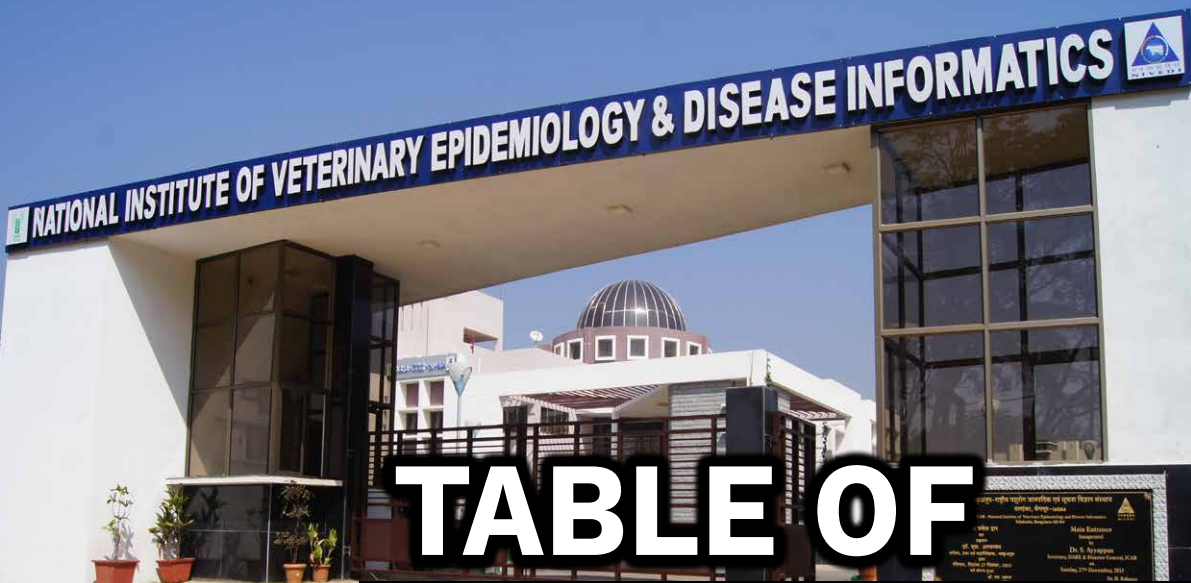


TABLE OF

CONTENTS

01	EXECUTIVE SUMMARY कार्यकारी सारांश
09	INTRODUCTION
17	RESEARCH ACHIEVEMENTS
51	CAPACITY DEVELOPMENT, EDUCATION AND TRAININGS
65	PARTICIPATION IN TRAINING/WORKSHOP/ CONFERENCE/MEETING
71	OUTREACH, EXTENSION AND INSTITUTIONAL ACTIVITIES
81	ONGOING RESEARCH PROJECTS
87	TECHNOLOGY DEVELOPMENT AND COMMERCIALIZATION
89	PUBLICATIONS
103	AWARDS, RECOGNITIONS AND PERSONAL MILESTONES
109	IRC, RAC AND OTHER REVIEW MEETINGS
114	DISTINGUISHED VISITORS



Dr. Himanshu Pathak, Hon'ble Secretary, DARE and Director General, ICAR visited ICAR-NIVEDI on 30 August 2023

Director's Foreword

In the realm of veterinary epidemiology and disease informatics, ICAR-NIVEDI stands as a beacon of excellence, tirelessly dedicated to unravelling the complexities of livestock diseases and safeguarding animal health. As the Director of ICAR-NIVEDI, I am honoured to present the institute's remarkable achievements in 2023 in this annual report.

Throughout the year, our research endeavours have yielded groundbreaking outcomes, from the development of advanced diagnostic kits for diseases including Lumpy Skin Disease (LSD) and Peste des Petits Ruminants (PPR) to elucidating disease prevalence and transmission dynamics. Collaborative partnerships, both national and international, have amplified our impact, expanded our laboratory capabilities, and facilitated knowledge exchange.

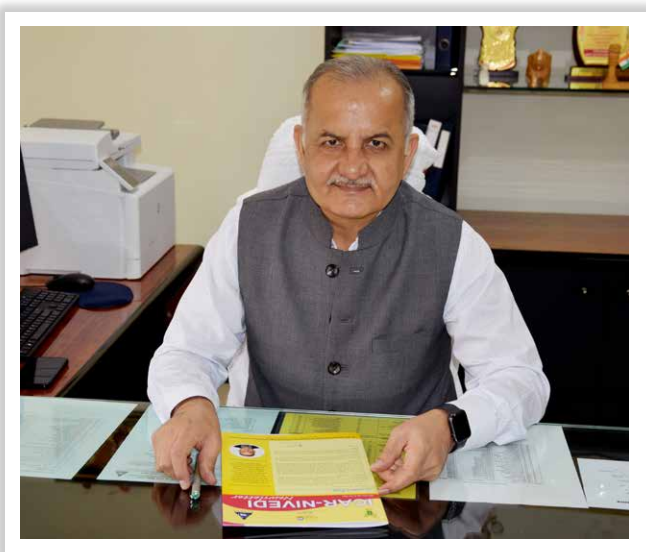
Beyond research, our institute has prioritized capacity building and knowledge dissemination through workshops, conferences, and training programs. Our proactive communication strategies have empowered stakeholders with timely alerts about disease outbreaks. Our initiatives supporting marginalized communities underscore our commitment to societal welfare. As we navigate the evolving landscape of animal health, ICAR-NIVEDI remains steadfast in its commitment to transformative change, leveraging research, partnerships, and a dedicated workforce to enhance food security and foster sustainable development.

I express my sincere gratitude to Hon'ble Secretary, DARE and Director General, ICAR, Dr Himanshu Pathak, and Deputy Director General (Animal Science), ICAR, Dr Raghavendra Bhatta and his

predecessor, Dr Joykrushna Jena for their vision, constant guidance, and generous support during the year. I profusely thank Assistant Director General (Animal Health), ICAR, Dr. Ashok Kumar for his cooperation, encouragement, and support. The institute conveys sincere thanks to all PIs, Co-PIs, and the staffs of National Animal Disease Epidemiology Network (NADEN) centres located in different states/ UT's and their respective Animal Husbandry Departments/ Universities for their valuable inputs, suggestions, and consistent cooperation.

The feedback on this year's annual report from all our stakeholders and readers on livestock disease epidemiology and informatics is solicited for improving the national livestock health and thereby the income of livestock farmers in the country.

(Baldev Raj Gulati)



Kannada Rajyotsava Celebration at ICAR-NIVEDI on 17 November 2023



01

Executive Summary

ICAR-NIVEDI is recognized as a forefront research institute with a focus on research and development in veterinary epidemiology and disease informatics. It undertakes crucial disease surveillance, monitoring and the assessment of livestock diseases' impact across India via its network of collaborative centres located in various states. The institute's contributions are pivotal in the development of disease models, conducting risk analyses, forecasting and forewarning of animal diseases, and creating diagnostic kits for epidemiological surveys in field diagnosis. It maintains both national and international collaborations with diverse organizations and stakeholders, aimed at joint research initiatives, enhancing laboratory capabilities, and fostering human resource development. Throughout 2023, ICAR-NIVEDI has made notable advancements in its research and development activities, which are summarized below.

During the reported period, notable achievements include the development of an ELISA kit using recombinant ORF117 of the Lumpy Skin Disease Virus (LSDV), which demonstrated 100% sensitivity and 95% specificity across 4990 bovine serum samples nationwide. Furthermore, an iELISA employing rNaH proteins was developed to detect the antibodies against *P. multocida* and it showed 86.2% sensitivity and specificity of 80.0 %. A 22% sero-positivity

for anti *P. multocida* specific antibodies was observed on screening of 250 bovines.

The sero-surveillance of infectious bovine rhinotracheitis, conducted using an in-house diagnostic kit, revealed a sero-prevalence of 20.97% (2,702 out of 12,879) in a nationwide screening. In a separate study, screening of 150 Mithun serum samples for antibodies against PPRV indicated a sero-prevalence of 13.9%. Additionally, 579 human patients presenting with pyrexia of unknown origin were tested using the MAT technique for anti-*Leptospira* antibodies, resulting in a 4.31% sero-positivity rate. Another study screened 444 buffaloes for brucellosis using a protein-G based ELISA, recording a sero-prevalence of 9.09%, with the highest sero-prevalence found in Haryana at 10.44% and the lowest in Arunachal Pradesh at 2.12%. Further, a comprehensive screening of 5,184 bovines (comprising 3,952 buffaloes, 1,072 cattle, and 160 mithun) across 20 states with an rVSG based iELISA for antibodies against *T. evansi* showed an overall sero-prevalence of 14.7%. In a specific outbreak investigation, PCR screening of 33 animals for *Theileria* species returned positive results for all animals. Subsequent screenings post-treatment revealed that the animals remained positive for up to six months post-infection.

In a study on mastitis, out of 221 milk samples, 38% were found to be clinically

positive for mastitis, and 5.8% were identified as subclinical cases. Analysis of 84 samples for mastitis pathogens detected *Staphylococcus* species and *E. coli*, with 16 samples showing MRSA positivity via PCR. The prevalence rates of MRSA were 9.69% in livestock, 5.79% in animal handlers, and 5.88% in environmental samples. Groundbreaking research confirmed the presence of Lumpy Skin Disease (LSD) in Mithun, marking the first such documentation in India. This was established through PCR amplification, sequence analysis, and serological methods. Phylogenetic analysis of the LSD virus, based on the RPO30 and P32 genes from both Mithun and cattle, showed 100% sequence identity, suggesting the circulation of an identical strain among these species and potential interspecies transmission. Similar findings were observed in cattle and yaks, with virus isolation and gene amplification studies indicating identical genetic profiles to LSDV strains prevalent in the Indian subcontinent, highlighting the widespread nature and genetic consistency of LSDV across different species and regions.

Screening for bovine tuberculosis among 116 bovines in Karnataka indicated a 16.4% positive rate using the single cervical tuberculin test, while the comparative cervical tuberculin test showed a 0.9% positivity rate. Additionally, conventional PCR screening for malignant catarrhal fever (MCF) in 64 bovines identified 6 positive cases. Sequencing and phylogenetic analyses highlighted a significant genetic similarity between the MCF virus isolates found in India and those in Egypt.

In another study, 50 tick samples underwent DNA barcoding using the COX1 gene, which confirmed their identification as belonging to the *Haemaphysalis* species. Furthermore, allele-specific PCR testing of 148 *R. microplus* ticks collected from the Bengaluru and Kolar districts in Karnataka revealed genetic resistance profiles: 32 ticks (21.6%) were found to be homozygous resistant (RR), 63 ticks (42.5%)

were homozygous susceptible (SS), and 53 ticks (35.8%) exhibited a heterozygous (RS) profile. This data contributes to the understanding of tick resistance patterns in the region, which is crucial for managing tick-borne diseases effectively.

ICAR-NIVEDI conducted a comprehensive study on antimicrobial usage (AMU) in livestock, particularly focusing on sheep farming. The study found the average quantities of antimicrobials used were 640.87 grams of enrofloxacin, 626.47 grams of gentamicin, 620.42 grams of oxytetracycline, and 280.56 grams of ciprofloxacin. This research highlights the reliance on these antibiotics in managing health in sheep farms, underlining the importance of monitoring and potentially optimizing antimicrobial use to prevent resistance.

In serological surveillance efforts, a study using an rNS1-NS3 fusion protein-based i-ELISA detected a 15% sero-prevalence of anti-BTV (Bluetongue virus) antibodies in a sample of 754 sheep. This finding contributes to understanding the spread of Bluetongue disease within the sheep population. A large-scale screening of 52,367 sheep and goat serum samples by a competitive ELISA (c-ELISA) kit for *Peste des Petits Ruminants* (PPR) antibody detection revealed a 47.54% sero-prevalence at the pre-vaccination stage. This rate increased to 73.4% sero-conversion in a post-vaccination analysis of 1,102 samples, demonstrating the effectiveness of vaccination campaigns against PPR in these populations. Additionally, a survey using a commercial CCPP (Contagious Caprine Pleuropneumonia) ELISA kit screened 244 serum samples from sheep and goats, recording a 13.11% sero-prevalence of CCPP. Furthermore, a meta-analysis study indicated an overall CCPP prevalence of 20% in small ruminants, emphasizing the presence and impact of this disease in the targeted animal populations. These studies provide crucial data for the ongoing management and control strategies against

significant infectious diseases in small ruminants.

During outbreak investigations in small ruminants in Mizoram, Karnataka, and Madhya Pradesh, PPRV isolates were identified and classified as belonging to lineage IV. In separate outbreak investigation in J&K on Bluetongue Virus (BTV), two serotypes, namely serotypes 1 and 9, were isolated and genetically sequenced. These findings are significant to the understanding of PRV and BTV's genotypic diversity essential for implementing control measures. A clinical study investigating the presence of *Pasteurella multocida* in sheep found that 8 out of 201 sheep tested positive. Phylogenetic analysis based on the OmpA protein sequence revealed the presence of a transmembrane domain with 8 antiparallel beta sheets, 4 periplasmic turns, and 4 long extracellular loops. This detailed genetic characterization contributes to the understanding of the bacterium's structure and pathogenicity, aiding in the development of diagnostic tools and treatments. Additionally, a study on *Clostridium perfringens* infection in sheep found that 13 out of 90 animals tested positive via PCR.

ICAR-NIVEDI's extensive work over the year also encompassed the diagnosis and surveillance of pig diseases, achieving significant advancements in this area. The institute standardized a virus neutralization test for the Japanese encephalitis virus (JEV), revealing that 177 out of 447 pig samples tested positive for JEV neutralizing antibodies. Furthermore, the development of an indirect ELISA using recombinant GP50 to detect antibodies against *Taenia solium* in pigs showcased a high sensitivity (96.2%) and specificity (98%), with a positive cutoff set at 53%. A comprehensive nationwide sero-prevalence study of the classical swine fever virus (CSFV) involved screening 14,450 pigs across 11 states. The results indicated a 34.15% sero-prevalence rate in the pre-vaccination stage, which significantly increased to 52.65% post-

vaccination, demonstrating the impact of vaccination efforts on controlling this disease. Additionally, a study on Porcine Epidemic Diarrhoea Virus (PEDV) found a 6.97% sero-positivity rate among 446 screened pigs.

Whole genome sequencing of two *Pasteurella multocida* strains from pigs revealed their allocation into different genetic clusters. A detailed correlative analysis of virulence-associated (VA) genes and an antibiotic resistance study highlighted the diversity of virulence factors, mobile genetic elements, and antimicrobial resistance genes within the pangenome of *P. multocida* of porcine origin. Notably, the analysis also pointed out the rare presence of the LPS genotype in serogroup D, shedding light on the genetic diversity and potential health implications of these bacterial strains in pigs.

During this period, ICAR-NIVEDI made significant progress in disease outbreak data management and risk prediction. The National Animal Disease Referral Expert System (NADRES) database was updated with outbreak data from 136 districts, facilitating the risk prediction for 14 significant diseases including anthrax, African swine fever, babesiosis, black quarter, bluetongue, classical swine fever, enterotoxaemia, fascioliasis, foot and mouth disease, hemorrhagic septicemia, lumpy skin disease (LSD), peste des petits ruminants (PPR), sheep and goat pox, theileriosis, and trypanosomosis.

Furthermore, ICAR-NIVEDI has continued developing sampling plans for state-wise sero-surveillance under the National Animal Disease Control Programme (NADCP) for diseases such as foot and mouth disease (FMD), brucellosis, classical swine fever (CSFV), and PPR. The integration of artificial intelligence (AI) and machine learning (ML) tools for risk estimation and prediction, particularly for anthrax, represents a cutting-edge approach to disease forecasting, which is expected to enhance

disease control measures. To communicate risks to stakeholders efficiently, more than 96 lakh SMS alerts were sent to livestock holders of the state of Karnataka, informing them about the probability of occurrence of various infectious animal diseases. This proactive communication strategy is vital for the early warning and rapid response to disease outbreaks, potentially saving significant economic losses and improving animal health management.

The activities undertaken to assess the economic impact of livestock diseases have provided insightful data on the transient estimated milk loss due to Lumpy Skin Disease (LSD) in Rajasthan and Gujarat. The estimated losses vary significantly between indigenous and crossbred cattle, with indigenous cattle in Rajasthan experiencing losses between Rs.1,624 to Rs.14,399 and crossbred cattle facing higher losses, ranging from Rs.1,648 to Rs.19,500. In Gujarat, the impact was somewhat different, with indigenous cattle suffering losses between Rs.599 to Rs.14,998, and crossbred cattle experiencing even greater losses, from Rs.2,698 to Rs.13,497. These figures underscore the severe economic burden that LSD can impose on cattle owners, affecting both milk production and, consequently, income. Additionally, under the Development of Action Plan for Scheduled Castes, the Institute took initiative of distributing 138 Osmanabadi goats to 46 SC families. This initiative not only supported the livelihoods of marginalized communities but also promoted goat farming as a viable economic activity, contributing to the poverty alleviation of SC communities.

ICAR-NIVEDI organised PPR-GREN meeting in collaboration with Food and Agriculture Organization (FAO) of the United Nations and World Organisation for Animal Health (WOAH) during 27-30th November 2023. A total of 165 global experts (including 100 online) from 35 countries across the globe participated in the event. Further, virtual workshop on “Epidemiological Approaches

to Prevent and Control Transboundary Animal Diseases with Special Focus on Zoonotic Diseases and Foot and Mouth Diseases” was jointly organised by ICAR-NIVEDI and ICAR-NIFMD under the aegis of Bay of Bengal Initiative for Multi-sectoral, Technical and Economic Cooperation (BIMSTEC) during 3-12th October 2023. The workshop was attended by the participants from Bhutan, India, Myanmar, Nepal, Thailand and Sri Lanka. ICAR-NIVEDI in collaboration with Indian Virological Society organized national workshop on “Lumpy Skin Disease in India: Current Scenario and Future Challenges” on 27th January 2023. During the meeting, the need for national control program, post-vaccination monitoring and genomic surveillance of LSD in India was emphasized. In addition, two national level hands-on trainings on laboratory diagnosis of brucellosis and leptospirosis were organised for district level medical microbiologists under NCDC program.

During the year, ICAR-NIVEDI established Memorandums of Understanding (MoUs) with the Tata Institute for Genetics and Society (TIGS), Bengaluru; Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Bidar; Dayananda Sagar University, Bengaluru; and Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST), Kashmir. These MoUs were signed to foster collaboration in research and development, including postgraduate research, faculty exchange for training, research, and study, in line with ICAR guidelines.

During this period, ICAR-NIVEDI generated revenue of Rs 42.15 lakhs through the sales of various diagnostic kits and services. Additionally, the institute secured two international projects funded by the Defence Threat Reduction Agency (DTRA), USA, and the UK Centre for Ecology & Hydrology (UKCEH), along with six research projects funded by national agencies such as the Department of Biotechnology (DBT) and the Department of Animal Husbandry

and Dairying (DADF) during 2023, receiving a total grant of 746.29 lakhs.

ICAR-NIVEDI staff achieved significant recognition, securing 15 awards in total. These included three fellowships from prestigious national academies/societies, six awards for research presentations at national conferences, and four medals at the ICAR South Zone Sports Event.

The Livestock Disease Diagnosis Laboratory (LDDL) of ICAR-NIVEDI received NABL Accreditation (ISO/IEC 17025:2017) for diagnosing PPR and Leptospirosis on 5th December 2023. Additionally, the PPR research laboratory, part of the WOAHP Reference Laboratory Network for PPR, was inaugurated for surveillance and monitoring under the PPR Eradication Program (PPR-EP). ICAR-NIVEDI has also applied for the recognition of its PPR and Leptospirosis laboratories as WOAHP Reference Laboratories. Furthermore, ICAR-NIVEDI contributed significantly to drafting the “National Strategic Plan for PPR Eradication 2030” for the Department of Animal Husbandry and Dairying (DAHD), Government of India (GOI).

During the year, ICAR-NIVEDI had four of its technologies certified by ICAR: the ABrC-ELISA kit/PPR Ab Chek kit, Indirect ELISA

for bluetongue population surveys, the National Animal Disease Referral Expert System (NADRES V2), and the Bovine Lepto LAT Kit (Rapid Test). Additionally, the institute was granted two Indian patents and two copyrights in 2023.

ICAR-NIVEDI scientists published 72 research papers in the year, with 18 papers having a NAAS rating above 9.0, and 28 papers with NAAS rating between 6.0 and 9.0. During this period, ICAR-NIVEDI scientists were also inducted as faculty members at IVRI Deemed University. Moreover, ICAR-NIVEDI joined the Bengaluru Academic Hub of IVRI Deemed University, contributing to postgraduate teaching in Veterinary Microbiology and Veterinary Public Health & Epidemiology.

The remarkable strides made by ICAR-NIVEDI in the past year underscore its unwavering commitment to excellence in veterinary epidemiology and disease informatics. Through its innovative research, strategic partnerships, and significant contributions to disease surveillance and control, the institute continues to play a vital role in enhancing animal health, public safety, and economic stability across India and beyond.

01

कार्यकारी सारांश

भाकृ.अनु.प.-निवेदी को पशुरोग जानपदिक एवं रोग सूचना विज्ञान में अनुसंधान और विकास पर केंद्रित एक प्रमुख अनुसंधान संस्थान के रूप में मान्यता प्राप्त है। यह भारत भर में विभिन्न राज्यों में स्थित अपने सहयोगी केंद्रों के नेटवर्क के माध्यम से पशुधन रोगों की निगरानी, संवीक्षण और प्रभाव के मूल्यांकन का महत्वपूर्ण कार्य करता है। संस्थान का योगदान रोग मॉडलों के विकास, जोखिम विश्लेषण करने, पशु रोगों की भविष्यवाणी और पूर्व सूचना देने, और क्षेत्रीय निदान में महामारी विज्ञान सर्वेक्षणों के लिए नैदानिक किट बनाने में निर्णायक है। यह विविध संगठनों और हितधारकों के साथ राष्ट्रीय और अंतरराष्ट्रीय सहयोग बनाए रखता है, जो संयुक्त अनुसंधान पहलों, प्रयोगशाला क्षमताओं को बढ़ाने, और मानव संसाधन विकास को प्रोत्साहित करने पर लक्षित हैं। वर्ष 2023 के दौरान, संस्थान ने अपनी अनुसंधान और विकास गतिविधियों में उल्लेखनीय प्रगति की है, जिसे नीचे संक्षेप में बताया गया है।

इस अवधि के दौरान, उल्लेखनीय उपलब्धियों में लम्पी स्किन डिजीज वायरस (LSDV) के रिकॉम्बिनेंट ORF117 का उपयोग करके एक ईलिसा किट का विकास शामिल है, जिसने देशभर में 4990 गोवंशीय सीरम नमूनों में 100% संवेदनशीलता और 95% विशिष्टता प्रदर्शित की। इसके अलावा, पैस्टुरेला मल्टोसिडा (*P. multocida*) के खिलाफ एंटीबॉडीज का पता लगाने के लिए rNaH प्रोटीनों का उपयोग करके एक iELISA विकसित किया गया, जिसने 86.2% संवेदनशीलता और 80.0% विशिष्टता दिखाई। 250 गोवंशीयों की जांच पर *P. multocida* विशिष्ट एंटीबॉडीज के लिए 22% सीरो-पॉजिटिविटी देखी गई। संक्रामक गोवंशीय राइनोट्रेकाइटिस (IBR) की सीरो-निगरानी, एक घरेलू नैदानिक किट का उपयोग करके की गई, जिसने देशभर में स्क्रीनिंग में 20.97% (2,702 में से 12,879) की सीरो-प्रोवेलेंस दर्ज की। एक अन्य अध्ययन में, पेस्ट-दे-पेटी-रुमिनेट्स (PPR) के खिलाफ एंटीबॉडीज के लिए 150 मिथुन सीरम नमूनों की जांच की गई, जिसमें 13.9% की सीरो-प्रोवेलेंस दर्ज की गई। इसके अतिरिक्त, अज्ञात मूल के पायरेक्सिया से पीड़ित 579 मानव रोगियों की एंटी-लेटोस्पायरा एंटीबॉडीज के लिए MAT तकनीक का उपयोग करके जांच की गई, जिसमें 4.31% सीरो-पॉजिटिविटी दर दर्ज की गई। एक और अध्ययन में, ब्रुसेल्लोसिस के लिए 444 भैंसों की जांच एक प्रोटीन-जी आधारित ईलिसा का उपयोग करके की गई, जिसमें 9.09% की सीरो-प्रोवेलेंस दर्ज की गई, जिसमें हरियाणा

में सबसे अधिक सीरो-प्रोवेलेंस 10.44% और अरुणाचल प्रदेश में सबसे कम 2.12% पाया गया।

इसके अलावा, 20 राज्यों में फैले 5,184 गोवंशीयों (3,952 भैंसों, 1,072 मवेशियों और 160 मिथुनों को मिलाकर) की ट्रायपनोसोमोसिस (*T. evansi*) के खिलाफ एंटीबॉडीज के लिए एक rVSG आधारित iELISA के साथ व्यापक स्क्रीनिंग में 14.7% की समग्र सीरो-प्रोवेलेंस दर्ज की गई। एक विशिष्ट प्रकोप जांच में, थेलेरिया के लिए 33 जानवरों की PCR स्क्रीनिंग में सभी पशु संक्रमित पाए गए। उपचार के बाद की गई बाढ़ की स्क्रीनिंगों में पाया गया कि जानवर संक्रमण के छह महीने बाद तक सकारात्मक बने रहे। मैस्टाइटिस रोग के एक अध्ययन में, 221 दूध के नमूनों में से 38% को मैस्टाइटिस रोग के लिए नैदानिक रूप से सकारात्मक पाया गया, और 5.8% को उप-नैदानिक मामले के रूप में पहचाना गया। मैस्टाइटिस रोगजनकों के लिए 84 नमूनों के विश्लेषण में स्टैफ़िलोकोकस प्रजातियाँ और ई. कोलाई पाया गया, जिनमें से 16 नमूनों में PCR के माध्यम से MRSA सकारात्मकता दिखाई गई। पशुधन में MRSA की प्रवृत्ति दरें 9.69%, पशु पालकों में 5.79%, और पर्यावरणीय नमूनों में 5.88% थीं।

हमारे नवाचारी अनुसंधान ने मिथुन में लम्पी त्वचा रोग (LSD) की उपस्थिति की पुष्टि की, जो मिथुन में LSD संक्रमण का पहला उदाहरण है। यह PCR एम्प्लीफिकेशन, अनुक्रम विश्लेषण, और सीरोलॉजिकल विधियों के माध्यम से स्थापित किया गया था। आरपीओ-30 और P32 जीनों पर आधारित LSD वायरस का फाइलोजेनेटिक विश्लेषण ने मिथुन और गायों दोनों से 100% अनुक्रम पहचान दिखाया, जिससे इन प्रजातियों के बीच प्रसार और संभावित अंतर-प्रजाति संचरण का सुझाव मिलता है। उसी प्रकार याक्स में LSDV की संक्रमण की पुष्टि हुई, वायरस अलगवाव और जीन एम्प्लीफिकेशन अध्ययनों ने भारतीय उपमहाद्वीप में प्रचलित LSDV वायरस के याक्स और गायों दोनों से समान आनुवंशिक प्रोफाइलों का संकेत दिया, जिससे विभिन्न प्रजातियों और क्षेत्रों में LSDV की व्यापक प्रकृति और अंतर-प्रजाति संचरण का पता चलता है।

कर्नाटक में 116 गोवंशीयों में क्षय-रोग (bovine TB) की जांच से, एकल ट्यूबरकुलिन परीक्षण का उपयोग करते हुए 16.4% सकारात्मकता दर दर्ज की गई, जबकि तुलनात्मक दोहरे ट्यूबरकुलिन परीक्षण ने 0.9% सकारात्मकता दर दिखाई। इसके अतिरिक्त, मलियेंट कैटरल फीवर

(MCF) के लिए 64 गोवंशीयों की पारंपरिक PCR स्क्रीनिंग ने 6 सकारात्मक मामले पहचाने। अनुक्रमण और फाइलोजेनेटिक विश्लेषणों ने भारत और मिस्र में पाए गए MCF वायरस के बीच एक महत्वपूर्ण आनुवंशिक समानता को उजागर किया।

एक अन्य अध्ययन में, 50 टिक्स (ticks) नमूनों की COX1 जीन का उपयोग करके DNA बारकोडिंग की गई, जिसने उनकी पहचान हेमाफिसालिस प्रजातियों के रूप में पुष्ट की। इसके अलावा, कर्नाटक के बेंगलुरु और कोलार जिलों से एकलित 148 *R. microplus* टिक्स की जीन विशिष्ट PCR परीक्षण ने जेनेटिक प्रतिरोध प्रोफाइल का पता लगाया: 32 टिक्स (21.6%) होमोजाइगस प्रतिरोधी (RR) पाए गए, 63 टिक्स (42.5%) होमोजाइगस संवेदनशील (SS) थे, और 53 टिक्स (35.8%) ने हेटरोजाइगस (RS) प्रोफाइल प्रदर्शित किया। यह डेटा क्षेत्र में टिक प्रतिरोध पैटर्न की समझ में योगदान देता है, जो टिक-जनित रोगों को प्रभावी ढंग से प्रबंधित करने के लिए महत्वपूर्ण है।

भा.कृ.अनु.प.-निवेदी ने पशुधन में एंटीमाइक्रोबियल उपयोग (AMU) पर एक व्यापक अध्ययन किया, विशेष रूप से भेड़ पालन पर ध्यान केंद्रित किया। अध्ययन ने पाया कि उपयोग की गई एंटीमाइक्रोबियल्स की औसत मात्राएँ 640.87 ग्राम एनरोफ्लॉक्सासिन, 626.47 ग्राम जेंटासाइसिन, 620.42 ग्राम ऑक्सीटेट्रासाइक्लिन, और 280.56 ग्राम सिप्रोफ्लॉक्सासिन थीं। यह अनुसंधान भेड़ फार्मों में स्वास्थ्य प्रबंधन में इन एंटीबायोटिक्स पर निर्भरता को उजागर करता है, और प्रतिरोध को रोकने के लिए एंटीमाइक्रोबियल उपयोग की निगरानी और संभवतः अनुकूलन करने के महत्व को रेखांकित करता है।

सीरोलॉजिकल निगरानी प्रयासों में, एक अध्ययन ने एक rNS1-NS3 फ्यूजन प्रोटीन-आधारित i-ELISA का उपयोग करके 754 भेड़ों के नमूने में ब्लूटंग वायरस एंटीबॉडीज की 15% सीरो-प्रीवैलेंस का पता लगाया। यह निष्कर्ष भेड़ों की आबादी में ब्लूटंग रोग के प्रसार की समझ में योगदान देता है। भेड़ और बकरी के 52,367 सीरम नमूनों की स्क्रीनिंग, पेस्ट-दे-पेटी-रुमिनेंट्स (PPR) एंटीबॉडी का पता लगाने के लिए एक प्रतियोगी ईलिसा (c-ELISA) किट का उपयोग करके की गई, जिसमें टीकाकरण से पहले की अवस्था में 47.54% सीरो-प्रीवैलेंस दर्ज की गई। टीकाकरण के बाद 1,102 नमूनों के विश्लेषण में यह दर बढ़कर 73.4% सीरो-कन्वर्जन हो गई, जो इन आबादियों में PPR के खिलाफ टीकाकरण अभियानों की प्रभावशीलता को दर्शाता है। एक वाणिज्यिक संक्रामक कैप्रिन प्ल्यूरोप्ल्यूमोनिया (CCPP) ईलिसा किट का उपयोग करके किए गए एक सर्वेक्षण ने भेड़ और बकरियों के 244 सीरम नमूनों की जांच की, जिसमें CCPP का 13.11% सीरो-प्रीवैलेंस दर्ज किया गया। इसके अलावा, एक मेटा-विश्लेषण अध्ययन ने छोटे पशुओं में CCPP की कुल प्रेवैलेंस 20% दिखाई, जिससे लक्षित पशु आबादी में इस रोग की उपस्थिति और प्रभाव पर जोर दिया गया। ये अध्ययन छोटे पशुओं में महत्वपूर्ण संक्रामक रोगों के खिलाफ चल रही प्रबंधन और नियंत्रण रणनीतियों के लिए महत्वपूर्ण डेटा प्रदान करते हैं।

मिजोरम, कर्नाटक, और मध्य प्रदेश में छोटे पशुओं में प्रकोप जांच के दौरान, PPRV आइसोलेट्स की पहचान की गई और वे लीनियेज-IV के

रूप में वर्गीकृत किए गए। जम्मू और कश्मीर में ब्लूटंग वायरस (BTV) पर अलग से किए गए प्रकोप जांच में, दो सीरोटाइप, अर्थात् सीरोटाइप 1 और 9, को आइसोलेट किया गया और जेनेटिक रूप से अनुक्रमित किया गया। ये निष्कर्ष PPRV और BTV की जीनोटाइपिक विविधता को समझने में महत्वपूर्ण हैं जो नियंत्रण उपायों को लागू करने के लिए आवश्यक हैं। भेड़ों में पैस्चुरेला मल्टोसिडा की उपस्थिति की जांच करने वाले एक नैदानिक अध्ययन में पाया गया कि 201 भेड़ों में से 8 पॉजिटिव थे। Omp A प्रोटीन अनुक्रम के आधार पर किए गए फाइलोजेनेटिक विश्लेषण ने 8 एंटीपैरलेल बीटा शीट्स, 4 पेरिप्लाज्मिक मोड़, और 4 लंबे बाह्यकोशिकीय लूप के साथ एक ट्रांसमेम्ब्रेन डोमेन की उपस्थिति का पता लगाया। यह विस्तृत जेनेटिक वर्णन बैक्टीरियम की संरचना और पथोजेनिसिटी को समझने में योगदान देता है, नैदानिक उपकरणों और उपचारों के विकास में सहायता करता है। इसके अतिरिक्त, भेड़ों में क्लोस्ट्रिडियम परफ्रिंजेन्स संक्रमण पर किए गए एक अध्ययन में पाया गया कि 90 जानवरों में से 13 PCR के माध्यम से पॉजिटिव थे।

भा.कृ.अनु.प.-निवेदी का वर्ष भर में किया गया व्यापक काम सुअरों की बीमारियों के निदान और निगरानी को भी शामिल करता है, जिसमें इस क्षेत्र में महत्वपूर्ण प्रगति हासिल की गई। संस्थान ने जापानी इंसेफलाइटिस वायरस (JEV) के लिए एक वायरस न्यूट्रलाइजेशन टेस्ट को मानकीकृत किया, जिसमें पाया गया कि 447 सुअर नमूनों में से 177 JEV न्यूट्रलाइजिंग एंटीबॉडीज के लिए पॉजिटिव थे। इसके अलावा, सुअरों में टीनिया सोलियम के खिलाफ एंटीबॉडीज का पता लगाने के लिए रीकॉम्बिनेंट GP50 का उपयोग करके एक अप्रत्यक्ष ईलिसा का विकास उच्च संवेदनशीलता (96.2%) और विशिष्टता (98%) के साथ किया गया, जिसमें पॉजिटिव कटऑफ 53% पर निर्धारित किया गया।

इस अवधि के दौरान, भा.कृ.अनु.प.-निवेदी ने रोग प्रकोप डेटा प्रबंधन और जोखिम भविष्यवाणी में महत्वपूर्ण प्रगति की। नेशनल एनिमल डिजीज रेफरल एक्सपर्ट सिस्टम (NADRES) डेटाबेस को 136 जिलों से प्रकोप डेटा के साथ अपडेट किया गया, जिससे एंथ्रेक्स, अफ्रीकी सुअर ज्वर, बेबेसियोसिस, ब्लैक क्वार्टर, ब्लूटंग, क्लासिकल सुअर ज्वर, एंटेरोटॉक्सीमिया, फैसिओलायसिस, खुरपका और मुँह पका रोग, गलाघोटू, लम्पी स्किन रोग (LSD), पेस्ट देस पेटिट्स रुमिनेंट्स (PPR), भेड़ और बकरी पाँक्स, थीलेरिओसिस, और ट्राइपैनोसोमोसिस सहित 14 महत्वपूर्ण रोगों के जोखिम की भविष्यवाणी को सुगम बनाया।

इसके अलावा, भा.कृ.अनु.प.-निवेदी ने खुरपका -मुँह पका रोग (FMD), ब्रुसेल्लोसिस, क्लासिकल सुअर बुखार (CSFV), और PPR जैसे रोगों के लिए नेशनल एनिमल डिजीज कंट्रोल प्रोग्राम (NADCP) के तहत राज्य-वार सीरो-निगरानी के लिए नमूना योजनाएं विकसित करना जारी रखा है। जोखिम अनुमान और भविष्यवाणी के लिए कृत्रिम बुद्धिमत्ता (AI) और मशीन लर्निंग (ML) उपकरणों का एकीकरण, विशेष रूप से एंथ्रेक्स के लिए, रोग भविष्यवाणी के लिए एक उन्नत दृष्टिकोण प्रस्तुत करता है, जिसकी उम्मीद है कि यह रोग नियंत्रण उपायों को बढ़ावा देगा। हितधारकों को कुशलतापूर्वक जोखिम सूचित करने के लिए, कर्नाटक राज्य के पशुधारकों को 96 लाख से अधिक एसएमएस (SMS) अलर्ट भेजे गए, जिसमें विभिन्न संक्रामक पशु रोगों के होने की संभावना के बारे

में सूचित किया गया। यह संचार रणनीति रोग प्रकोपों के लिए प्रारंभिक चेतावनी और त्वरित प्रतिक्रिया के लिए महत्वपूर्ण है, जिससे महत्वपूर्ण आर्थिक हानि और पशु स्वास्थ्य प्रबंधन में सुधार हो सकता है।

पशु रोगों के आर्थिक प्रभाव का आकलन करने के लिए किए गए कार्यों ने राजस्थान और गुजरात में लम्पी त्वचा रोग (LSD) के कारण अस्थायी अनुमानित दूध हानि पर अंतर्दृष्टिपूर्ण डेटा प्रदान किया। अनुमानित हानियाँ देशी और क्रॉसब्रेड पशुओं के बीच काफी भिन्न होती हैं, जिसमें राजस्थान में देशी पशुओं को रु. 1,624 से रु. 14,399 के बीच हानि होती है और संकरित पशुओं को अधिक हानि होती है, जो रु. 1,648 से रु. 19,500 तक होती है। गुजरात में, प्रभाव कुछ अलग था, जिसमें देशी पशुओं को रु. 599 से रु. 14,998 के बीच हानि होती है, और संकरित पशुओं को और भी अधिक हानि होती है, जो रु. 2,698 से रु. 13,497 तक होती है। ये आंकड़े LSD के कारण पशु मालिकों पर पड़ने वाले गंभीर आर्थिक बोझ को रेखांकित करते हैं, जो दूध उत्पादन और परिणामस्वरूप आय को प्रभावित करते हैं। इसके अतिरिक्त, अनुसूचित जातियों के लिए कार्य योजना के विकास के तहत, संस्थान ने 46 अनुसूचित जाति परिवारों को 138 ओस्मानाबादी बकरियों का वितरण करने की पहल की। यह पहल न केवल हाशिये के समुदायों की आजीविका को समर्थन प्रदान करती है, बल्कि बकरी पालन को एक व्यवहार्य आर्थिक गतिविधि के रूप में बढ़ावा देती है, जो SC समुदायों की गरीबी उन्मूलन में योगदान देती है।

भा.कृ.अनु.प.-निवेदी ने 27 से 30 नवंबर 2023 के बीच खाद्य और कृषि संगठन (FAO) और विश्व पशु स्वास्थ्य संगठन (WOAH) के साथ मिलकर PPR-GREN मीटिंग का आयोजन किया। इस आयोजन में दुनिया भर से 35 देशों के 165 वैश्विक विशेषज्ञ (जिनमें से 100 ऑनलाइन) शामिल हुए। इसके अतिरिक्त, 3 से 12 अक्टूबर 2023 के बीच बंगाल की खाड़ी पहल के लिए बहुक्षेत्रीय, तकनीकी और आर्थिक सहयोग (BIMSTEC) के अधीन भा.कृ.अनु.प.-निवेदी और भा.कृ.अनु.प.-NIFMD द्वारा "पार-सीमार्गी पशु रोग, जूनोटिक और फुट-और-माउथ रोग को रोकने और नियंत्रित करने के इपिडेमियोलॉजिकल दृष्टिकोण" नामक वर्चुअल वर्कशॉप का संयुक्त आयोजन किया गया। इस वर्कशॉप में भूटान, भारत, म्यांमार, नेपाल, थाईलैंड और श्रीलंका से वैज्ञानिक और सहभागी शामिल हुए। भा.कृ.अनु.प.-निवेदी ने 27 जनवरी 2023 को भारतीय वायरलॉजिकल सोसाइटी के साथ मिलकर "भारत में लम्पी स्किन रोग: वर्तमान परिदृश्य और भविष्य की चुनौतियाँ" नामक राष्ट्रीय वर्कशॉप का आयोजन किया। इस मीटिंग के दौरान, भारत में लम्पी स्किन रोग के राष्ट्रीय नियंत्रण कार्यक्रम, पोस्ट-टीकाकरण मॉनिटरिंग और जेनोमिक सर्वेलेंस पर जोर दिया गया। इसके अतिरिक्त, जिला स्तर के मेडिकल माइक्रोबायोलॉजिस्ट के लिए राष्ट्रीय रोग नियंत्रण केंद्र (NCDC) प्रायोजित कार्यक्रम के तहत दो राष्ट्रीय प्रशिक्षण कार्यक्रमों का आयोजन किया गया। इस वर्ष, भा.कृ.अनु.प.-निवेदी ने टाटा इंस्टीट्यूट फॉर जेनेटिक्स एंड सोसाइटी, बंगलुरु; कर्नाटक पशु चिकित्सा, पशु और मत्स्य विज्ञान विश्वविद्यालय, बीदर; दयानंद सागर विश्वविद्यालय, बंगलुरु; और शेर-ए-कश्मीर कृषि विज्ञान और प्रौद्योगिकी विश्वविद्यालय (SKUAST), कश्मीर के साथ समझौते (MoUs) स्थापित किए। इन MoUs को भारतीय कृषि अनुसंधान परिषद के दिशानिर्देशों के साथ

अनुसंधान और विकास में सहयोग को बढ़ावा देने के लिए हस्ताक्षर किए गए थे, जिसमें पोस्टग्रेजुएट अनुसंधान, प्रशिक्षण के लिए शिक्षक आदान-प्रदान, अनुसंधान, और अध्ययन शामिल हैं।

इस अवधि के दौरान, भा.कृ.अनु.प.-निवेदी ने विभिन्न नैदानिक किट्स और सेवाओं की बिक्री से 42.15 लाख रुपये की आय उत्पन्न की। इसके अतिरिक्त, संस्थान ने डिफेंस ग्रेट रिडक्शन एजेंसी, संयुक्त राज्य अमेरिका, और यूके सेंटर फॉर एकोलॉजी और हाइड्रोलॉजी द्वारा वित्त पोषित दो अंतरराष्ट्रीय शोध अनुदान प्राप्त किए गए। साथ ही वर्ष 2023 में बायोटेक्नोलॉजी विभाग (DBT) और पशुपालन और डेयरी विभाग (DAHD) जैसे राष्ट्रीय एजेंसियों द्वारा वित्त पोषित छः शोध परियोजनाएं मंजूर की गईं, जिन्हें कुल अनुदान के रूप में 746.29 लाख रुपये प्राप्त हुए। संस्थान के कर्मचारियों ने महत्वपूर्ण 15 पुरस्कार और मान्यताएं हासिल कीं। इनमें से तीन उत्कृष्ट राष्ट्रीय अकादमियों/शोध संगठनों से फेलोशिप, राष्ट्रीय सम्मेलनों में शोध प्रस्तुतियों के लिए छः पुरस्कार, और भा.कृ.अनु.प.-दक्षिण क्षेत्र खेल कार्यक्रम में चार पदक शामिल हैं।

भा.कृ.अनु.प.-निवेदी की पशुरोग निदान प्रयोगशाला ने 5 दिसंबर 2023 को PPR और लेप्टोस्पिरॉसिस का निदान करने के लिए NABL प्रमाणीकरण (ISO/IEC 17025:2017) किया गया। इसके अतिरिक्त, PPR अनुसंधान प्रयोगशाला, जो PPR उन्मूलन कार्यक्रम के तहत निगरानी और मॉनिटरिंग के लिए WOAHA संदर्भ प्रयोगशाला नेटवर्क का हिस्सा है, को उद्घाटित किया गया। संस्थान ने अपनी PPR और लेप्टोस्पिरॉसिस प्रयोगशालाओं को WOAHA संदर्भ प्रयोगशालाओं के रूप में मान्यता के लिए भी आवेदन किया। इसके अतिरिक्त, संस्थान ने "राष्ट्रीय पशुपालन और डेयरी विभाग" के लिए "PPR उन्मूलन 2030 के लिए राष्ट्रीय रणनीतिक योजना" का मसौदा तैयार करने में महत्वपूर्ण योगदान दिया। साल में, निवेदी के चार प्रौद्योगिकियां भा.कृ.अनु.प. द्वारा प्रमाणित की गईं: ABrC-ईलिसा किट/PPR-एबी चेक किट, ब्लूटिंग पापुलेशन सर्वे के लिए अप्रत्यक्ष ईलिसा, राष्ट्रीय पशुरोग रेफरल एक्सपर्ट सिस्टम (NADRES V2), और बोवाइन लेप्टो-एलएट किट (रैपिड टेस्ट)। इसके अतिरिक्त, संस्थान को दो भारतीय पेटेंट और दो कॉपीराइट मिले। भा.कृ.अनु.प.-निवेदी वैज्ञानिकों ने साल में 72 अनुसंधान लेख प्रकाशित किए, जिनमें 18 लेख की राष्ट्रीय कृषि विज्ञान अकादमी (NAAS) रेटिंग 9.0 से अधिक थी, और 28 लेख की NAAS रेटिंग 6.0 से 9.0 के बीच थी। इस अवधि के दौरान, संस्थान के वैज्ञानिकों को आई.वी.आर.आई. (IVRI) डीम्ड विश्वविद्यालय के शिक्षक के रूप में भी शामिल किया गया। इसके अतिरिक्त, संस्थान ने IVRI डीम्ड विश्वविद्यालय के बंगलुरु शैक्षिक हब में शामिल होकर पशु-चिकित्सा माइक्रोबायोलॉजी और पशु सार्वजनिक स्वास्थ्य और महामारी विज्ञान में पोस्टग्रेजुएट शिक्षण में पहल की।

पिछले वर्ष भा.कृ.अनु.प.-निवेदी द्वारा किए गए उल्लेखनीय कदम पशु एपीडेमियोलॉजी और रोग सूचना विज्ञान में उत्कृष्टता के प्रति हमारे अटूट समर्पण को दर्शाते हैं। अपने नवाचारी अनुसंधान, रणनीतिक साझेदारियों, और रोग सर्वेलेंस और नियंत्रण में महत्वपूर्ण योगदान के माध्यम से, संस्थान भारत में पशु स्वास्थ्य, जनस्वास्थ्य और आर्थिक स्थिरता में वृद्धि करने में एक महत्वपूर्ण भूमिका निभाता है।

02

Introduction

ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI), (Formerly Project Directorate on Animal Disease Monitoring and Surveillance, PD-ADMAS) has been set up under the aegis of the Indian Council of Agricultural Research (ICAR), Department of Agricultural Research and Education, Ministry of Agriculture and Farmer Welfare, Government of India. ICAR-NIVEDI is a pioneering research institute working with the mandate of R&D in the field of veterinary epidemiology and disease informatics and carrying out disease surveillance, monitoring and impact analysis of livestock diseases in India through collaborative centers located in different states of the country. The Institute has a long successful history of delivering predicted informatics and epidemiological solutions for various animal diseases.

Located in Karnataka, ICAR-NIVEDI had its humble beginning as the All India Coordinated Research Project (AICRP) on Animal Disease Monitoring and Surveillance (ADMAS) in 1987, up-graded to Project Directorate on Animal Disease Monitoring and Surveillance (PDADMAS) in 2000 and finally in the year 2013 it was rechristened as ICAR-NIVEDI. The coordinating units of AICRP-ADMAS continued to grow from four in 1987 to 31 till 2021. From April 2021 onwards, this has been rechristened as National Animal Disease Epidemiology Network (NADEN) with forty-four centers at present. The Institute has a state-of-the-art Bio-safety Level 2 laboratory, which is managed as per the national guidelines for laboratory biosafety and biosecurity practices.



VISION

Achieving freedom from animal diseases, animal welfare, food and nutritional security through healthy foods of animal origin, poverty alleviation and economic growth of rural India.



MANDATE

- Epidemiology, informatics and economics of animal diseases including zoonosis
- Surveillance, forecasting and forewarning for management of animal diseases including Zoonosis
- Repository and Capacity Development



MISSION

Capacity building in frontier areas of Veterinary Epidemiology: dynamics of animal diseases including zoonosis and animal healthcare intelligence.

The role of ICAR- NIVEDI is significant in developing disease models, risk analysis, animal disease forecasting & forewarning. It is also working on the development of population assays and surveillance diagnostic kits for epidemiological serosurvey. ICAR-NIVEDI is also working on the development of spreadsheet modules for economic impact analysis of important endemic livestock diseases viz., FMD, PPR, BT, Brucellosis, HS, and LSD in the country. The role of this institute in the eradication of Rinderpest from India and the development of the National Animal Disease Referral Expert System (NADRES), interactive software for animal disease forecasting is noteworthy.

The institute has eight patents granted to its credit and another one patent has been filed in the area of disease diagnostics. With regard to copyright, five applications have been registered. Four applications were submitted for no objection certificate and one application has been filed for trademark. The scientists of the institute have published more than 322 research papers in reputed national and international journals in the last five years. ICAR-NIVEDI also organized capacity-building programs for students, academicians, veterinarians, and medical and para-medical professionals in the field of biosafety, animal health emergency, zoonotic disease diagnosis, descriptive epidemiology, and disease modelling.

ICAR-NIVEDI has established an excellent National Livestock Serum Repository consisting of randomly collected serum samples from different livestock species. Currently, more than one lakh serum samples of various livestock species have been catalogued and stored. The said repository acts as a storehouse for a retrospective screening of livestock diseases and for the development and validation of diagnostic assays.

The Institute has national and international funded with various organizations and stakeholders, including DBT, ICMR, NCDC, NIE, NIMHANS, CDC, FAO, WHO, WOA, ILRI, BBSRC, MRC-UK, UKCEH, DTRA, BMGF etc., for collaborative research,

laboratory capacity building and human resource development. The institute has conducted more than 60 capacity-building training programmes on epidemiology, economic impact, sampling frame, GIS and RS and disease diagnosis including biosafety and biosecurity. Naavic, the Agri-business incubation center, is a unique facility of NIVEDI, nurturing the startups/entrepreneurs in the field of animal husbandry and veterinary services through identification, incubation, promotion and funding. This centre has provided needbased physical space for administrative and laboratory work, technical, business and networking support, facilities and services to test and validate their venture before the successful establishment of enterprises.

ICAR-NIVEDI is at the forefront of the societal development of scheduled caste and schedule tribe communities through DAPSC and TSP programs. Under these GoI initiatives, goats, chickens feed, medicines and training programs have been provided to ensure economic, and social upliftment and nutritional security for the children, rural women and youth.

In the pursuit of advancing education, ICAR- IVRI, Bengaluru has been designated as the educational hub and ICAR- NIVEDI was identified as integral component of this educational network in Bengaluru. The Director and scientists of ICAR- NIVEDI expressed willingness to be a part of this educational hub and to focus on two disciplines viz., Veterinary Public Health and Epidemiology and Veterinary Microbiology at ICAR NIVEDI for teaching.

The future priority areas for NIVEDI include improvement and strengthening of the existing disease forecasting system through the development of a quality database using village/ block level livestock disease data, a database on climatic and non-climatic risk factors, research on animal disease simulation modelling for effective forecasting, improving the precision of forecasting models and validation, risk analysis and risk assessment of endemic, emerging and re-emerging diseases, development of risk map for optimal utilization of available resources and for

better management of diseases. NIVEDI participation is noteworthy in the National Digital Livestock Mission (NDLM) of DAHD, GoI, and /or other organizations/ stakeholders for carrying out disease modelling, surveillance, monitoring and forewarning of livestock diseases, need-based diagnostics, population surveillance assay kits for the epidemiological survey and field diagnosis, organizing capacity buildings programme, etc., including the integrated one health surveillance, epidemiological investigations of outbreaks, one health supporting unit's capacity buildings and forecasting and forewarning of zoonoses. The estimation of country-wide economic losses due to important livestock diseases, public health issues and the economic burden of zoonotic diseases, impact of climate changes on animal disease incidence and emergence of new pathogens through modelling are the niche areas for NIVEDI.

Infrastructure Facilities

ICAR-NIVEDI has state of art containment facility of biosafety level 2++ category, unique facility in the country. Institute has a training hall equipped with state of art audio-visual aids for organising training cum awareness programmes. Apart from this, the institute has a committee room for conducting regular meetings and farmer's cum training hostel for accommodating trainees. Further, the institute has a spatial epidemiology and GIS lab, disease informatics lab and lab for routine disease investigation. Institute is maintaining National Livestock Serum Repository (NLSR) consisting of randomly collected serum samples of various livestock species from different states and UTs of India. To enhance the green cover of the campus more than 1200 sampling of mango, jack fruits avocado, has been planted as ecofriendly gesture. As an effort to increase IT infrastructure of 1000 mbps wifi campus facilities was installed in this institute for better connectivity. As a recreation facility for the staff and student's table tennis and carom board has been installed in this institute.

FOCUS

- Improving disease monitoring and surveillance through the development of population assays and pen-side diagnostics
- Risk assessment for the occurrence of economically important animal diseases
- Adapting strategies to improve animal disease data quality
- Understanding the threat from animal diseases in the background of climate change and globalization
- Developing early warning system and disease modeling/forecasting
- Understanding the economic impacts of animal diseases and the management strategies
- Promoting innovations and improving human resource capacity
- Fostering linkages and collaborations with public and private, national and international organizations
- Improving the knowledge management system

THRUST AREAS

- Development of robust forecasting & forewarning models for important livestock diseases along with risk analysis.
- Epidemiological investigation, surveillance and monitoring of endemic, and re-emerging diseases of animals including zoonosis.
- Development of diagnostics for population survey of economically important diseases including zoonosis.
- Molecular epidemiology of pathogens, disease outbreaks and detection and control of infectious diseases.
- Socio-economic impact and policy analysis of prioritized diseases.

National Animal Disease Epidemiology Network (NADEN)

The National Animal Disease Epidemiology Network (NADEN) is a newly established network of collaborative centres involved in animal disease epidemiology across every state of India. The network came into existence after the closure of All India Coordinated Research Project on Animal Disease Monitoring and Surveillance (AICRP on ADMAS) on 31st March 2021. As an internal network, ICAR-NIVEDI, plans to function with forty-plus collaborative

centers, as compared to the existing 31 centres of AICRP_ADMAS. NADEN includes 6 Regional Disease Diagnostic Laboratories (RDDLs), 6 AQCS (Animal Quarantine and Certification Service), a center from Ladakh and an additional center each from the state of Uttar Pradesh, Rajasthan in addition to existing 31 centers. The focus of NADEN would be on understanding the nationwide animal disease epidemiology to better inform control strategies.

OBJECTIVES OF NADEN

- To participate in R & D in animal disease epidemiology and informatics by collecting / generating and collating livestock disease data and systematic outbreak investigation.
- To undertake seroepidemiological studies
- To analyse disease data for risk mapping, epidemiological trends, and forewarning for taking appropriate intervention strategies for disease control
- To devise epidemiological solutions for effective control of animal diseases.

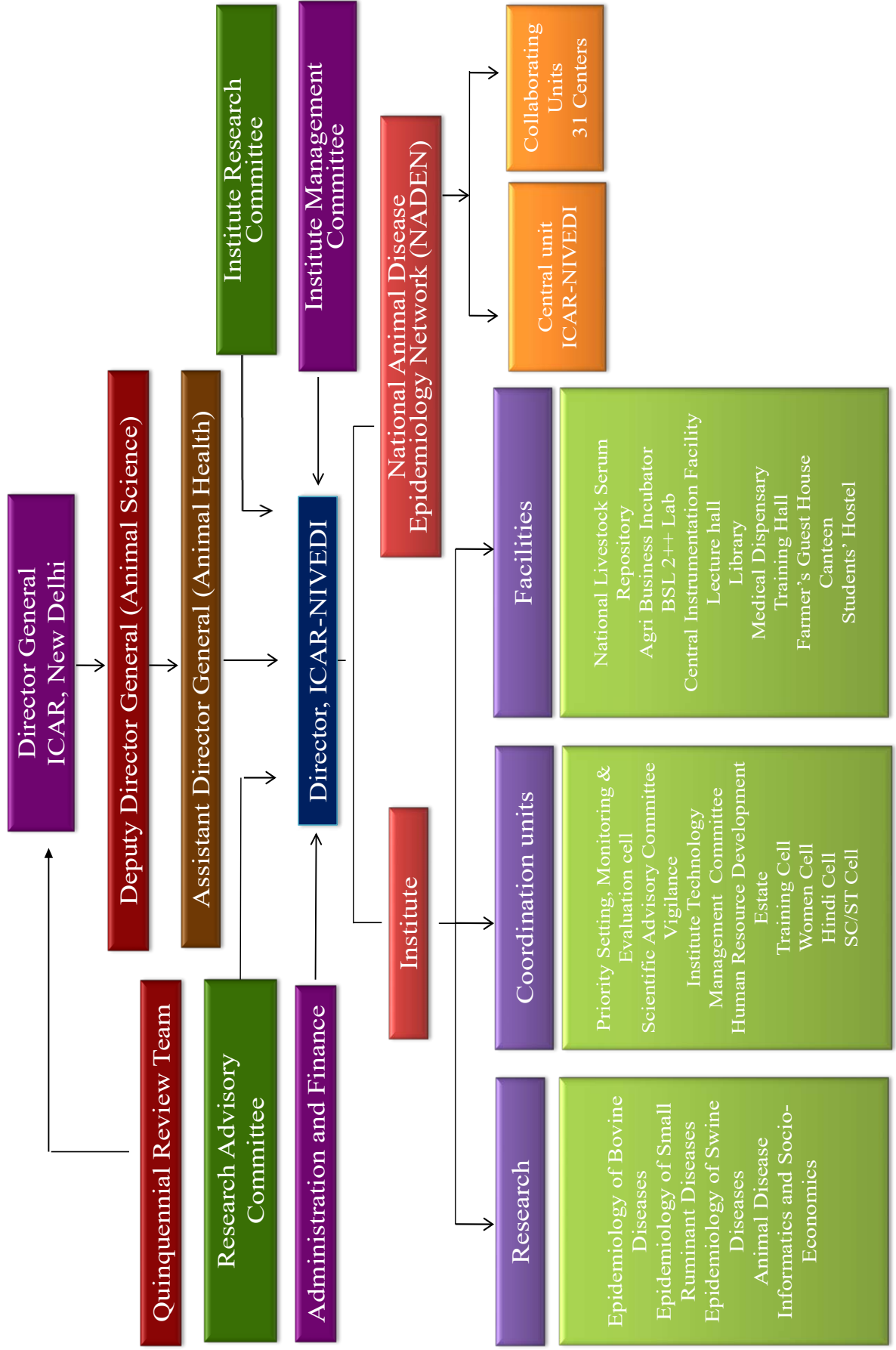
MANDATES OF NADEN

- Strengthening of the National Animal Biological Repository
- Effective updating of NADRES with active disease data, climatic and non-climatic factors
- Surveillance of diseases/pathogens in domestic companions, laboratory and wild animals
- Sero-monitoring of animal diseases based on strategic sampling
- Investigation of endemic, emerging and reemerging animal disease outbreaks using innovative technologies.
- Working with all stakeholders in the public and private domain for the welfare and health care of animals.
- Analysis of economic losses due to animal diseases and impact of control measures adopted for their management.

First annual review meet of National Animal Disease Epidemiology Network (NADEN) held during 6-7 July 2023



Organogram



1987-2000



- ✦ 1 July 1987: AICRP on animal disease monitoring and surveillance (AICRP-ADMAS) initiated
- ✦ The institute worked under National Project on Rinderpest Eradication (NPRE)
- ✦ Year 2000: Project Directorate on Animal Disease Monitoring and Surveillance (PD_ADMAS) established

2001-2010



- ✦ Institute awarded Sardar Patel Outstanding ICAR Institution Award in the year 2002
- ✦ ICAR Awards for Team Research for the Biennium 1999-2000 in the year 2002
- ✦ DBT Biotech Product Process Development and Commercialization Award for the development of veterinary ELISA diagnostic kits in the year 2002
- ✦ International OIE Meritorious Award in 2002 for RP eradication

2011-2015



- ✦ FAO Gold Medal, for outstanding contribution to global RP eradication programme in the year 2011
- ✦ Between 2012-2017, 17 additional collaborating units were added to AICRP-ADMAS
- ✦ Patent Granted on “A Kit for diagnosis of Brucellosis” on 20 January 2013
- ✦ Year 2013: PD-ADMAS promoted to National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI)
- ✦ ISO 9001:2008 certificate awarded in the year 2014
- ✦ Administrative Building, Utility Building and BSL-2 Inaugurated on 9 January 2015

2016-2020



- ✦ DBT Biotech Product Process Development and Commercialization Award for development of Brucellosis diagnostic kits in the year 2016
- ✦ Best Stall Award during National Sheep and Farmers Fair held at Avikanagar held during March 2016
- ✦ ISO 9001:2015 certificate awarded to ICAR-NIVEDI in the year 2017
- ✦ Training cum Farmers Hostel and Laboratory Block inaugurated on 30 June 2018
- ✦ Agribusiness Incubation Centre for Animal Husbandry and Veterinary Services (NaaViC) established in 2019

2021-2023



- ✦ Patents granted for:
 - ◆ Recombinant protein based ELISA for *T.evansi* antibodies on 18 March 2021
 - ◆ Recombinant protein based ELISA for *T.evansi* antigen on 21 June 2021
 - ◆ Recombinant protein based ELISA for Bluetongue virus antibodies on 27 January 2023
 - ◆ Recombinant protein based ELISA for *Leptospira* antibodies on 18 September 2023
- ✦ Copyrights registered for:
 - ◆ Bluetongue forewarning mobile app on 28 March 2022
 - ◆ ANIP on GIP mobile app on 28 March 2022
 - ◆ ADMaC mobile app on 28 March 2022
- ✦ PPR Ab Check kit and PPR Ag Check kit released on 26 March 2022
- ✦ PPR research lab inaugurated on 8 February 2023
- ✦ Livestock Disease Diagnosis Laboratory obtained ISO/IEC 17025:2017 accreditation on 5 December 2023



LANDMARK ACHIEVEMENTS

Summary of Expenditure

Major Heads	Expenditure (₹)
Grant for the creation of capital assets (Capital)	0.00
Works	0.00
Equipment	4899469
Information Technology	7552
Library books and journals	3550
Vehicles and vessels	0.00
Furniture & Fixtures	1161041
Grant in Aid salaries (Revenue)	0.00
Establishment expenses (Salaries)	83661717
Grant in Aid General (Revenue)	0.00
Traveling allowances	1639812
Research & operational expenses	14071551
Administrative expenses	26495563
Miscellaneous expenses	2092173
North Eastern Hill Region fund	
Capital	1000000
General	10357307
Scheduled Caste Sub-Plan fund	
Capital	891000
General	6251024
Grand Total	152531759

*Rs 610000 utilised for pension and retirement benefits

Revenue Receipts (as on 31 December 2023)

Description	Amount (₹)
License fee	726052
Interest earned from loans & advances	0.00
Interest from short term deposit	3836
Interest earned from training	0.00
Income generated from sales of kits	356710
Miscellaneous receipts	777836
TOTAL	1864434

Staff Position at ICAR-NIVEDI (as on 31 December 2023)

Name of the post	Sanctioned	Filled	Vacant
Director	01	01	00
Scientific	22	19	03
Technical	10	02	08
Administrative	14	06	08
Supporting	03	01	02

03

Research Achievements

The research activities conducted at ICAR-NIVEDI have been categorized into four research groups viz., epidemiology of bovine diseases, epidemiology of small ruminant diseases, epidemiology of swine diseases and animal disease informatics and socio-economics.

EPIDEMIOLOGY OF BOVINE DISEASES

Development of Diagnostics

Development of population assay for detection of Lumpy Skin Disease in cattle and buffaloes

An indirect ELISA using recombinant ORF117 protein of LSDV was developed to detect antibodies against LSDV in cattle and buffaloes. The diagnostic sensitivity of the assay was 96.1% whereas specificity was 95.0%. A total of 4990 bovine sera samples across the country were screened. Similarly, the whole virus-based iELISA for detection

of antibodies against the capripoxvirus was developed and validated internally and externally. The developed assay showed a diagnostic sensitivity of 100% and specificity of 95.0% (**Fig 1**). Based on the diagnostic values and inter-rater agreement by the Kappa index, both test were found suitable for screening of antibodies against LSDV.

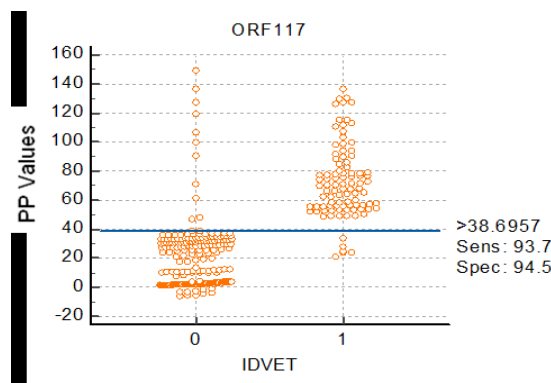


Fig 1: Sensitivity and specificity of recombinant iELISA developed, compared to commercially available IDVET ELISA kit

(Manjunatha Reddy GB, Shivashanaranappa N, Chethan Kumar HB and Patil SS)

Development and evaluation of recombinant protein and native proteins based indirect-ELISA for anti-*Pasteurella multocida* antibodies in bovines

To detect the antibodies of *P. multocida* in bovines, an indirect ELISA employing rNanH protein (~63 kDa) with a C- and N-terminal truncation, was developed. The immunogenic potential of purified rNanH-Tr was confirmed by the western blot method (**Fig 2**). An indirect ELISA based on rNanH-Tr was developed and optimized. The receiver operating characteristic curve analysis for the detection of anti *P. multocida* specific antibodies indicated a diagnostic sensitivity of 86.2% (CI 73.26-96.80%) and specificity of 80.0 (63.06- 91.56%). No cross-reactivity was noted with antibodies against other bovine diseases (e.g., foot-and-mouth disease and brucellosis). Screening of random bovine serum samples (n=250) showed a 22% seropositivity for anti

P. multocida specific antibodies. Besides, another indirect-ELISA using native heat extract antigens of *Pasteurella multocida* B:2 (strain P52), as coating antigen was standardized. A positive and negative panel of 75 bovine serum samples were formed using the IHA test and commercial-ELISA kit. The in-house iELISA revealed sensitivity of 94.74% (95% CI = 87.07- 98.55) and specificity of 90.79% (95% CI = 81.94 to 96.22), at 30% PP value as cut-off. Further, optimized assay was used to screen a total of 540 buffalo serum samples from Haryana state for surveillance and 26.48% sero-positivity was recorded. The study warrants further screening bovine sera from HS endemic states of India.

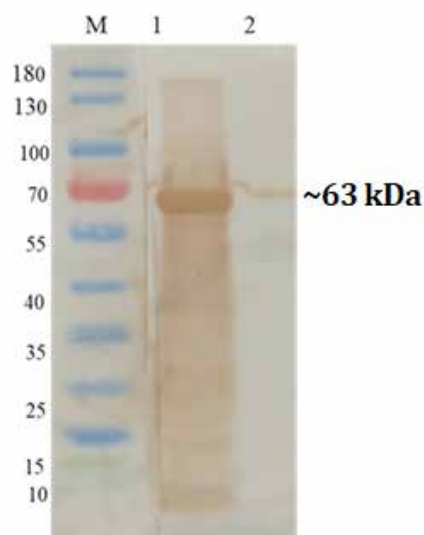


Fig 2: Detection of recombinant rNanH-Tr protein by western blot using the rabbit hyper immune sera

(Prajapati A, Yogishardhya R, Chanda MM and Shivachandra SB)

Disease Surveillance

Serological and molecular surveillance of infectious bovine rhinotracheitis

This study presents the serological and molecular surveillance of IBR across various states of India. A total of 12,879 samples were tested, revealing 2,702 positive cases and highest prevalence was observed in Haryana (38.36%, 694/1,809) and Gujarat (15%, 305/2,032). Additionally, the study extended its focus to different

species, including cattle, buffalo, bulls, and mithun, uncovering varying infection rates. Notably, Andhra Pradesh exhibited a substantial number of positive cases in both cattle (12.68%, 237/1,868) and bulls (6/6) (**Fig 3**). Molecular analysis through PCR was performed on 161 samples, revealing four positive cases.

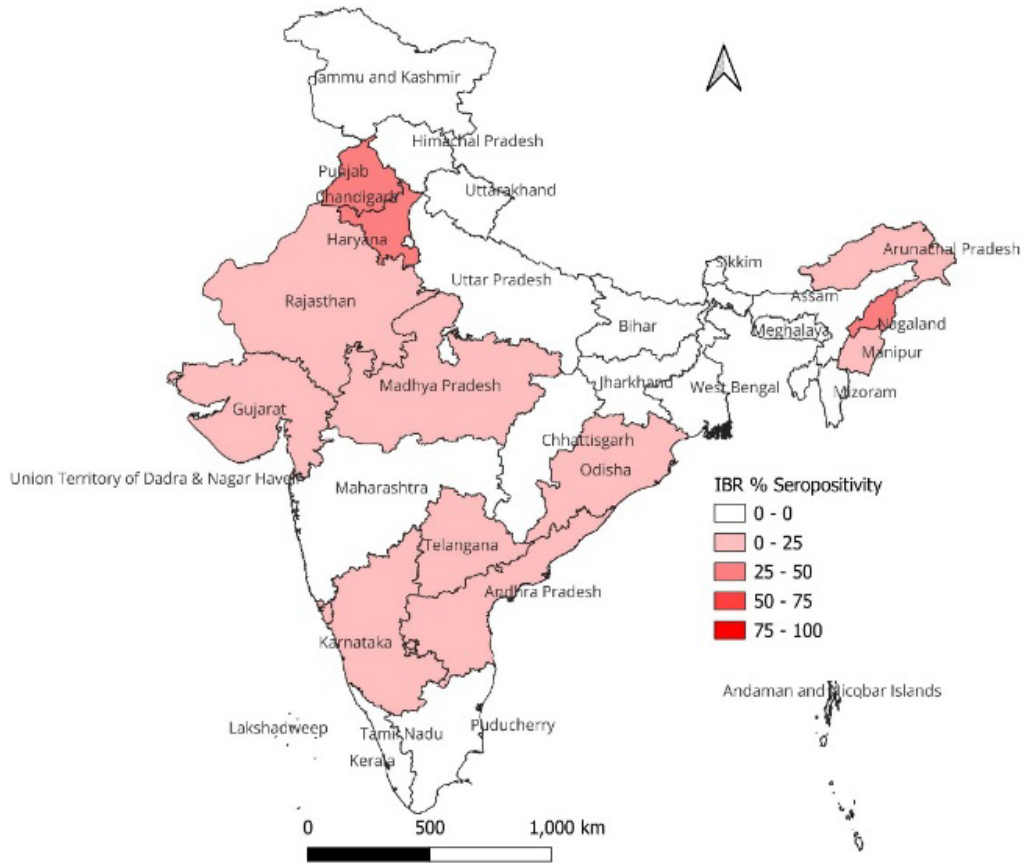


Fig 3: State-wise sero monitoring and sero surveillance of IBR

(Patil SS)

Evidence of Peste des Petits Ruminant's virus-specific antibodies and cross-species transmission in Mithun (*Bos frontalis*) of Northeastern India

This study investigated the presence of Peste des Petits Ruminants virus (PPRV) antibodies in mithun (*Bos frontalis*), an atypical host species. The study included the analysis of 158 serum samples, 107 nasal swabs, and 32 blood samples from Mithun, comprising both healthy and those suspected of having bovine diseases. To assess the possibility of cross-species transmission of infection, 21 goat samples (serum, blood, and nasal swabs) from areas in proximity to mithun herds were also included. These samples were tested for PPRV antibodies, antigens, and nucleic acids using PPR c-ELISA, virus Neutralization Test (VNT), PPR s-ELISA, and RT-PCR assays. The results revealed that 22 out of 158 sera (13.9%; 95% CI: 8.5% to 19.3%) of mithun and 11 sera from goats were positive for PPRV-specific antibodies in PPR c-ELISA

(Table 1). Notably, no PPRV antigens were detected in blood or swab samples from both mithun and goats using PPR s-ELISA and RT-PCR, indicating the absence of active PPRV infection through secretions. Further, validation involving complement inactivation and retesting, confirmed the presence of PPRV antibodies in 14 sera of mithun with PI values ranging from 41.9 to 73.1. Follow-up tests on samples from positive reactors (n=20) indicated persistent antibody presence after one month in eight samples, with two demonstrating VNT titers greater than 1:10, conclusive of protective titers for PPRV infection. This finding suggests the potential circulation of PPRV among mithun, particularly those in close contact with goats, indicates seropositivity due to spill-over from domestic goats.

Table 1 Details of the mithun samples tested for PPR and its test results of seropositivity

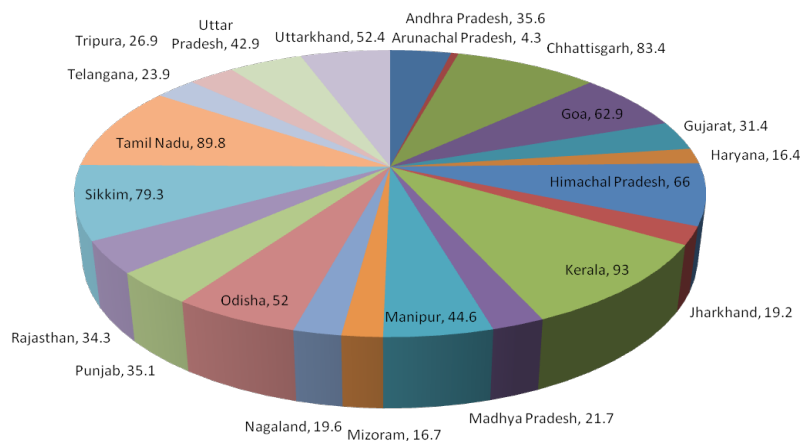
Variable	(No. of samples tested) Positive	% Positive (95% confidence inter- val)	χ^2 (Chi- squared value)	<i>P</i> value
Total	(158) 22	13.9 (8.5-19.3)		
Sex				
Female	(102) 12	11.8 (5.5-18)	1.12	>0.05
Male	(56) 10	17.9 (7.8-27.9)		
Age				
≤ 2 years	(28) 3	10.7 (-0.7-22.2)	0.29	>0.05
> 2 years	(130) 19	14.6 (8.5-20.7)		
Adult	(149) 19	12.8 (7.4-18.1)	2.99	>0.05
Calves	(9) 3	33.3 (2.5-64.1)		
Locations				
Medziphema (farm)	(95) 16	16.8 (9.3-24.4)	3.65	>0.05
Porba (farm)	(25) 4	16 (1.6-30.4)		
Tening (field)	(12) 0	0 (0-0)		
Thüvopisü (field)	(24) 2	8.3 (-2.7-19.4)		
Noklak (field)	(2) 0	13.9 (8.5-19.3)		

(Balamurugan V and Gulati B R)

Population survey of bluetongue in buffaloes using recombinant NS1-NS3 based indirect ELISA

A study was undertaken to determine the prevalence of anti-BTV antibodies on an India basis using recombinant NS1-NS3 based indirect ELISA. During the period a total of 15956 buffalo serum samples were screened belonging to the 22 states of India. An overall percent positivity of 34.5

was observed (**Fig 4**). The Study indicated that the prevalence of infection in buffaloes is definitely not more than that found in disease-resistant reservoir hosts such as goats. Therefore, contribution of buffaloes alone in precipitation of bluetongue needs further investigation.


Fig 4: State-wise seroprevalence of bluetongue in buffalo

(Hemadri D)

Spatial and temporal distribution of emerging zoonotic diseases in India

During the period collection of data on Kyasanur Forest disease (KFD) and vectors from different sources was done. The distribution of KFD cases in different districts is shown in **Fig 5**. KFD is reported

from 5 states and cases are more along the western ghat districts. Further habitat suitability map for *Haemaphysalis spinigera* was developed using remote sensed variables and statistical models.

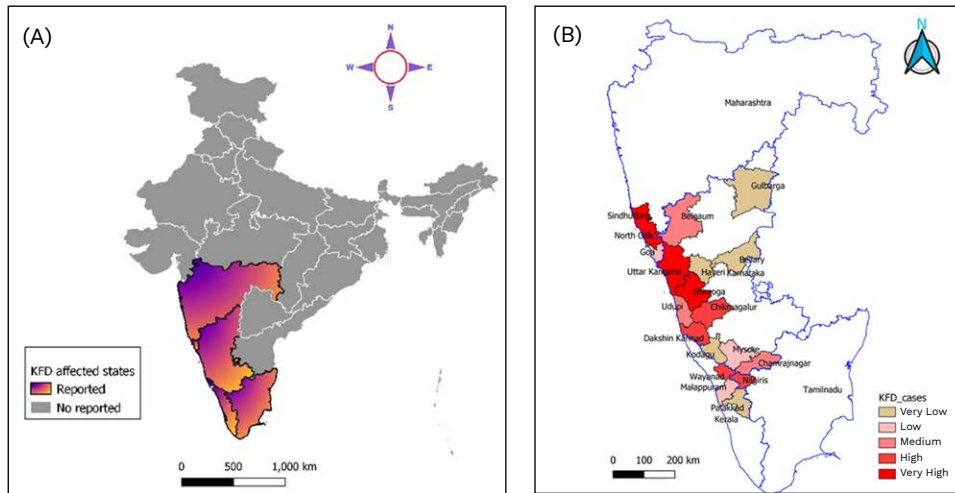


Fig 5: Reports of KFD from five states (A) and distribution of cases in different districts of South India (B).

Cases of anthrax in humans was obtained from IDSP for the year 2009 to 2021. Year wise cases of anthrax was mapped using QGIS. The spatial and temporal distribution

of anthrax in humans is shown in Figure (**Fig 6**). The cases of human anthrax were more in Odisha, Jharkhand and West Bengal.

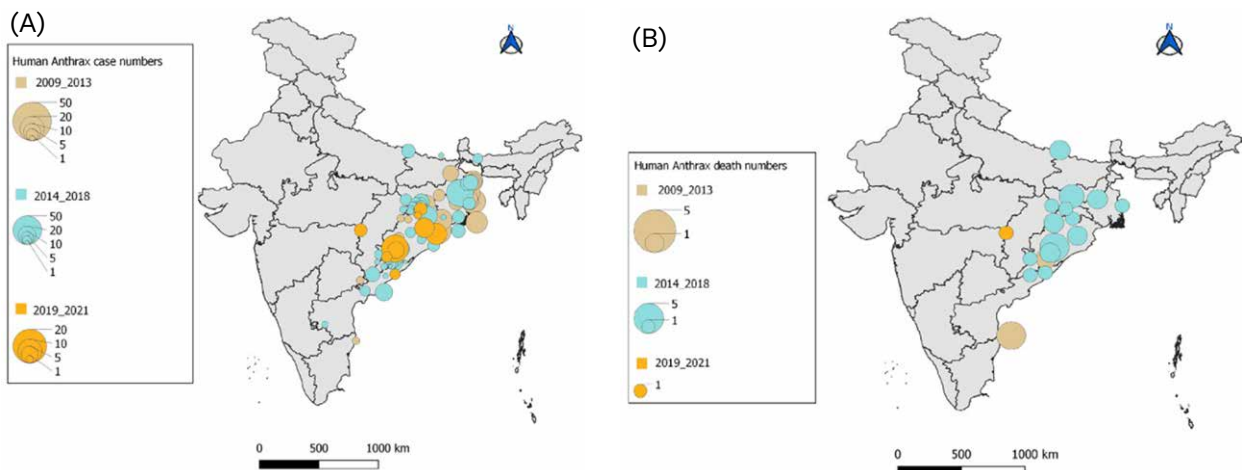


Fig 6: Spatio-temporal distribution map of human anthrax cases (A) and deaths (B)

Avian influenza outbreaks in Kerala were investigated and factors responsible for the occurrence of outbreaks were identified. It was found that the irrigated areas in and around the wetland's areas were at more

risk of the disease in the Alappuzha and Kottayam districts of Kerala. In addition, several rice paddy fields used by the duck farmers were significant in the spread of the disease in these two districts.

(Chanda MM, Yogisharadhya R, Prajapati A and Shivachandra SB)

State-wise *B. abortus* S19 vaccinations status under NADCP

Monthly data of countrywide brucellosis vaccination was collected from Information Network for Animal Productivity & Health (INAPH) database to correlate with sero-monitoring. By the observation of INAPH data from January-December, 2023, 5 southern states (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Telangana), 6 Northern states (Haryana, Punjab, UT's of Chandigarh, Delhi, J&K and Ladakh), two Western states (Gujarat and Maharashtra), 4 Eastern states (Bihar, Jharkhand, Odisha, and West

Bengal), 6 North-Eastern states (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram and Tripura) and 4 Central states (Chhattisgarh, Madhya Pradesh, Uttar Pradesh and Uttaranchal) have successfully implemented brucellosis vaccination program (**Fig 7**). Overall, vaccinations carried out were 73, 01,030 and 44,711,56 farmers were benefited under NADCP program in 23 states and 4 UT's. The highest vaccination was carried out in Maharashtra state.

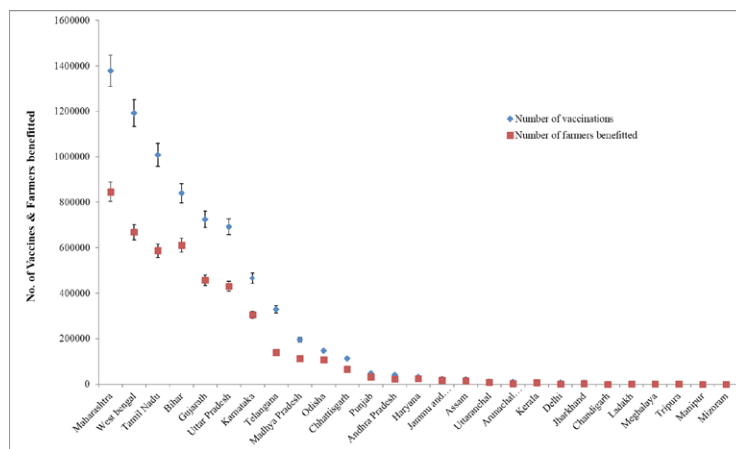


Fig 7: Brucellosis vaccination status as per INAPH 2023

(Shome R and Nagalingam M)

Country-wide serosurveillance of brucellosis in buffalo

In the present study, we aimed to evaluate the seroprevalence of brucellosis in buffalo during 2023, a total of 4446 buffalo serum samples sourced from NADEN centres were tested by protein G-based indirect ELISA. Overall, seroprevalence recorded was 9.09% with the highest sero-prevalence of 10.44% was reported from Haryana and seroprevalence > 7% was observed in three states (Telangana, Odisha and Punjab). Whereas, low seroprevalence of 2.64% and 2.12% was noted in Nagaland and Arunachal Pradesh, respectively (**Fig 8**). Buffalo is an important livestock species in India and identification of brucellosis endemic regions in buffaloes will help the states to implement compulsory vaccination in buffaloes and to create awareness among farmers and veterinary health care staff.

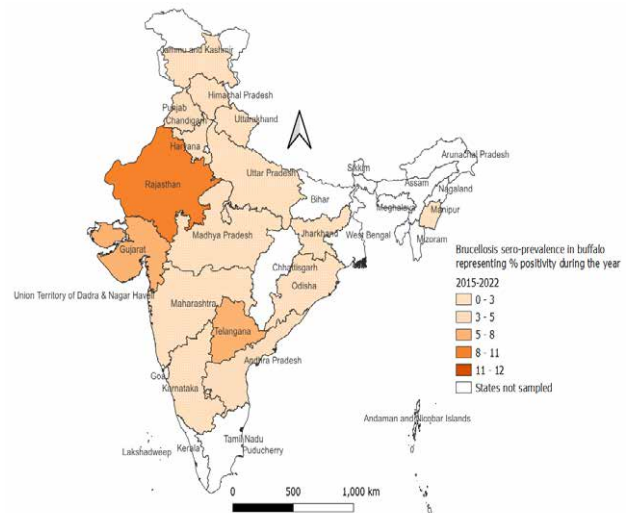


Fig 8: Brucellosis in buffaloes recorded during the year 2023

(Shome R and Nagalingam M)

Sero-monitoring of *Brucella* S-19 vaccination under NADCP

A total of 33,615 serum samples received under phase-I, II and phase-III vaccination at ICAR-NIVEDI during January to December 2023 were tested by indirect ELISA to detect post-vaccination antibodies to S19 vaccination. Under Phase-I, a total of 9345 serum samples were received from 6 states, in Phase II, 19,177 serum samples

were received from 10 states and two UTs and under Phase III, 3624 serum samples were received from two states and one UT. The highest percentage of seroconversion was recorded in Tamil Nadu (88.03%), Delhi (92.56%) and Chandigarh (72.54%) in phase-I, II and III, respectively (**Fig 9**).

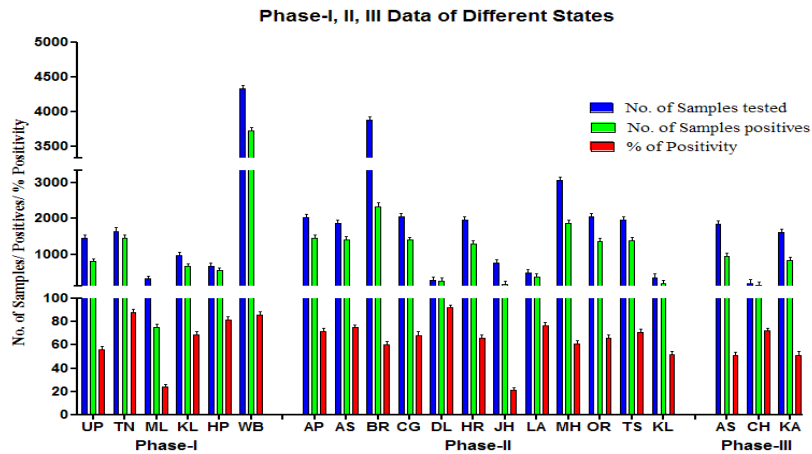


Fig 9: *Brucella abortus* S19 post-vaccination monitoring results during 2023

Day-wise post-vaccination sero-monitoring was evaluated in 22 states for 20,476 serum samples (cattle-17,877 and buffalo-2599) by protein G-based iELISA from 21 to >120

days post-vaccination (DPV) during 2021-23. Among cattle samples, 77.16% seroconversion and 69.48 % in buffaloes was noted (**Fig 10**).

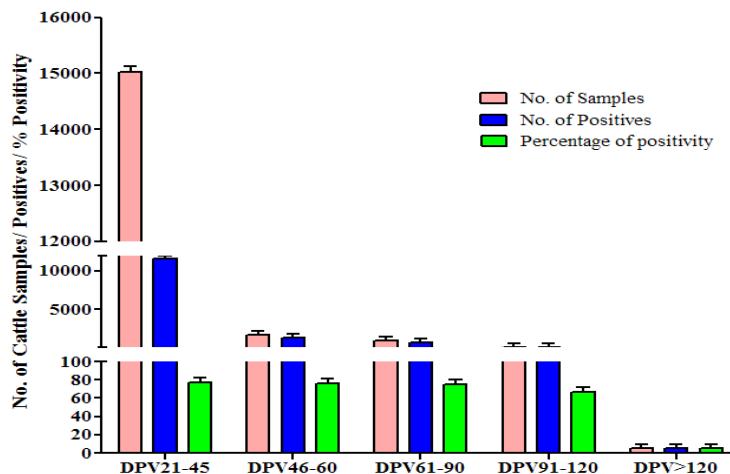


Fig 10: Day-wise antibody response of post-S19 vaccination results in female cattle calves

The recommended collection period for assessing post vaccination antibodies can be between 21-60 DPV and the study emphasizes the importance of

timely collection of samples for effective monitoring of brucella vaccination under NADCP program.

(Shome R and Nagalingam M)

Seroprevalence of leptospirosis and distribution of *Leptospira* serovars in enzootic states of India

A serosurvey was conducted to establish the prevalence of anti-leptospiral antibodies in buffaloes. A total of 1888 serum samples were from four states of India, viz., Kerala (115), Tamil Nadu (197), Gujarat (661) and Telangana (915) tested at 1:100 dilution in Microscopic Agglutination Test (MAT) using *Leptospira* reference serovars (21). The overall seroprevalence of 15.8% (299/1888)

with 21.4 % (196/915) in Telangana, 60.9 % (70/115) in Kerala, 4.1 % (8/197) in Tamil Nadu, and 3.8 % (25/661) in Gujarat were observed. The predominant leptospiral antibodies were determined against the frequency of distribution of the serovars Pomona (58.2%), Tarassovi (47.4%), Canicola (21%), Pomona (19 %) and Autumnalis (19.9 %) (Fig 11).

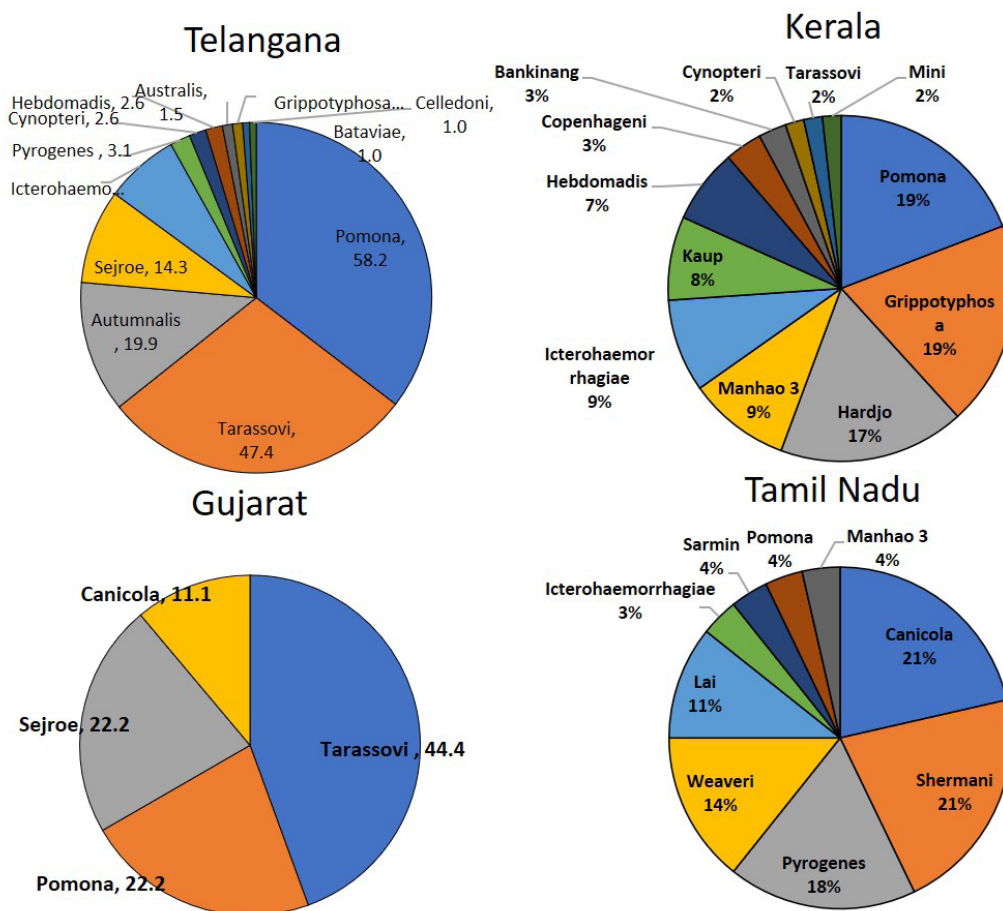


Fig 11: The pie chart representing the percentage frequency of serogroup and state-wise distribution of *Leptospira* serovars in buffaloes

This study indicates an alarmingly high seroprevalence of leptospirosis in buffaloes in the states of Kerala and Telangana. Besides a total of 579 human serum samples from clinically febrile (PUO) cases suspected for leptospirosis from seven Taluk/Blocks of Dakshina Kannada district of Karnataka were subjected to Microscopic

Agglutination Test (MAT) using a reference panel of 21 *Leptospira* serovars. The overall seropositivity 4.31% (25/579) with anti-*Leptospira* antibodies against major reactive serovars namely Javanica (21.5 %), Hurstbridge (16.9 %), Lai (13.8 %), Djasiman (9.2 %), Autumanalis (9.2 %), Hebdomadis (6.2 %) were recorded (Fig 12).

OVERALL REACTED SEROGROUP FREQUENCY

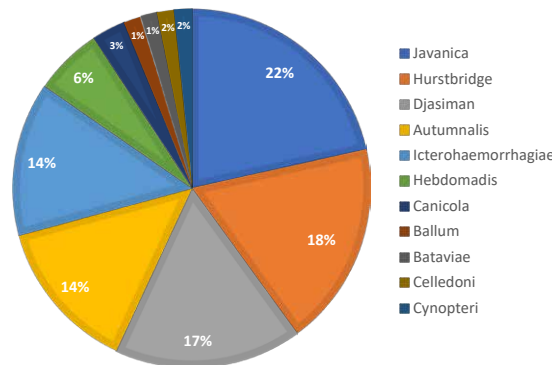


Fig 12: Frequency distribution of serovars of leptospira in humans in Dakshina Kannada district of Karnataka

(Balamurugan V, Chethan Kumar HB and Gulati BR)

Detection of mastitis and characterization of isolates in bovine milk samples

A pilot study was conducted to assess the prevalence of mastitis in bovine milk samples sourced from 20 villages in the Bangalore Rural District, Karnataka. The study utilized three different diagnostic tests, namely California Mastitis Test (CMT), FaunaSCC test device, and PortaSCC test kits. Among the 221 samples tested using CMT, 38% were identified as mastitis positive and within this category, 5.8% of the samples were classified as subclinical mastitis cases. Similarly FaunaSCC test device identified 31.22% of the samples as mastitis positive, with 5.0% categorized as subclinical mastitis. Notably, PortaSCC test indicated the highest prevalence with 44.76% of the samples declared as mastitis positive and 12.6% identified as subclinical mastitis cases. The Kappa agreement between CMT and FaunaSCC test device was found to be 0.850 (CI: 0.778 – 0.922), indicating a

high level of agreement between the two tests and agreement between FaunaSCC test and PortaSCC test was measured at 0.754 (CI: 0.647 – 0.867), indicating a substantial level of agreement between these two diagnostic methods. The results suggest a significant prevalence of mastitis in bovine milk samples in the study area. Continuous surveillance programs should be implemented to manage and control mastitis in the bovine population. A total of 84 mastitis milk samples were subjected to isolation of *Staphylococcus* and *E. coli* isolation. A total of 72 *Staphylococcus* and 60 *E. coli* were isolated recovered. Overall, 16 MRSA positives by PCR was recorded (22.2%) represent very high prevalence of AMR pathogens in mastitis milk samples, which should be viewed as public health importance (Fig 13 and Table 2).

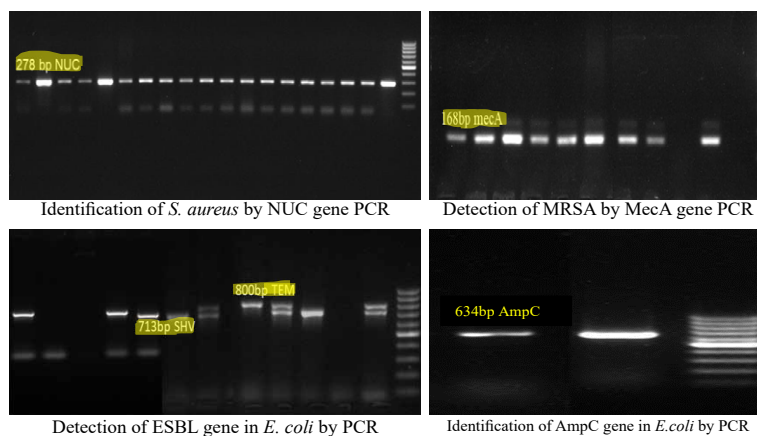


Fig 13: Detection of *Staphylococcus* and *E. coli* resistance genes by PCR

Table 2 Isolation of *Staphylococcus* and *E. coli* from mastitis samples

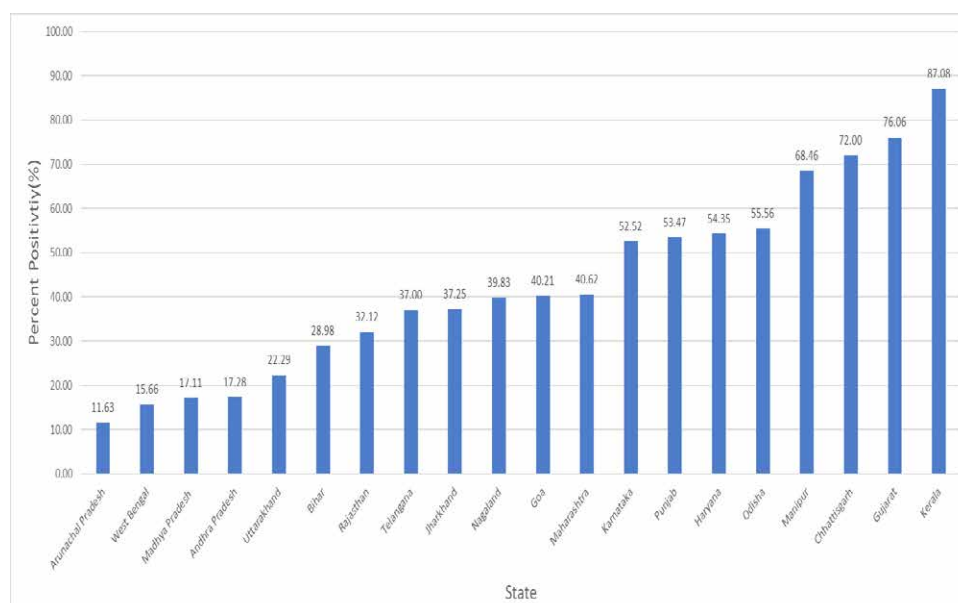
CMT positives	<i>Staphylococcus</i>			<i>E. coli</i>		
	Species	Total <i>S.aureus</i>	MRSA	ESBL	AmpC	<i>Staph & E. coli</i>
+ (13)	<i>S. aureus</i> = 2 <i>S. chromogenes</i> = 1 <i>S. sciuri</i> = 2 <i>Staph spp</i> = 4	9	6	3	0	4 (30.76%)
++ (28)	<i>S. aureus</i> = 7 <i>S. chromogenes</i> = 3 <i>S. sciuri</i> = 5 <i>Staph spp</i> = 9	24	5	3	1	11 (39.28%)
+++ (28)	<i>S. aureus</i> = 6 <i>S. chromogenes</i> = 3 <i>S. sciuri</i> = 7 <i>Staph spp</i> = 9	25	3	4	1	16 (57.14%)
++++ (15)	<i>S. aureus</i> = 6 <i>S. chromogenes</i> = 3 <i>S. sciuri</i> = 3 <i>Staph spp</i> = 2	14	2	2	0	9 (60%)
84		72	16	12	2	40

(Shome R and Shivasharanappa N)

Nationwide serosurveillance of surra in bovines

A total of 5184 bovine serum samples (buffaloes 3952; cattle 1072; mithun 160) received from 20 states were screened by the recombinant variable surface glycoprotein-based indirect ELISA. An overall 40.7% seroprevalence was observed.

Among buffaloes, the least seropositivity was observed in Arunachal Pradesh (11.63%). Among cattle, Kerala has the highest seropositivity of 87.08 % and the lowest seropositivity in Telangana (21.11%) (**Fig 14**).


Fig 14: Sero-prevalence of surra in bovines in different states of India

(Sengupta PP and Jacob SS)

Pilot study on bovine tuberculosis in Karnataka, India

A pilot study in Karnataka with focus on Government farms, Gaushalas and private cattle farms for bovine tuberculosis was

carried out. A total of 116 bovines from five farms in Bengaluru, Kolar and Gadag districts in Karnataka were tested (**Fig 15**).



Fig 15: Comparative cervical tuberculin skin testing in cattle

Percent positivity by single cervical test (SCT) 16.4 % (19/116) and on comparative cervical test (CCT), it was 0.9 % (1/116). The suspected or inconclusive is 14.7 % (17/116) in SCT and 20.7 % (24/116) in CCT (**Table 3**).

Thus, the initial study indicates the presence of bovine tuberculosis in the cattle population, and it warrants the need for taking up the extensive prevalence study in India.

Table 3 Single cervical test (SCT) and Comparative cervical test (CCT) results for bovine tuberculosis in Karnataka

Farm. No	District	No. of animals screened	Single cervical test (SCT)			Comparative cervical test (CCT)		
			Posi- tive	Inconclu- sive	Nega- tive	Posi- tive	Inconclu- sive	Nega- tive
1	Bengaluru	30	3	3	24	0	5	25
2	Gadag	19	0	3	16	0	3	16
3	Kolar	29	5	3	21	0	3	26
4	Kolar	15	5	5	5	0	5	10
5	Kolar	23	6	3	14	1	8	14
Total		116	19	17	80	1	24	91

(Nagalingam M, Krishnamoorthy P, Shivasharanappa N, Shome R, Balamurugan V and Gulati BR)

Molecular Epidemiology

Unravelling the genomic origins of lumpy skin disease virus in recent outbreaks

In this study, we used whole genome sequencing approach to investigate the origin of the outbreak and to understand the genomic landscape of the virus.

Analysis showed that the LSDV strain of 2022 outbreaks exhibited many genetic variations compared to the Reference Neethling strain sequence and the previous

field strains. A total of 1819 variations were found in 22 genome sequences, which includes 399 extragenic mutations, 153 insertion frameshift mutations, 234 deletion frameshift mutations, 271 Single nucleotide polymorphisms (SNPs) and 762 silent SNPs. Thirty-eight genes have more than 2 variations per gene, and these genes belong to viral-core proteins, viral binding proteins, replication, and RNA polymerase proteins. Phylogenetic analysis of whole

genome sequences of LSDV showed two types of variants in India. One group of the variant with fewer mutations was found to lie closer to the LSDV 2019 strain from Ranchi while the other group clustered with previous Russian outbreaks of 2015 (Fig 16). Our study highlights the importance of genomic surveillance to monitor the circulating variants and also to address its role in understanding the pathogenesis of LSDV.

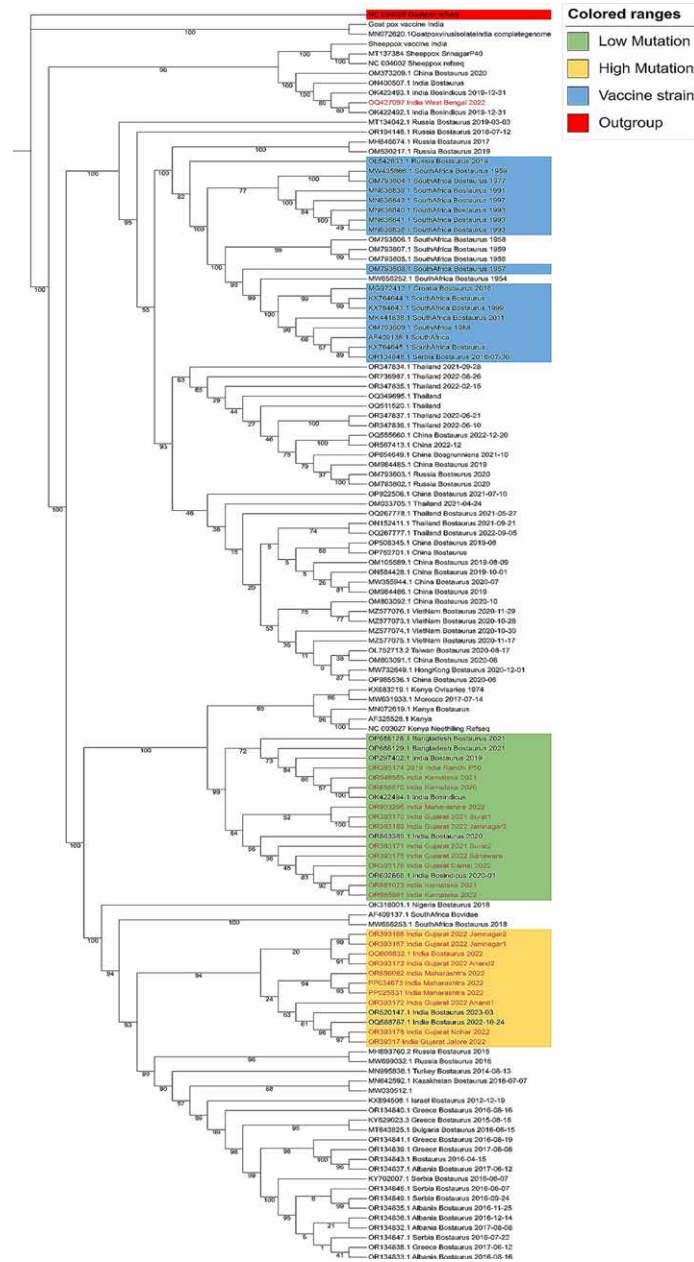


Fig 16. Phylogenetic analysis of LSDV. The genomes sequenced in this study are highlighted in red text. (Manjunatha Reddy GB and Gulati BR)

Emergence of LSD in Mithun (*Bos frontalis*) and Yak: First evidence of species spill over in India

Lumpy Skin Disease (LSD), a dreadful disease of cattle and known to cause mild infection in buffaloes, to date there were no reports of LSD in Mithun (*Bos frontalis*) and Yak (*Bos grunniens*), a unique bovine species in NER part of India. During the investigation, both Mithun and Yak exhibited typical clinical signs of LSD, including skin nodular lesions similar to cattle. The morbidity, mortality, and case fatality rates for cattle were 9.08%, 1.84%, and 20.24%, respectively. Similarly, the morbidity, mortality, and case fatality rates in Mithun and Yak were similar to cattle in the affected NER states. The virus isolation and amplification of LSDV-specific genes confirmed the presence of LSDV in cattle, yak, and vectors. Further,

demonstrated antibodies in randomly collected sera from naïve and unvaccinated Mithun and Yak using indirect Enzyme Linked Immuno-sorbent Assay (iELISA) and Serum Neutralisation test (SNT) from this region. Sequencing and phylogenetic analysis of P32, GPCR, and RPO30 genes revealed that the virus isolated from both species were closely related to the field LSDV isolates circulating in the Indian subcontinent (**Fig 17**). The study highlighted the emergence of LSDV in unconventional hosts and underscored the need to include other bovine species in national disease control programs, encompassing disease surveillance initiatives.

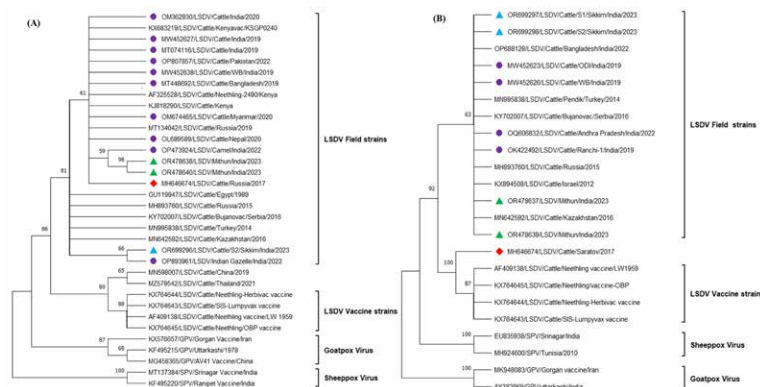


Fig 17. Phylogenetic analysis of full-length *RPO30* (A) and *P32* (B) genes of LSDV from Mithun (Manjunatha Reddy GB and Gulati BR)

One Health approach to understand and develop interventions for zoonotic diseases affecting forest communities in India

The project aims to use One Health approach to understand exposure to zoonotic diseases concerning vector and host cycles and human activities. During the period under report, a total of 50 tick samples were DNA barcoded using COX1 (**Fig 18**). Amplicons were sequenced and BLAST analysis of obtained COX1 partial sequences was carried out. Among 100 sequences analysed, the majority of the sequences matched with *Haemaphysalis* species.

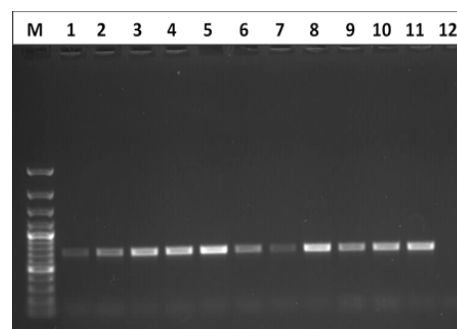


Fig 18: M-100bp plus Molecular Marker, Lane 1-11: Tick samples, Lane 12: Negative control.

(Chanda MM and Gulati BR)

One Health study on prevalence of ESBLs, MRSA and their molecular signatures of antibiotic resistance in livestock, animal handlers and environment

A cross-sectional study was carried out to determine the prevalence of ESBLs and MRSA and their molecular signatures of antibiotic resistance. A multistage random sampling was done covering 16 villages in four taluks of Bengaluru Rural District and collected a total of 378 samples (livestock 240, animal handlers 72 and environment 66). The overall prevalence of MRSA was 9.69% in livestock, 5.79% in animal handlers and 5.88% in the environment. The % prevalence of ESBL *E. coli* was 28.78% (67/198) and AmpC was 23.23% (46/198) from livestock (Fig 19). There was evidence of horizontal gene transfer of *mecA* gene in MRSA and MRCoNS between

livestock and animal handlers. The dairy and poultry revealed a higher rate of ESBL and AmpC *E. coli*. Antibiogram of MRSA and CoNS in livestock-humans-environment revealed highest resistance to penicillin followed by cefoxitin, Linezolid, and least to enrofloxacin. Antibiogram of ESBL and AmpC *E. coli* revealed highest resistance to ampicillin, nalidixic acid, cefotaxime, and least was found in enrofloxacin. The multiple antibiotic resistance index (MARI) was ranging from 0.2-0.6 in both MRSA and ESBLs. The study had significant understanding about the transmission of AMR pathogens between livestock, humans and the environment.

AMR pathogens in Livestock, Animal handler and Environment

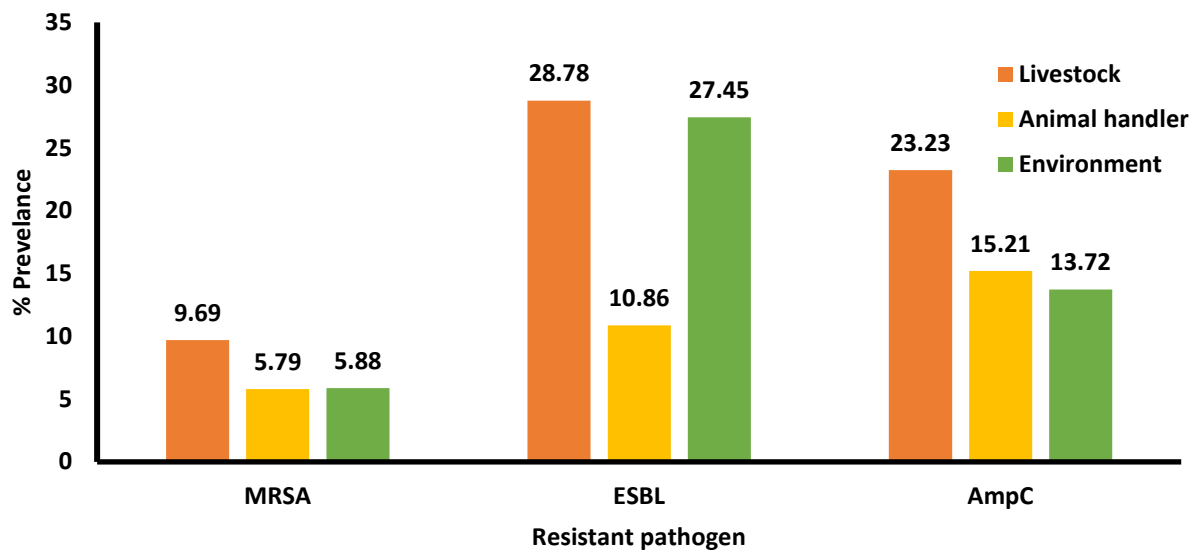


Fig 19: Percentage prevalence of AMR pathogens in livestock, animal handler and environment (Shivasharanappa N, Shome R, Krishnamoorthy P and Prajapati A)

Outbreak investigation and molecular characterization of oriental theileriosis in a livestock breeding farm in Karnataka

An outbreak of theileriosis was investigated in the Hessarghatta livestock breeding farm during May 2023. Out of the 33 animals in the farm, there was a report of death of two cross-bred animals with symptoms of high fever, weakness and sudden death.

The total genomic DNA was isolated from the blood and was subjected to PCR using genus-specific primers for *Babesia* spp., *Theileria* pp., *Anaplasma* spp. and *Ehrlichia* spp. All the affected animals were positive for *Theileria* spp. genus-

specific primers. The samples were turned to be positive with *T. orientalis*-specific primers. Testing of all the animals on the farm revealed 29 animals as positive for *T. orientalis*. All positive animals treated with Buparvaquone and blood samples were collected monthly and screened for *T. orientalis* and was found that the treated animals remained as carriers for infection

upto 6 months of infection. Molecular characterization revealed the presence of infection with mixed genotypes (Type 1 and Type 7) (Fig 20). The type 7 genotype was not responding to treatment with buparvaquone and as present in the carrier animals, whereas the Type 1 genotype was responding to treatment.

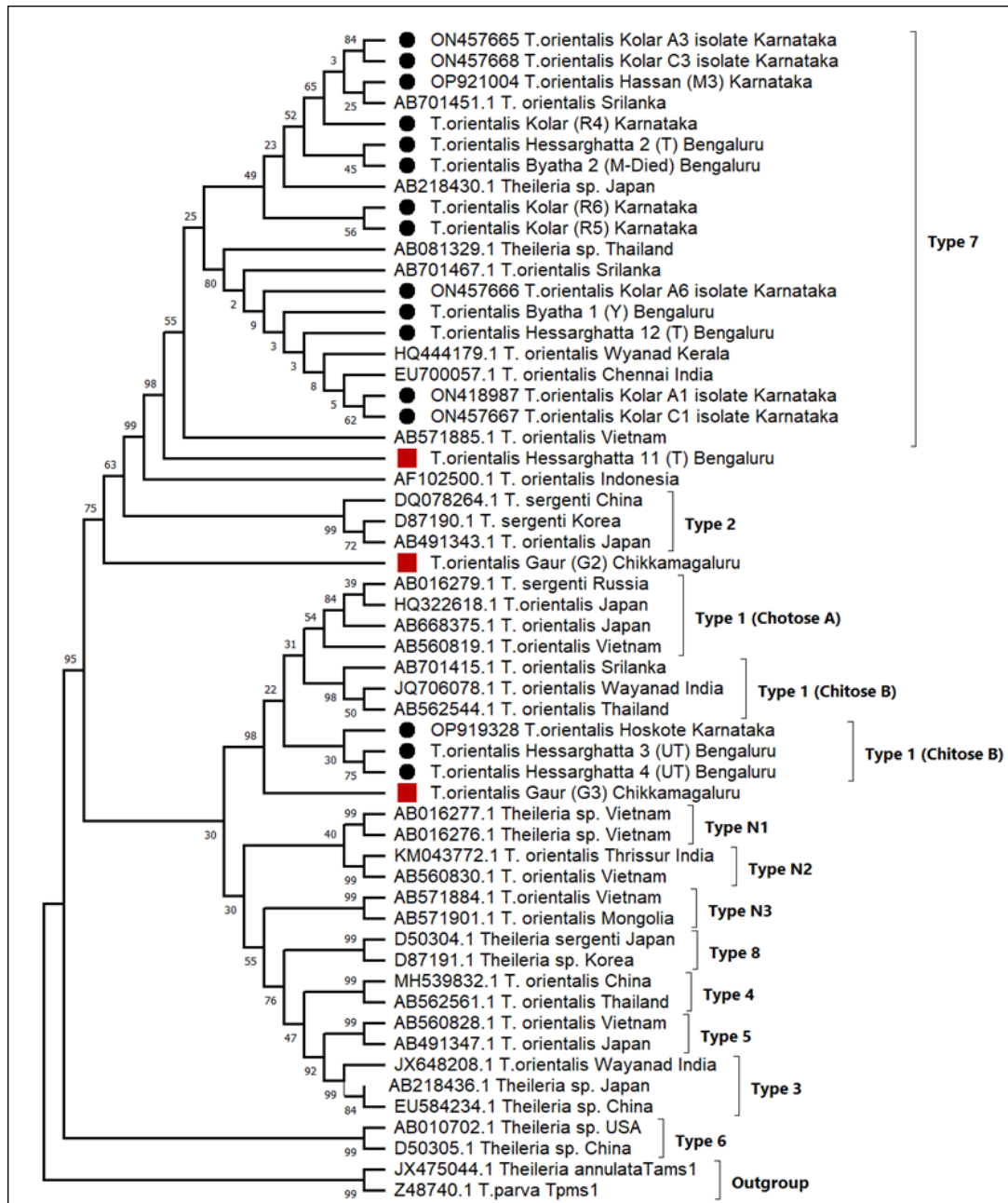


Fig 20: Phylogenetic analysis of *Theileria orientalis* based on MPSP gene sequence

(Jacob SS, Sengupta PP and Manjunatha Reddy GB)

Diagnostic Services

Screening of cattle for detection of lumpy skin disease

During this period, a total of 161 cattle and buffaloes clinical samples (scab/biopsy/swabs/blood) from Himachal Pradesh, Sikkim, Karnataka, Gujarat, Pondicherry and Arunachal Pradesh were tested for LSD diagnosis. An overall 70.41 % of samples were found positive for LSDV. The 157 random mithun serum samples were screened for LSDV antibodies using ELISA and SNT which revealed 74.52% positivity in the affected region. During the investigation, both cattle (**Fig 21**) and yak exhibited typical clinical signs of LSD, including skin nodular lesions in yak, the morbidity, mortality, and case fatality rates for cattle were 9.08%, 1.84%, and 20.24%, respectively and the morbidity, mortality, and case fatality rates in yak were 7.57%, 1.24%, and 16.33%, respectively.



Fig 21: LSD affected bullock showing nasolacrimal secretions and typical skin nodular lesions

(Manjunatha Reddy GB, Shivashanaranappa N, Chethan Kumar HB and Patil SS)

Screening of the cattle samples for malignant catarrhal fever (MCF)

A total of 64 MCF suspected livestock (cows=13, buffaloes=12 and sheep=39) were tested by conventional PCR (amplicon size-422bp) and heminested PCR (amplicon size-238 bp) targeting the partial tegument gene of the virus. The results indicated the presence of virus in 12 suspected bovine and sheep samples with (2 buffaloes; 3 cows;

7 sheep). Among them, 6 positive samples were sequenced and percentage identity matrix and phylogenetic tree revealed a close association with Indian and Egyptian isolates (**Fig 22**). In all the incidences, sheep were harbouring the virus and were the most probable source of infection to bovines.

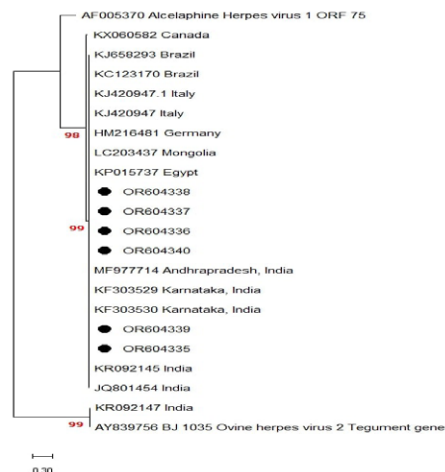


Fig 22: Phylogenetic analysis of partial tegument gene coded ORF75 of ovine gamma herpesvirus

Screening for bacterial diseases

Haemorrhagic septicemia and black quarter

During the period, a total of 107 clinical samples (blood, nasal swabs and tissues) from cattle and mithun, were screened by PCR. All the samples were found 'negative' for *Pasteurella multocida*. A total of 12 clinical samples (blood, exudates, muscle

tissue) were screened for detection of *Clostridium chauvoei*. Of which, 8 samples were found negative and 4 samples were positive by culture and PCR assay.

(Prajapati A, Yogishardhya R, Chanda MM and Shivachandra SB)

Leptospirosis

A total of 199 which species serum samples were screened for diagnosis of Leptospirosis based on MAT analysis at $\geq 1:100$ dilution by using the panel of 20 *Leptospira* reference serovars for seroprevalence of *Leptospira* serogroup-specific antibodies that includes

48 samples from Karnataka of which 3 samples tested positive, 160 samples from Nagaland of which 19 samples were found positive and 9 samples from Gujarat tested negative.

(Balamurugan V)

Brucellosis

A total 640 mithun and bovine serum samples received from Nagaland and Karnataka were screened for brucellosis using iELISA test. All the mithun serum

samples were found negative to brucellosis. Meanwhile, the bovine samples (484) showed a 3.10% brucellosis positivity.

(Shome R)

Screening of clinical samples for parasitic diseases

A total of 235 suspected cattle blood samples received from Karnataka were screened for haemoprotozoan parasites by PCR which revealed 114 samples (48.5 %) as positive for *Theileria orientalis*, 44 samples

(18.7%) as positive for *Anaplasma* spp. and 6 samples (2.55%) were positive for *Babesia* spp.

(Jacob SS and Sengupta PP)

Detection of acaricide resistance in *Rhipicephalus microplus* ticks of cattle

A study to evaluate the acaricide resistance status of *Rhipicephalus (Boophilus) microplus* to deltamethrin was conducted on the samples collected from Doddaballapur Taluk, Bengaluru district, Karnataka. Adult Immersion Test (AIT) was conducted using field strain for the determination of 50 and 95% lethal concentration of deltamethrin. The results revealed the presence of level II resistance with a resistance factor of

13.43. For molecular detection of pyrethroid resistance, a total of 148 *R. microplus* ticks collected from Bengaluru and Kolar districts of Karnataka were subjected to allele-specific PCR and the results revealed 32 (21.62%) as homozygous resistant (RR), 63 (42.56 %) as homozygous susceptible (SS), and 53 (35.8 %) as heterozygous (RS).

(Jacob SS, Sengupta PP and Manjunatha Reddy GB)

EPIDEMIOLOGY OF SMALL RUMINANT DISEASES



Development of Diagnostics

Production of monoclonal antibodies to non-structural proteins of bluetongue virus

Many diagnostic assays have used mAbs to VP7 as one of the constituents to detect bluetongue virus infection, however, those involving mAbs to non-structural (NS) proteins have been rare. Compared to assays targeted to structural proteins, those targeting NS proteins have the potential to be used as DIVA tests. Keeping this in mind, mAbs to recombinant NS1-NS3 fusion protein were produced using mouse hybridoma technology. Upon screening

two reactive clones were identified and preliminary characterization of these mAbs indicated these belong IgG1 class and both are directed against NS3 protein. Preliminary studies using both the clones indicated their usefulness in the development of competitive ELISA. Further characterization and development of competitive ELISA is in progress.

(Hemadri D and Hosamani M)

Selection of candidate vaccine strains of bluetongue

During the reported period, our team extracted 176 unclassified Bluetongue Virus (BTV) isolates from the ICAR-NIVEDI bluetongue virus collection, and serotyped employing multiplex PCR (mPCR). The majority of these isolates were identified as serotypes BTV1 (31%), BTV2 (11%), and BTV16 (22%). These serotypes are key components of the existing pentavalent vaccine authorized for preventive use in India. The identification reveals a significant prevalence of these serotypes, highlighting their continued relevance in vaccine formulation. The other serotypes (3,4,5,9,12,21,24) contributed to 34% of the total isolates serotyped indicating dynamic nature of BTV serotype distribution. Given the lower incidence of serotypes 23 (2%) and 10 (<1%), which are also part of the pentavalent vaccine, our strategy has shifted towards incorporating serotypes like BTV4, BTV12, and BTV24, which more

accurately reflect the current field situation.

In the initial phase of selecting potential vaccine candidates, we focused on 30 field isolates belonging to latter above three serotypes. Out of these, 20 isolates (n=5), BTV12 (n=6), BTV24 (n=9) were successfully plaque purified, while 10 presented challenges in purification despite numerous attempts. Subsequent virus titration of the 20 purified isolates yielded titers ranging between 4.6 TCID₅₀/ml to 6.3 TCID₅₀/ml. From these, two isolates per serotype (BTV4, BTV24, BTV12) were chosen for the generation of hyper-immune serum in rabbit & sheep. We then assessed the neutralization titers of these sera against both homologous and heterologous BTV isolates. Further characterization of these isoaltes by nucleotide sequencing for zeroing on the candidate vaccine strain is in progress.

(Hemadri D and Chanda MM)

Disease Surveillance

Screening of sheep to determine the incidence of bluetongue

A study was undertaken to determine the incidence of bluetongue in Maharashtra, Odisha and southern states of India. A total

of 753 sheep serum samples belonging to the age group 6-12 months, collected during 2023, were screened of anti-BTV

antibodies using an indirect ELISA. An overall incidence of 16.5% was observed in Karnataka State, however, incidence varied among districts indicating role of various risk factors in the precipitation of the disease. Similarly, a total of 754 sheep serum samples from Andhra Pradesh and Karnataka were investigated for incidence of bluetongue in sheep during 2023 using rNS1-NS3 fusion protein-based indirect ELISA. Preliminary analysis indicated an incidence rate of 15% among the age group between 6-12 months.

Besides an outbreak of bluetongue was investigated in the flock of Rambouillet

and Gaddi crossbreeds of sheep in the union territory of Kashmir during July-August, 2023. Based on clinical signs it was observed that fourteen animals in a flock of 482 animals were affected. The animals were not vaccinated against bluetongue. Antibodies to the bluetongue virus were found in ten animals. Of the two isolates that were recovered in cell culture belong to serotypes 1 & 9. Nucleotide sequencing and phylogenetic analysis of serotype 9 showed the virus having 95.47% homology with other Indian serotype 9 viruses (**Fig 23**). Farmers were advised with proper preventive and treatment measures.

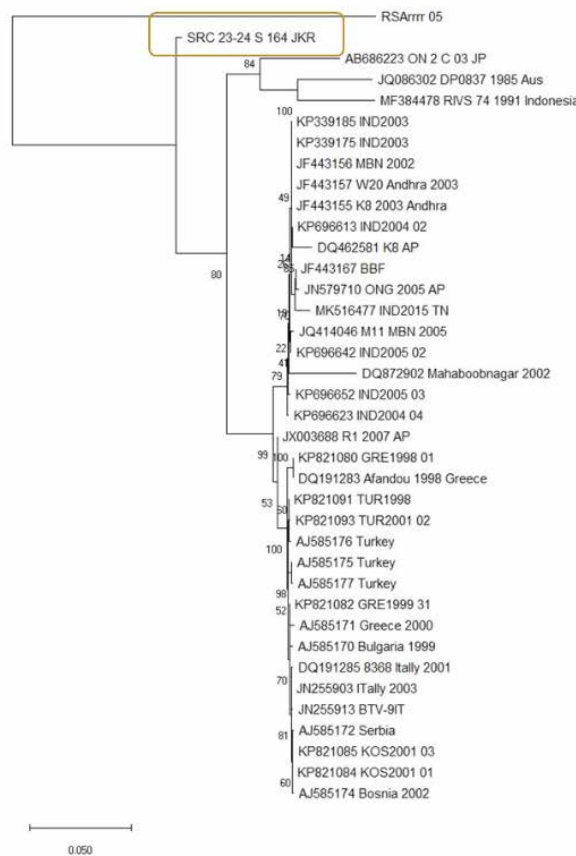


Fig 23: Neighbour-joining tree based on partial L2 gene sequences of BTv9 (Hemadri D and Chanda MM)

Prevalence status of PPR virus antibodies in goat and sheep populations before implementation of PPR Eradication Programme

The study involved approximately 3,240 random serum samples from three different age groups (6-12 months, 1-2 years, >2 years) across 108-120 epi-units covering different taluks in various districts in 23

states and UTs. The PPRV antibody status in the population was assessed using the indigenous H protein monoclonal antibody-based PPR-Competitive ELISA kit. A total of 53,035 serum samples were received from 23

States and 1875 villages out of which a total of 52,367 samples were tested through the PPR c-ELISA kit resulting in 24,899 positive samples showing 47.54% seroprevalence in the country for Pre-vaccination sampling plan. Notably, 26% of epi-units (n=502) had prevalence rates >70%, indicating a substantial level of population immunity due to continuous vaccination efforts in some states since 2011. Conversely, 32% of epi-units (n=595) had prevalence rates below 30%, highlighting the need for intensified vaccination efforts (**Fig 24**). Significant associations ($p < 0.05$) were found between PPRV antibody presence and host factors such as species, age, breed,

and sex. The observed seropositivity before mass vaccination implementation was 15%, 19%, and 14% in age groups of 6-12 months, 1-2 years, and >2 years, respectively. For active PPR eradication as per the plan, a mass vaccination campaign (>95% coverage) targeting populations aged >4 months is advocated. The aim is for >85% vaccine efficacy to achieve the desired herd immunity of >80% within four to five years of the NSP of India. This study offers crucial insights into PPR baseline seroprevalence/immunity status, guiding national strategies towards a PPR-free India and further supporting the global eradication initiative.

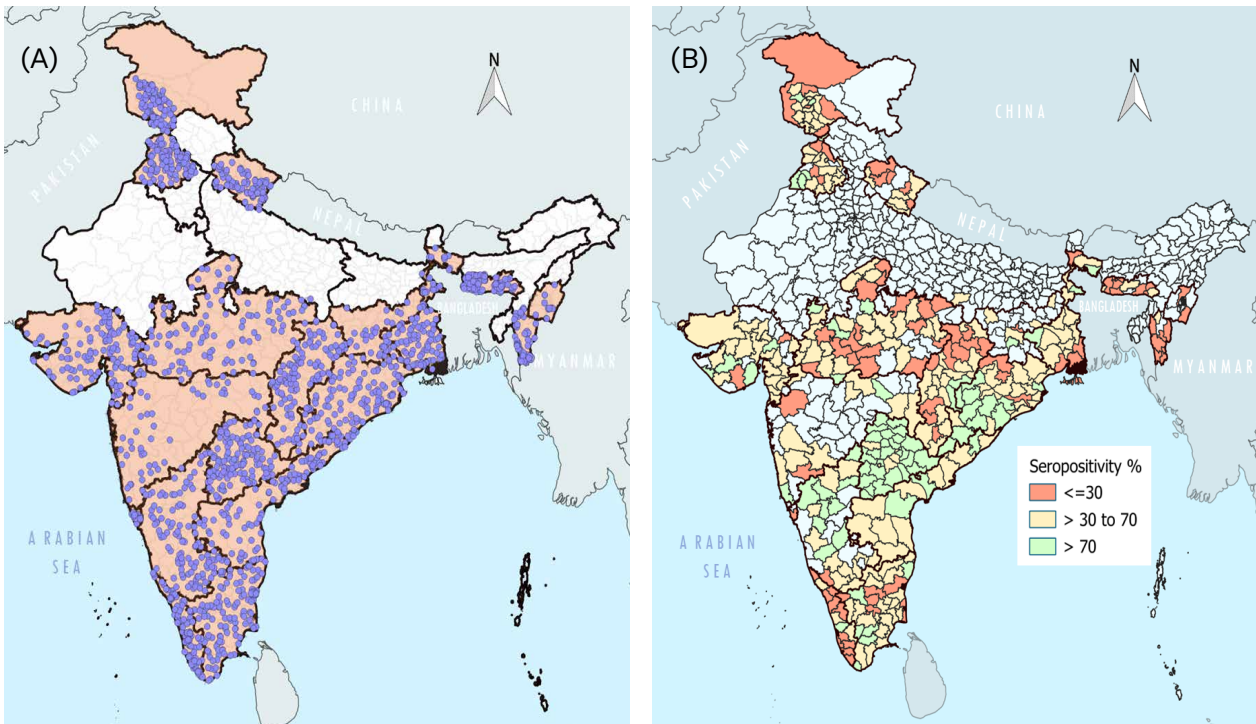


Fig 24. Map of India indicating epi-units (A) and % seropositivity (B) of PPR in different districts in the different states.

(Balamurugan V, Suresh KP, Govindaraj G, Hemadri D and Gulati BR)

Post-vaccination seromonitoring of Peste des Petits Ruminants in sheep and goats in Karnataka

A study was conducted to assess the immunity status of PPR before mass vaccination involved 3,466 random serum samples from three different age groups (6-12 months, 1-2 years, >2 years) across 116 epi-units covering 82 Taluks in 28

districts in Karnataka. The post-vaccination seromonitoring included 1,102 serum samples from 6-12-month age groups across 111 epi-units covering 64 Taluks in 23 vaccinated districts. The PPRV antibody status in the population was assessed

using the indigenous H protein monoclonal antibody-based PPR-Competitive ELISA kit. Results showed a 61% PPRV antibody prevalence across all age groups in the prevaccination stage. Notably, 41% of epi-units (n=47) had prevalence rates >70%, indicating the substantial level of population immunity, due to continuous efforts of vaccination implementation in the state since 2011. Conversely, 17% of epi-units (n=20) had prevalence rates below 30%, highlighting the need for intensified vaccination efforts. Significant associations ($p < 0.05$) were found between PPRV antibody presence and host factors like species, age, breed, and sex. The observed seropositivity

before mass vaccination was 55%, 62%, and 66% in age groups of 6-12 months, 1-2 years, >2 years, respectively. Whereas, the post-vaccination seromonitoring showed an overall seroconversion of 73.4% in the 6-12 months age group, with 69% epi-units (n=77) having PPRV antibody prevalence rates >70%, in contrast to only 42 epi-units (n=48) before mass vaccination. For active PPR eradication as per the plan, a mass vaccination campaign (> 95 % coverage) targeting populations aged >4 months is advocated, aiming for >85% vaccine efficacy to achieve desired herd immunity of >80%.

(Balamurugan V, Suresh KP, Govindaraj G, Hemadri D and Gulati BR)

Prevalence of mycoplasmosis among small ruminants of Karnataka

During 2023 blood samples from sheep and goats (n=244) from 14 districts of Karnataka were collected and screened by serological tests for the prevalence of Mycoplasma infections and specific Contagious caprine pleuropneumonia (CCPP). Among the serum samples screened by commercial CCPP ELISA, overall prevalence of 13.11% with 9% prevalence among sheep and 20% prevalence among goats, 5.45% in males and 15.3% in females were reported. Majority of the samples were collected from farms which follow non-migratory pattern of rearing.

A total of 215 nasal swabs were collected from animals showing respiratory signs and

transported in PPLO broth and screened by Mycoplasma genus-specific PCR. An overall 4.6% prevalence was observed, 6.9 % in goats and 3.8% in sheep. To know the mycoplasma prevalence agglutination was carried out in 321 serum samples and found to have 32 % overall prevalence with 28% prevalence among sheep, 38% prevalence among goats, 37% among males and 30% among females. From the study carried out so far, it was inferred that mycoplasma seroprevalence are higher in goats as compared to the sheep population of Karnataka.

(Sridevi R, Sumathi B and Hemadri D)

Meta-analysis of pooled prevalence of CCPP among small ruminants in world

Under the reporting period, to estimate pooled prevalence of Contagious Caprine Pleuropneumoniae (CCPP) among small ruminants, relevant research publications were collected on CCPP from 1980 to 2022 from public domains such as ScienceDirect, PubMed. The search was carried out with specific terms and followed certain inclusive and exclusive criteria's. A total of 200 studies obtained and with set of inclusion and exclusion criteria, a total of 64 studies were included and analysis was carried out by overall prevalence, year and

different diagnostic methods with Forest plot analysis /Random effects model in R software. The pooled prevalence estimate of CCPP in small ruminants was found to be 26% with lower and upper limits {13-45} with a 95% Confidence Interval and in India, the pooled prevalence was 18% {11-27} with a 95% Confidence Interval and the overall worldwide pooled prevalence estimate was 18% {15-22}.

(Sridevi R, Jacob SS and Hemadri D)

Molecular Epidemiology

Isolation and molecular characterization of Peste des Petits Ruminants Viruses from outbreaks in goats

Five PPR outbreaks were reported in goat flocks in different states of India during the years, characterized by high morbidity and significant mortality rates. Two outbreaks occurred in Mizoram, one in Lungpho and another in East Thinglian regions, with together 225 cases and 199 deaths, third in Dewas, Madhya Pradesh (MP), with 150 cases and 30 deaths, fourth in Hassan, Karnataka with 31 cases and fifth in Chikkamagaluru, Karnataka with 22 cases and 6 deaths. Clinical samples from the affected flocks were tested using PPR-c-ELISA, PPR s-ELISA, and RT-PCR. The selected highly positive infected tissue swab samples by PPR s-ELISA and RT-PCR from each outbreak were subjected to PPR isolation in Vero cells following standard procedures. PPRV was successfully isolated from selected one out of four samples in

MP, two out of two isolates from Mizoram, one out of one in Hassan, Karnataka, one out of two in Chikkamagaluru, Karnataka. Outbreaks samples were passaged in Vero cell lines for virus isolation and confirmed by PPRV Nucleocapsid (N) and Fusion (F) gene-specific RT-PCR. The characteristic cytopathic effect (CPE) includes cell roundings, vacuolations, and Fusion of cells was observed in Vero cells within 5th to 7th day of infection (**Fig 25**). Further, sequence and phylogenetic analyses of partial F and N gene sequences of all five recovered isolates in Vero cells revealed that the isolated PPR viruses belong to lineage IV exhibit close genetic relationships with other Asian or Indian PPRV isolates and strains. Work is ongoing to characterize the complete genome sequences of the isolated PPRV.

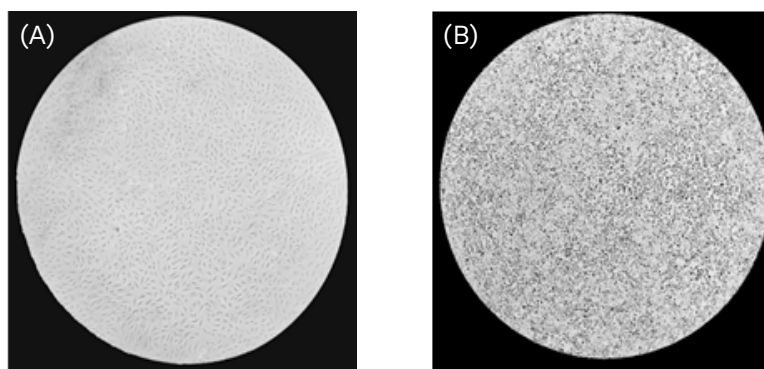


Fig 25: Isolation of PPRV in cell culture, Healthy Cells (A), CPE of MP/23 G-44 (B)
(Balamurugan V and Gulati BR)

Evolutionary rate and codon usage bias of nucleocapsid and fusion protein coding genes of Peste Des Petits Ruminants virus in goats and sheep

Through the analysis of evolutionary rate, phylogenetics, selection pressure, and codon usage bias, we determined the time to the most recent common ancestor (tMRCA) as 1984, 1973, 2000, and 2004 for goat and sheep and N and F genes, respectively, with evolutionary rates ranging from 2.859×10^3 to 4.995×10^4 . The F-gene appears to evolve faster than the

N-gene, indicating evident virus pressure in immune animals and transmission across different regions of India, as supported by phylogenetic analysis. Examination of codon usage bias, incorporating nucleotide composition and various plots (eNC plot, parity plot, neutrality plot), suggests evolution in India is influenced by both natural selection and mutational

pressure, resulting in changes in the virus's codon bias. The comprehensive analysis emphasizes the significant role of selection pressures, implying the co-evolution and

adaptations of PPRV influenced by various genes.

(Balamurugan V and Suresh KP)

Comparative genomics and epidemiology of capripox viruses in India

Sheep and goat pox data for past ten years has been collected from WAHO and for the past 20 years from Karnataka state. The temporal and spatial distribution of sheep and goat pox outbreaks is carried out. The survey tool is designed for use during the outbreak surveys. The LSD, sheep and goat pox outbreaks samples received from different states were screened and provided the diagnostic reports. The LSDV, sheep and goat pox virus isolation were carried out (10). The LSD outbreaks were attended in Karnataka, Sikkim, Maharashtra and Uttarakhand as a part of DADF expert nominee and reports were submitted to DADF. A probe based Real

time PCR for specific detection of LSDV is standardized. The goat pox vaccine seroconversion studies in field were carried out in Maharashtra (659) and Karnataka (646) in post vaccinated serum samples using iELISA and the results revealed seroconversion rate of 73.7% and 76.65% respectively in these states. Ten whole genome sequencing of LSDV is carried out and data analysis revealed there are two major clusters circulating in India. For the first time India, LSD was documented in yak and Mithun for the first time in the world.

(Manjunath Reddy GB, Shivashanaranappa N and Chethan Kumar HB)

Epidemiological study of antimicrobial use (AMU) and Antimicrobial Resistance (AMR) in sheep and goats with one health approach in Karnataka

A cross-sectional study with multistage random sampling was conducted during 2022-23 in Chitradurga district to estimate antimicrobial use and AMR in sheep. A total of 439 samples (sheep 341, farm environment 60 and animal handlers 38) were collected and processed for isolation and characterization of methicillin resistant *Staphylococcus aureus* (MRSA) and extended spectrum beta lactamase (ESBLs). AST was performed using automated AST (BD Phoenix M50). The mPCR assay was

done to detect antimicrobial resistance genes (ARGs) in ESBL and MRSA isolates. AMU was estimated using FAO validated method.

The average quantity of AMU at farm level was 640.87 g of Enrofloxacin, 626.47 g of Gentamicin, 620.42 g of Oxytetracycline and 280.56 g of Ciprofloxacin in sheep. AMU expressed in mg/population correction unit (PCU) for Oxytetracycline was 101.48 mg/kg and 89.97 mg/kg enrofloxacin in sheep (Fig 26).

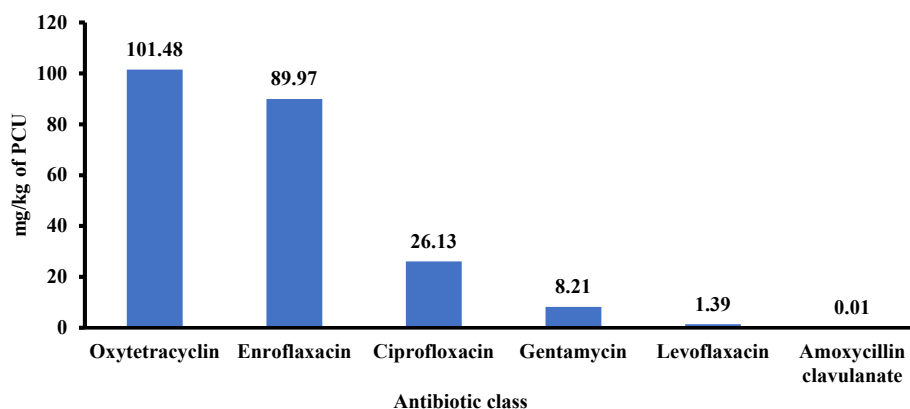


Fig 26: Antimicrobial use in sheep and goats (mg/kg of PCU)

The percentage prevalence of ESBL *E. coli* was 9.09% (31/341) in sheep and 15.51% (9/60) in farm environment. The % prevalence of *Staphylococcus* was 2.96% (13/439). mPCR assay revealed presence of resistant gene (TEM) among forty ESBL isolates. There was no evidence of MRSA in sheep, animal handlers as well as from

environment. The study showed significant understanding about the reduced level of antibiotic use in sheep which was reflected in lower prevalence of AMR pathogens in small ruminants.

(Shivasharanappa N, Shome R, Patil SS, Krishnamoorthy P, Narayanan G and Chethan Kumar HB)

Diagnostic Services

Diagnosis of pasteurellosis and enterotoxaemia suspected clinical samples

A total 201 clinical samples (blood, nasal swabs and tissues) from suspected pasteurellosis cases in sheep and goat were received screened for confirmatory diagnosis. Of which, 193 samples were found negative and 8 samples were positive for *Pasteurella multocida* by conventional and PCR assays. During the period, a total of 90 clinical samples (intestinal fluids/exudates, tissues, faecal swabs) were screened for detection of *Clostridium perfringens* by conventional and PCR assays. Of these, 77 samples were found negative and 13 samples were positive for *C. perfringens*. To know the variability at Omp level among *P. multocida* strains a total of seven *P. multocida* strains obtained from sheep, buffaloes, rabbits and pigs succumbed to different clinical conditions were comparatively analyzed at sequence and structure level using *ompA* gene sequences in conjunction with the

capsular type. Analysis revealed that the length of CDs region in different serogroups of *P. multocida* varied from ~1050 to 1077 bp, being highest in serogroups B (1077 bp) and lowest in serogroups A of rabbit strain (1050 bp). Nucleotide length was the same in all sheep serogroup A strains (1059 bp). Protein domain analysis of OmpA showed signal peptide, N-terminal *ompA* domain and C-terminal ligand binding domain. The phylogenetic analysis showed two major clusters of the bovine and porcine/ sheep/ rabbit/human strains, which were further divided into 5 different sub-clusters. The study concluded that the clustering of *P. multocida* based on *ompA* proteins was associated with capsular serogroup and host species. Further, three-dimensional models indicated the presence of a transmembrane domain consisting of 8 antiparallel β -sheets with 4 periplasmic turns and 4 long extracellular loops (Fig 27).

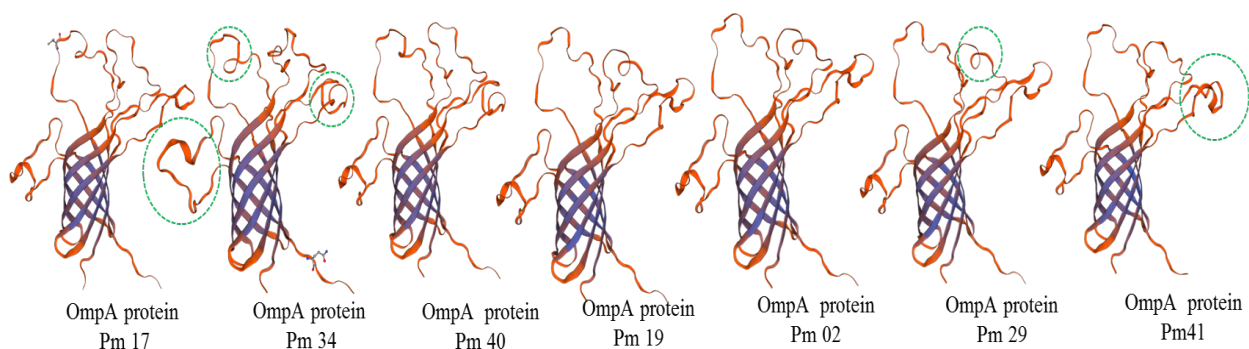


Fig 27: Homology-based 3D structure of OmpA proteins. Homology structure of OmpA protein of seven *P. multocida* strains was carried out by using the Swiss-Prot model. The area in the 'green' circle represents the variability in the loop region

(Prajapati A, Yogishardhya R, Chanda M M and Shivachandra SB)

Molecular detection of anthelmintic resistance in *Haemonchus contortus* in sheep

A total of 51 sheep faecal samples collected from Bengaluru which was found positive for Strongyle ova by faecal sample examination were cultured and recovered the larvae of *Haemonchus contortus* (n=57). Total genomic DNA was isolated from individual larvae and PCR amplification of β -tubulin was done by primary and nested PCR to detect the benzimidazole resistance. PCR-

RFLP was done with the RsaI enzyme for species identification and confirmation of the larvae. Genotyping was done by Allele-specific PCR using Nested PCR product as a template. Out of 57 larvae, 9 (15.78%) were homozygous resistant (RR), 31 (54.38 %) were homozygous susceptible (SS), and 17 (29.82 %) were heterozygous (RS).

(Jacob SS, Sengupta PP and Sridevi R)

EPIDEMIOLOGY OF SWINE DISEASES



Development of Diagnostics

Development of Enzyme Linked Immunosorbent assay for the serosurveillance of porcine cysticercosis

Porcine cysticercosis caused by the metacestode state of *Taenia solium* is a major public health concern in the developing countries including India. Understanding the prevalence of infection in pigs is extremely important to prevent the transmission of infection to human beings. In the present study, the *Cysticercus cellulosae* were collected from the pig slaughterhouses and total RNA was isolated. Complementary DNA was prepared and the GP 50 gene of *T. solium* was amplified using custom-designed primers. The PCR products were cloned, sequenced and analysed. Further, the GP 50 gene was

ligated into the pET 32b expression vector and was transformed into *E.coli* BL 21 cells. Induction of expression of recombinant protein was achieved by using 1mM IPTG. The expressed protein was purified and dialysed. Indirect ELISA using GP 50 recombinant protein was standardized and was characterized by western blotting. The developed enzyme immunoassay showed 96.2 % sensitivity and 98 % specificity with a cut-off of 53 % percent positive. Hence, the developed assay can be exploited as a potent tool in the diagnosis and sero-surveillance of porcine cysticercosis.

(Jacob SS, Sengupta PP and Patil SS)

Molecular Epidemiology

Whole genome and correlative virulence associated gene (VAGs) analysis of *Pasteurella multocida* strains from pigs

Two *P. multocida* strains NIVEDIpM17 (serogroup D) and NIVEDIpM36 (serogroup A) isolated previously from clinical samples of porcine origin obtained from Guwahati, Assam and Aizwal, Mizoram states, respectively, were subjected for whole genome sequencing analysis. The *de novo* assembly of their genomes contained 43

and 20 contigs, respectively, with a G + C content of ~40.2. The analysis of draft genomes of NIVEDIpM17 and NIVEDIpM36 revealed the presence of total 2182–2284 coding sequences (CDSs) predicted along with 5–6 rRNA and 45–46 tRNA genes in the genomes. A total of 17,270 and 16,335 SNPs were detected in the genomes of

NIVEDIpM17 and NIVEDIpM36, respectively (Fig 28). The non-synonymous SNPs in NIVEDIpM17 and NIVEDIpM36 were 19.5% and 18.9%, respectively. Pangenome analysis of 61 *P. multocida* strains showed the presence of 1653 core genes, 167 soft core genes, 750 shell genes, and 1820 cloud

genes. The pan-genome of the 61 strains of porcine origin analyzed through SNP and core genome-based phylogenetic analysis grouped the porcine isolates/strains into three major clusters. Strains NIVEDIpM17 and NIVEDIpM36 were present in different clusters.

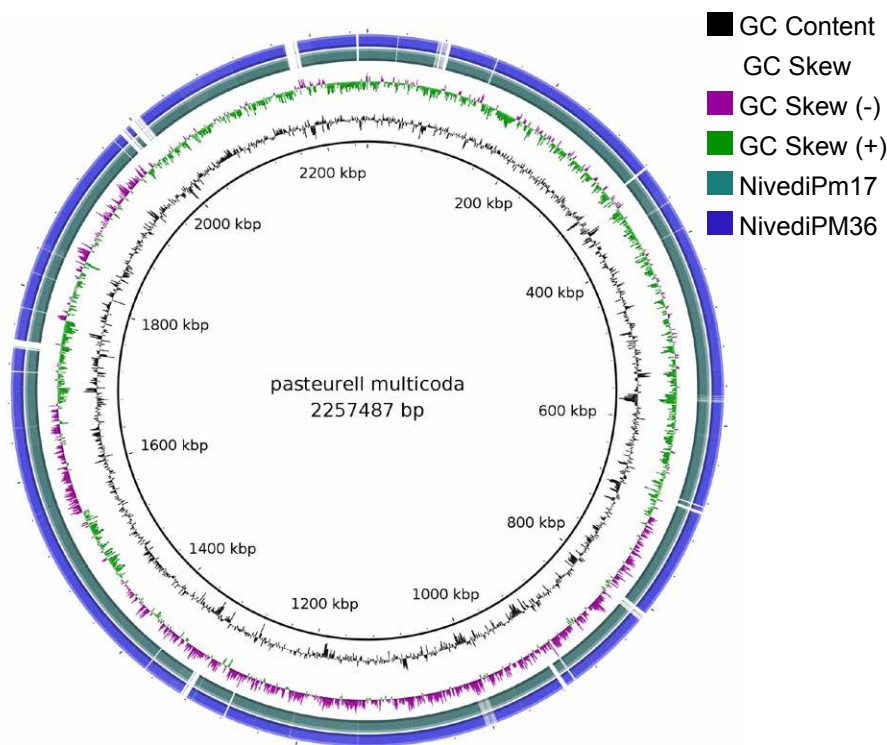


Fig 28: Comparative circular genome visualization of *P. multocida* strains of porcine origin (NIVEDIpM17, NIVEDIpM36) and references by BRIG.

Further, associations/correlations between the sequence type and VAGs were identified using the statistical models. Analysis of VAGs in 61 genomes indicated the presence of *nanB*, *exxB*, *exxD*, *ptfA*, *ompA*, *ompH*, *fur*, *plpB*, *fimA*, *sodA*, *sodC*, *tonB*, and *omp87* in all strains. The 61 genomes contained genes encoding tetracycline (54%), streptomycin (48%), sulphonamide (28%), tigecycline (25%), chloramphenicol (21%), amikacin (7%), cephalosporin (5%), and trimethoprim (5%) resistance. Multilocus sequence type revealed that ST50 was the most common (34%), followed by ST74 (26%), ST13 (24%), ST287 (5%), ST09 (5%), ST122 (3%), and ST07 (2%). The genome of NIVEDIpM17 did not harbour the *toxA* gene, while it was found in the genome of NIVEDIpM36. In correlation studies, there was no significant correlation between sequence type and the *toxA* gene.

The genome of strain NIVEDIpM17 was devoid of *pmHAS*-encoding hyaluronidase *hsf-1* and *hsf-2*- encoding surface fibrils. There was a “negative” correlation between ST50 and *pmHAS* and *hsf-1*. Overall, we noticed the various virulence factors, mobile genetic elements, and antimicrobial resistance genes in the pangenome of *P. multocida* of porcine origin, besides the rare presence of LPS genotype 7 in serogroup D. Significant correlations based on 95% credible intervals were plotted. The “red” colour indicates “negative” correlations and “blue” indicates “positive” correlations. The size of the circle shows the strength of the correlation between virulence genes.

(Prajapati A, Yogishardhya R, Chanda MM and Shivachandra SB)

Serosurveillance

Nation-wide seroprevalence of classical swine fever

A total 14,450 pig serum samples were received from 11 states of India. The overall seroprevalence of pre vaccinated samples was 34.15% (3238/9480) and post vaccinated seroprevalence was 52.65% (2617/4965) (**Fig 29**). A total 186 serum/blood and 78 tissue samples were received from Karnataka, Goa, Kerala, Odisha, Tamil Nadu, Madhya Pradesh and Pune states of India and tested for CSFV using 5'UTR

primers. Out of 186 serum/blood samples, 9 samples were from Karnataka, 2 samples from Odisha and one tissue samples from Goa were found Positive. A total 158 Non-CP pig serum samples were received from Karnataka, Chhattisgarh and Madhya Pradesh and tested for CSFV antibodies using CSF AB ELISA. Out of these samples, 97 were found positive for CSFV antibodies.

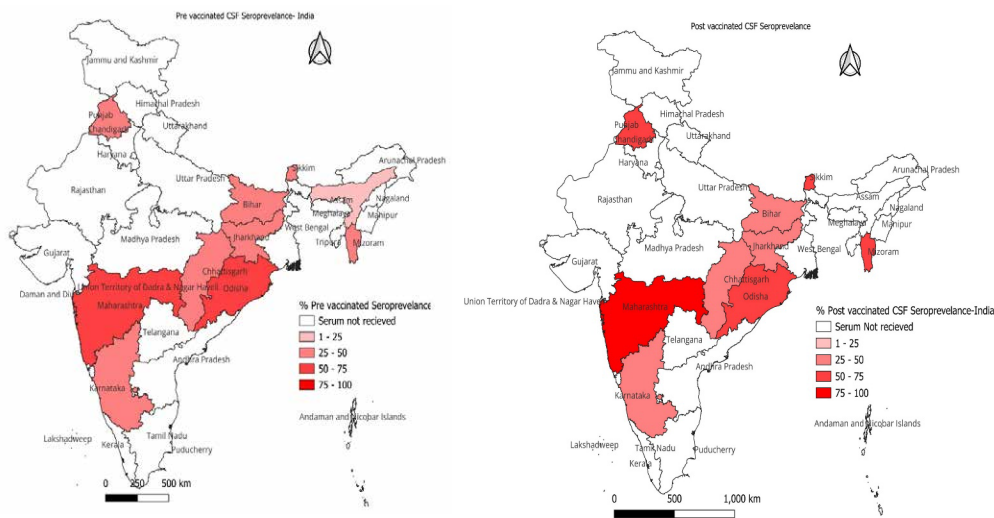


Fig 29: Overall pre- and post-vaccinated seropositivity for CSFV

(Patil SS)

Epidemiology of major pig diseases in India

The ASF outbreak in the Kannur district of Kerala was investigated and identified swill as a likely source of infection and swill feeding practice as a potential risk factor for ASF outbreak. The genetic characterization of ASF revealed that the ASFVs circulating in Kerala (South India) formed a separate clade along with those found in Mizoram (North East India), while ASFVs circulating in Arunachal Pradesh and Assam states of India grouped into different clades.

For the purpose of JE serosurveillance VNT was standardised using JEV SA 14-14-2 strain. The result was recorded on day 4 and the serum with titer of ≥ 8 was considered positive for JEV infection. Using VNT a total of 441 pig sera were tested of which 177 (40%) were found positive for

neutralization antibodies to JEV. The JE outbreak in Palakkad district, Kerala was investigated with one health approach. Although pigs were seronegative, the detection of antibodies in cattle, goats and horses within the infected zone indicated the circulation of the virus in the village (**Fig 30**).

Other ecological factors such as paddy fields, ponds, egrets, and vectors supporting JEV circulation were also present. The study emphasized the significance of sero-surveillance in other species of livestock in addition to pig during outbreak investigation. Additionally, the sero-surveillance and diagnostic services resulted in the screening of samples for ASF, JE and *Taenia solium* (**Table 4**).

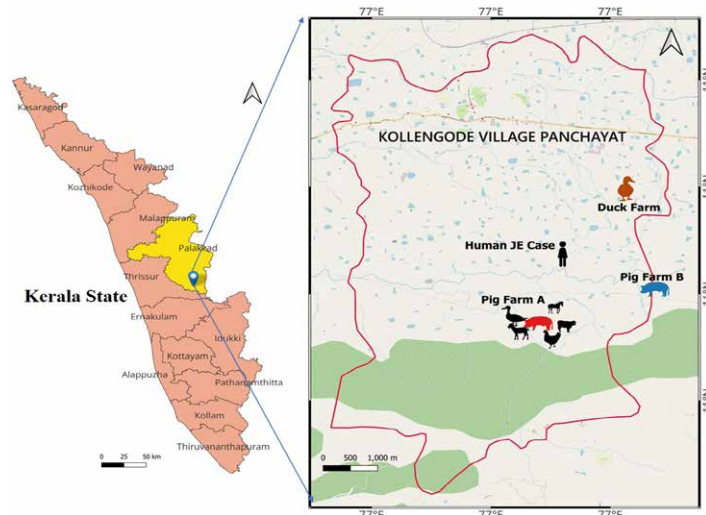


Fig 30: Mapping outbreak zone highlighting the location of different livestock species in the epicenter

Table 4 Surveillance for ASF, JE and *Taenia solium* (2023-24)

Disease	Sample type	No. of samples screened	% positivity
African Swine Fever	Tissue	119	73%
Japanese Encephalitis	Serum	447	40%
<i>Taenia solium</i>	Serum	163	9.8%

(Hiremath J, Chethan Kumar HB, Jacob SS, Shivasharanapp N, Gowda CS, Suresh KP Balamurugan V, Manjunatha Reddy GB, Hemadri D, Patil SS and Gulati BR)

Diagnosics Services

Serological screening for porcine coronaviruses in Karnataka

A total of 446 serum samples were screened for antibodies against Transmissible gastroenteritis virus (TGEV) (142), Porcine respiratory coronavirus (PRCV) (46) and Porcine epidemic diarrhea virus (PEDV) (258). The serum samples for PEDV were collected from eight districts of Karnataka. The results showed 6.97% positivity for PEDV (**Fig 31**) and samples were seronegative for TGEV and PRCV. Multivariate analysis revealed that breed was a significant risk factor for PED in Karnataka. The results indicate that prevalence of the disease in southern India as the serological detection of the disease from the state of Assam was reported in the year.

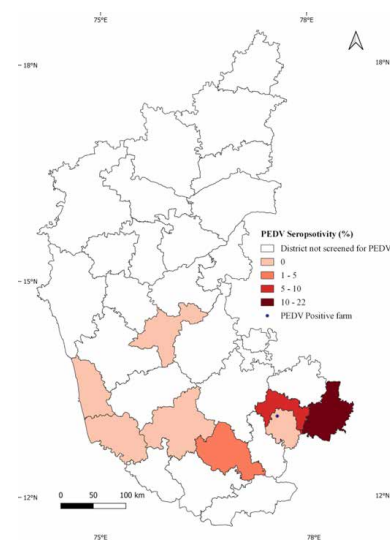


Fig 31: PED seropositivity in Karnataka

(Hiremath J and Suresh KP)

ANIMAL DISEASE INFORMATICS & SOCIO-ECONOMICS



Disease Informatics

Scientifically-driven forecasting and forewarning systems for proactive management of livestock infectious diseases

A total of 136 district-wise disease outbreak data was received and entered into the NADRES database. A total of 14 diseases were predicted. Risk/vulnerable maps were prepared for Foot and Mouth Disease and Lumpy Skin Disease to analyze their trends over time and assess the potential impact

of any interventions on disease incidence (Fig 32). These maps provide valuable insights for the formulation of vaccination strategies, disease surveillance plans, and the development of other preventive measures.

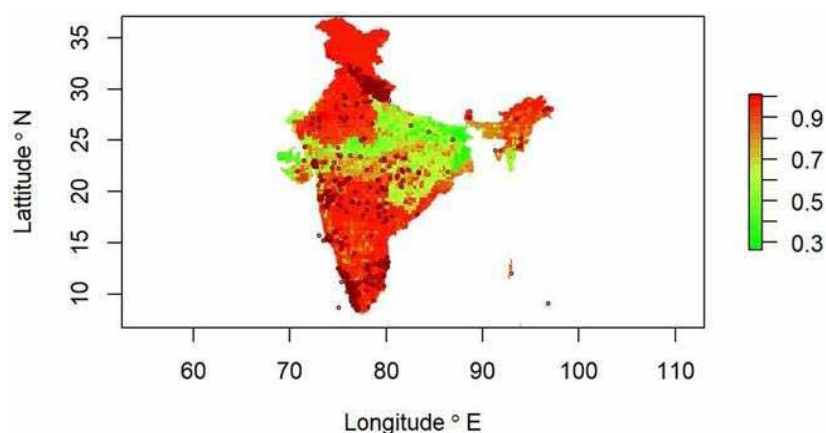


Fig 32: The predicted risk map for LSD in India

Further, ICAR-NIVEDI in collaboration with NIC, Govt. of Karnataka has sent more than 100 lakhs SMS alerts on the risk of occurrence of diseases viz., Anthrax,

Black Quarter, Babesiosis, Fasciolosis, Foot & Mouth Disease, Theileriosis, Trypanosomiasis (Table 5).

Table 5 Detail of SMS alerts sent on the risk of occurrence of diseases

Sl No.	Diseases	Apr 23 to Jan 24
1	Anthrax	2530242
2	Black quarter	2992548
3	Babesiosis	40011
4	Fasciolosis	817946
5	Foot & Mouth Disease	3663757
6	Theileriosis	378985
7	Trypanosomiasis	211439
Total		10634926

(Suresh KP, Hemadri D, Patil SS, Krishnamoorth P, Jacob SS and Shome R)

Generation of sampling plan for serosurveillance under the National Animal Disease Control Programme (NADCP)

During this period sampling plans were generated for sero-surveillance and seromonitoring of FMD and brucellosis in India (**Table 6**). Also modified data frame for state-wise sampling and sero surveillance of FMD. Calculated sample size of state/UTs wise percentage of animals

showing protective titre against FMD virus serotypes O, A, and Asia (LHDCP-2). For PPR-EP, sampling plans for phase II for different districts of Karnataka, Nagaland, Puducherry, Mizoram, Ladakh, and Goa were carried out.

Table 6 Sampling plan for FMD Serosurveillance 2024 in India

State	Total no of Cattle + Buffalo **	No Animals to be Sampled	Average No of Samples Per Districts
Andaman & Nicobar	40138	1017	509
Andhra Pradesh	10819586	6105	470
Arunachal Pradesh	345600	2241	112
Assam	11330954	1980	42
Bihar	23117774	4773	126
Chandigarh	25617	240	240
Chhattisgarh	11158676	1322	49
Dadra & Nagar Haveli & Diu & Daman	42947	606	202
Delhi	281219	1824	166
Goa	87454	1160	580
Gujarat	20176887	3631	110
Haryana	6296705	8730	397
Himachal Pradesh	2474582	4164	347
Jammu & Kashmir	3145868	1808	72
Jharkhand	12573365	3958	165
Karnataka	11453564	4536	105
Kerala	1443500	2695	193
Ladakh	78211	1334	667
Lakshadweep	2509	95	95
Madhya Pradesh	29057959	4688	92
Maharashtra	19595996	5780	165
Manipur	260702	1395	155
Meghalaya	919284	2510	228
Mizoram	47810	1833	229
Nagaland	93950	3030	303
Odisha	10362294	4250	106

Puducherry	74379	331	83
Punjab	6547407	1495	68
Rajasthan	27630946	7431	225
Sikkim	149154	1888	472
Tamil Nadu	746162	1107	28
Telangana	8458845	8775	283
Tripura	10037455	3460	433
Uttar Pradesh	2718441	9156	122
Uttarakhand	52036426	4343	334
West Bengal	19708837	5368	192
Total/ Average	303341203	119059	156

**** 20th Livestock Census (DAHD, GoI) Animals of 6 months to 18 months of age to be sampled, irrespective of vaccination.**

(Suresh KP, Hemadri D, and Patil SS)

Modeling the climate variability in various agro-climatic zones of India

By employing Kriging analysis, a thorough investigation into climatic dynamics across various regions of India was conducted. The study revealed existing noteworthy trends and patterns in rainfall, cloud cover, and NDVI parameters in Southern India and the North Eastern Region from 2001 to 2031. Kriging was applied to assess the Thermal

Heat Index (THI) parameter across the 15 agro-climatic zones in India, shedding light on the intricate climatic variations. Specific emphasis was placed on zone number 08 (Aravalli Central Plateau and Hills) (**Fig 33**), providing meaningful insights into the diverse climatic occurrences within these regions.

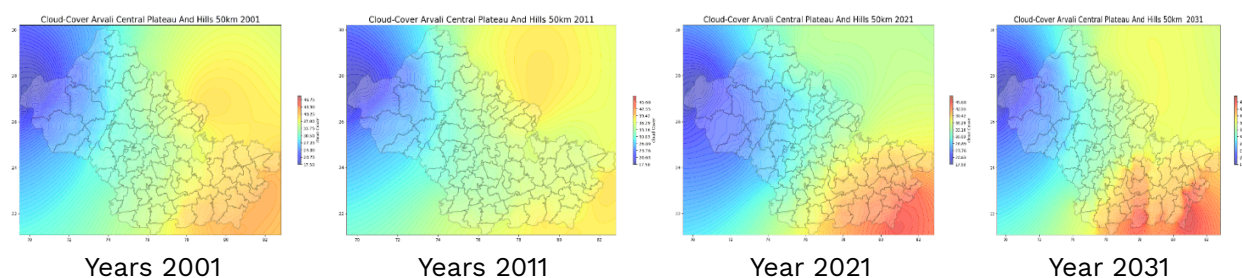


Fig 33: Cloud-Cover for Aravalli Central Plateau and Hills 2001-2021 (observed) and 2031 (Predicted)

(Suresh KP and Krishnamoorthy P)

Risk estimation and prediction of anthrax using artificial intelligence systems

A survey was carried out in anthrax-affected / endemic villages. Gathered soil profile data, implemented Epiflow model, Markov, Hidden Markov model, and PERT model for anthrax risk assessment in the villages of Tumkur, Bangalore Rural, and Koppal districts with coverage of 346

farmers spanning 30 villages across the three districts. In addition to that collected information from 121 farmers related to demographic, ecological, socio-economic, and risk factors, migration details, risk exposure, and mitigation and preparedness details for anthrax outbreak. One of the

notable observations was the tendency for underreporting and non-reporting of Anthrax cases. To combat this issue, an initiative was undertaken to disseminate informative leaflets among the farming communities. These leaflets aimed to enhance awareness regarding the symptoms, transmission, and effective control measures for Anthrax.

The results showcase varying behavioral patterns across different villages, particularly in response to social, economic, risk exposure, and risk mitigation factors. The knowledge on anthrax awareness and socioeconomic behaviour, risk exposure, and mitigation behaviour of farmers who

have experienced anthrax were more as compared to anthrax non-experienced farmers. The villages situated farther away from the Tungabhadra backwater region, such as Hatti, Kamanur, and Gabbur, face a risky period lasting between 1.2 to 1.3 years. Conversely, Hunkuntiakkapur and Hyati Mundargi, which are closer to the Tungabhadra backwater, have a shorter risky period ranging from 1.07 to 1.13 years. Therefore the villages with shorter risky period should be considered for active surveillance and to implement rapid control measures.

(Suresh KP, Hemadri D, and Patil SS)

Street dog population survey in Bengaluru

BBMP (Bruhat Bengaluru Mahanagara Palike) and World Veterinary Service (WVS), have teamed up with ICAR-NIVEDI for the street dog survey, leveraging ICAR-NIVEDI's robust methodology, analytical capabilities, and expertise in report writing. Single-Sight and Sight-Resight surveys were employed with Lincoln-Petersen's formula and Chapman's correction, which has yielded insightful results, revealing a 10% reduction

in Bengaluru's street dog population since 2019, alongside a remarkable 20% increase in neutering rates (**Table 7**). This success underlines the effectiveness of population control and responsible management initiatives, demonstrating the dedication of the community to fostering a harmonious coexistence between street dogs and city residents.

Table 7 Trend in the population of street dogs in Bengaluru from 2019 to 2023

Particulars	2019	2023	CAGR*
Total Population	3,09,898	2,79,335	-5.41
Male population	205660	165341	-5.31
Female Population	104316	82757	-5.62
Total Neutered	158588	200608	6.05

(Suresh KP, Hemadri D, and Gulati B R)

Disease Economic and Social Impact

Assessment of farm-level economic impact of LSD in Rajasthan and Gujarat

The primary data collected from 607 cattle and buffalo rearing farms of Rajasthan (343) and Gujarat (264) were analyzed using descriptive statistics and deterministic mathematical models. The primary survey results showed an incidence and mortality of 27% and 9.0% in indigenous cattle and

41% and 7.4% in crossbred cattle. The estimated transient milk loss in indigenous cattle ranged between Rs 1624 to 14399 and 599 to 14998 and in crossbred cattle between Rs 1648 to 19500 and 2698 to 13497 in Rajasthan and Gujarat states, respectively. The median loss per animal

due to draught power unavailability, modern treatment, ayurvedic treatment, vector management and the opportunity cost of labour ranged between Rs 1107 to 13,317, 246 to 25,002, 49.2 to 1271, 25 to 1148 and 123 to 3378, respectively. Overall,

the LSD outbreaks have caused significant burden to farmers due to high mortality and milk reduction and the ripple effects are expected in the ensuing years.

(Govindaraj G, Sathish Gowda CS and Narayanan G)

Introduction of Nandidurg goat breed among schedule caste beneficiaries

Based on baseline survey, the team ICAR-NIVEDI has identified 46 poorest of the poor SC beneficiaries in sutahhali village, Doddaballapura taluk and imparted training on scientific management practices for achieving higher productivity and production thereby doubling farmers' income (**Fig 34**). After discussion with Panchayat Raj institution member and

veterinary doctor, distributed Nandidurga goats (2+1) to 46 families (138 Nos.) with three years insurance cover. Further follow-up was conducted on the adaptability of the newly introduced breed in the locality and it was found that beneficiaries well received the newly introduced breed and started rearing along with others native breed.



Fig 34: Distribution of Nandidurg goat breeds to the SC beneficiaries in sutahhali village, Doddaballapura taluk, Bengaluru Rural Dist.

(Narayanan G, Sridevi R, Sathish Gowda CS, Chethan Kumar HB and Yogisharadhya R)

Impact of Osmanabadi goat breed distribution on rural women

Osmanabadi goat rearing is compatible with the existing rainfed agro-ecosystem. It generates self-employment and provides supplementary income, which helps rural women the most. During the year 2021, Osmanabadi goats were distributed for establishing goat farms among SC farm families of Pemmadevarahalli village of Tumkuru district in Karnataka. During the mid-term assessment carried out

during March 2023 it was revealed a shift of occupation among 40 beneficiaries from being a daily wage labourer to goat farm owner, has taken place with close monitoring and guidance by the state animal husbandry department.

(Narayanan G, Sridevi R, Sathish Gowda CS, Chethan Kumar HB and Yogisharadhya R)

PPR research laboratory inaugurated on 8 February 2023



04

Capacity Development, Education and Trainings

Entrepreneurship development

Promotion of Agri-startups by NaaViC Grant-in-Aid support

NaaViC continued its promotion of agri-startup activities under the two flagship programs (NEO and NEST) for the fifth year. During this period, physical verification of 3, 4 & 5 Cohort Grant-in-aid winning startups and progress evaluation of 1 & 2 Cohort were carried out. For the 1 Cohort of 6 startups 4 RIC was conducted to recommend the release of 3 Tranche Grant-in-aid amount (20 lakhs). For the 2 Cohort, the evaluation of the progress of startups was carried out physically. For the 3, 4 and 5 Cohorts entrepreneur's grant-in-aid amount of (92.4 Lakhs) was released.

For 6 Cohort startups, RC meeting was conducted which recommended a total of 6 startups with a Grant-in-aid to the tune of 86 Lakhs. In the RC meeting for 7 Cohort in association with MANAGE, Hyderabad and UAS, Dharwad, a total of 11 startups were recommended for Grant-in-aid to the tune of 161 Lakhs. In April 2023, the 8 Cohort was launched for business proposals under the NEO and NEST scheme which received an overwhelming 397 business proposals (NEO-217; NEST-180). NaaViC generated a revenue of Rs. 44,000/- through incubation charges to startups during this period.



(Yogisharadhya R, Prajapati A, Manjunatha Reddy GB, Chanda MM and Shivachandra SB)

Promotion of agri-entrepreneurship through flagship programmes of NaaViC

NaaViC, ICAR-NIVEDI continued its entrepreneurial promotional activities under its flagship programmes (NEXUS and NOVICE) by conducting year-round knowledge enriching orientation/workshops. NaaViC signed a total of seven MoUs with various institutes/organizations to strengthen the ecosystem. A total of two Entrepreneurship Development Programmes (EDP) were organized by NaaViC (Fig). The first EDP was with the students of B. Tech (Biotechnology), Agriculture College, Hassan and 50 participants attended the program. The second EDP was held at the College of Fisheries, Mangalore, KVAFSU, Bidar, and

it was attended by a total of 40 people. Team NaaViC organized two two-week virtual Faculty Development Programme (FDP) sponsored by Department of Science and Technology (DST), which was attended by 60 faculties from various institutes/universities. NaaViC actively participated in trade fairs like 5th World Coffee Conference & Expo, Krishi Mela, and Bengaluru Tech Summit to promote startups and various schemes of NaaViC. More than 1,400 young entrepreneurs and 170 farmers were oriented towards entrepreneurship development.



(Yogisharadhya R, Prajapati A, Manjunatha Reddy GB, Chanda MM and Shivachandra SB)

Entrepreneurship development programmes (EDP)

EDP on entrepreneurship opportunities in goat and sheep family	2	6-7 March 2023	40
EDP on 'Entrepreneurship opportunities in value-added fish products'	2	7-8 August 2023	40

Capacity development programmes organized by NaaViC

Name of Seminar /Workshop /EDP/Training	Duration (Days)	Date	No of Participants
Training on agripreneurship orientation program -AOP and SAIP for 7 th cohort entrepreneurs	60	18 January-18 March 2023	29
Training program on IPR- copyrights and compliances in collaboration with the IP&TM unit, ICAR	1	6 February 2023	25
G20 side event by conducting a training program on Sustainable agriculture for the women farmers of various horticulture FPOs as a part of G20 event	1	7 February 2023	56
Orientation program on entrepreneurship opportunities in agriculture & allied sectors for the students of the school of Biotechnology GADVASU, Ludhiana, Punjab	1	17 February 2023	19
Agripreneurship orientation program for the MSc students from the Department of food science and technology, Shivaji University Kolhapur	1	28 March 2023	28
Orientation program on entrepreneurship development for horticulture students	1	2 June 2023	46
Orientation program on entrepreneurship development for engineering students	1	13 June 2023	102
Faculty development program on empowering tomorrow through agripreneurship in collaboration with the Department of Science and Technology, Gol	13	3-15 July 2023	60
Orientation program on from idea to impact: the role of business incubators.	1	10 October 2023	70
Training on agripreneurship orientation program -AOP and SAIP for 8 th cohort entrepreneurs	60	4 Dec 2023 - 2 Feb 2024	50

Human Resource Development

The institute has established collaborative linkages with various international and national organizations/ Institutions including NGOs for research and development activities, training, outreach activities etc. The institute has conducted need-based training programmes for scientists/ academicians/ field veterinarians, etc., working at various levels and trained on modern laboratory techniques, epidemiological investigations, NADRES software, EpiInfo software, epidemiological

analysis, forecasting of livestock diseases, GIS data analysis, diagnostics, research methodologies, the economic impact of diseases and sensitization programme on disease control, etc., These trainings were imparted to veterinary officers in the departments of animal husbandry, medical officers/ IDSP officers, field veterinarians, Assistant professors from SAU's, students from various disciplines of life sciences on the above-said areas.

Awareness, sensitization and other programs organized

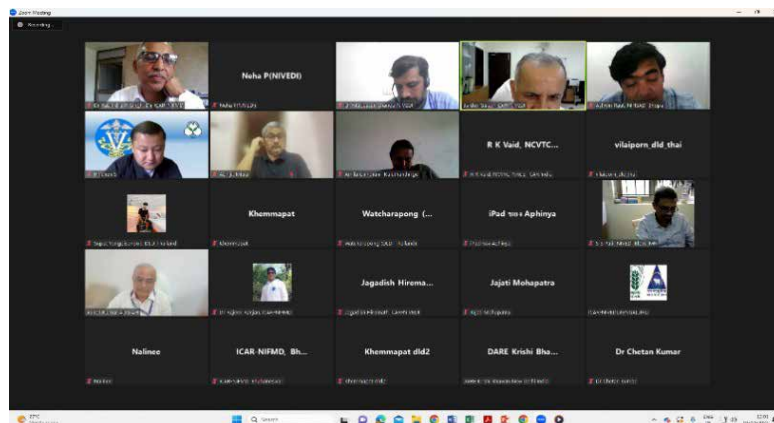
Name of Workshop/Training/Awareness Program	Duration (Days)	Date	No. of Participants
Workshops			
National Workshop on Lumpy Skin Disease in India: Current Scenario and Future Challenges	1	27 January 2023	100
One day technical workshop Empowering women veterinarians for tackling emerging diseases	1	10 March 2023	80
One day technical workshop on empowering veterinarians for tackling diseases through national animal disease control programs	1	23 August 2023	40
Epidemiological approaches to prevent and control transboundary animal diseases with a special focus on zoonotic diseases and Foot and Mouth Disease for BIMSTEC countries	10	3-12 October 2023	13
Workshop on enhancing skills in research for Post Graduate students of Maharashtra Animal and Fishery Sciences University.	5	20-24 November 2023	15
Trainings			
NABL Assessor's training for ISO 17025:2017 Standard	5	6-10 February 2023	25
Sensitization training programme on brucellosis control programme to veterinary officers from Pondicherry	1	15 February 2023	50
Hands-on training of laboratory diagnosis of brucellosis	5	27 February - 03 March 2023	30
Hands-on training on laboratory diagnosis of leptospirosis	5	9-13 October 2023	33
Awareness Programs			
Awareness program on Classical swine fever control programme (CSF-CP)	1	5 April 2023	60
Awareness program and poster making competition on Zoonotic Diseases and Anti-Microbial Resistance for the school children	1	12 July 2023	200
Awareness Program on Zoonotic Diseases	1	21 July 2023	150
One-day interaction meeting on strengthening ICAR laboratories for AMR and AMU surveillance was held with FAO officials	1	21 September 2023	25
Rabies awareness program for school children	1	23 September 2023	90

NIVEDI hosted global experts' meet on PPR eradication



Sixth Annual PPR Global Research and Experts Network (GREN) meeting was organized by ICAR-NIVEDI in collaboration with Food and Agriculture Organization (FAO) of the United Nations and World Organization for Animal Health (WOAH), during 28-30 November 2023. A total of 165 global experts (including 100 online) from 35 countries across the globe participated in the event. In the meeting it was recommended to define and map PPR epi-systems based on socioeconomics, epidemiology, and molecular factors in domestic and wild animals. The experts recommended further studies on transmission within atypical hosts and validation of DIVA vaccines and tests for field use and understanding stakeholder incentives for participation in surveillance and control programs. Further, Sixth Annual PPR-Advisory Committee (AC) meeting was also held during 1-2 December 2023.

Workshop organized for members of BIMSTEC countries on livestock disease epidemiology



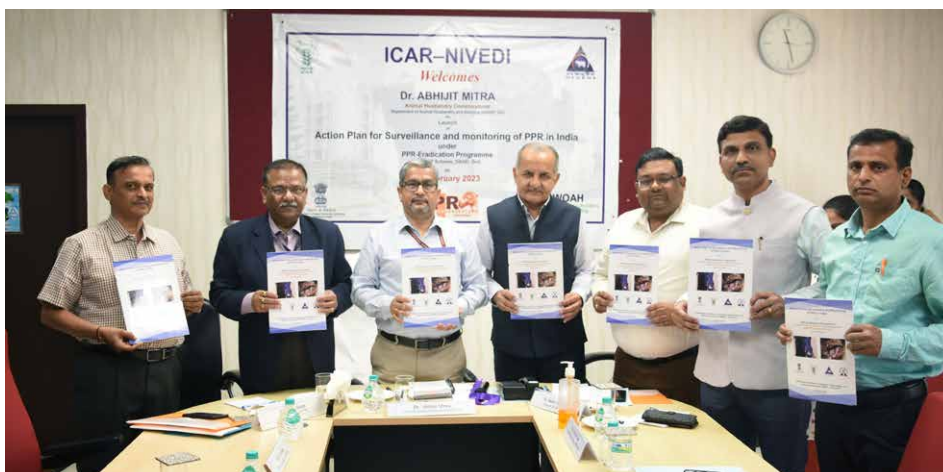
The virtual workshop on “Epidemiological Approaches to Prevent and Control Transboundary Animal Diseases with Special Focus on Zoonotic Diseases and Foot and Mouth Diseases” was jointly organized by ICAR-NIVEDI and ICAR-NIFMD from 3–12th October 2023 under the aegis of Bay of Bengal Initiative for Multi-sectoral, Technical and Economic Cooperation (BIMSTEC). The workshop was inaugurated by Dr. Abhijit Mitra, AHC, DAHD Govt. of India and Dr. Ashok Kumar, ADG (Animal Health) was the Guest of Honour. The workshop was attended by the participants from Bhutan, India, Myanmar, Nepal, Thailand and Sri Lanka. The dignitaries underscored the importance of organising such workshops in preventing transboundary diseases and to have long term collaboration at country level to learn from each other in the region. The workshop covered both theory and practical sessions on surveillance, risk analysis and mapping of TADs, use of newer technologies in disease surveillance etc.

National workshop on Lumpy Skin Disease (LSD)



ICAR-NIVEDI in collaboration with Indian Virological Society organized one day national workshop titled “Lumpy Skin Disease in India: Current Scenario and Future Challenges” on 27 January 2023. The workshop was inaugurated by Dr B.N. Tripathi, DDG (AS), while addressing the participants, he highlighted the strengths of veterinary infrastructure in India and leveraging the same for effective control and eradication of animal diseases in general and LSD in specific. Dr R.K. Singh, President, IVS, in his address emphasized the need of networking of Institutes and Scientists working in different aspect of LSD and pointed out that though the number of LSD outbreaks have reduced, but challenges to control and eradicate still exist. Dr Abhijit Mitra, Animal Husbandry Commissioner, DAHD, GOI in his opening remarks congratulated ICAR-NIVEDI for taking timely initiative of organizing national workshop and emphasized that there is need of deliberations for developing national action plan for control and eradication of Lumpy skin disease in India by the experts on LSD. Dr B. R. Gulati, Director, ICAR-NIVEDI highlighted the epidemiology of LSD in India, including how the virus entered India, the spatial and temporal patterns, patterns of different waves in India and economic burden of LSD. He also emphasized the need for national control program, post-vaccination monitoring and genomic surveillance of LSD in India. In this workshop other scientists from ICAR-NRCE, Hisar, ICAR-NIHSAD, Bhopal, ICAR-IVRI, Mukteshwar and Bengaluru centers, ICAR-NIANP and ADG (AH) have participated in panel discussions.

Launch of national action plan for surveillance and monitoring of PPR and technical orientation workshop



The Action plan for Surveillance and Monitoring of PPR in India under PPR Eradication programme, LH & DCP Scheme, GoI was officially launched by Dr. Abhijit Mitra, Animal Husbandry Commissioner, Department of Animal Husbandry and Dairying (DAHD), GoI at ICAR-NIVEDI, Bengaluru on 8 February 2023. A total of 19 participants and project staff attended the event at ICAR-NIVEDI Committee room. Inauguration of the PPR research laboratory by Dr. Abijith Mitra, Animal Husbandry Commissioner, DAHD, GoI. In the presence of Dr. R. K. Singh, Former Director, ICAR-IVRI, Dr. B. R. Gulati, Director, ICAR-NIVEDI and Dr. V. Balamurugan, PI, PPR-EP program. On 20 February 2023, a one-day Technical Orientation Workshop conducted through Online Video Conference for discussion on the Action plan for the Surveillance and Monitoring of PPR in India under PPR Eradication programme, LH & DCP Scheme, GoI was chaired by Dr. R. P. Singh, Director, ICAR-DFMD and Prof. Satya Parida, Vaccine and Laboratory specialist, PPR Secretariate, FAO for UN in the presence of patron Dr. Abhijit Mitra, Animal Husbandry Commissioner, Department of Animal Husbandry and Dairying (DAHD), GoI for strengthening the programme and to discuss issues and challenges to achieve PPR eradication as per timeline.

NCDC-sponsored hands-on training on laboratory diagnosis of brucellosis



ICAR-NIVEDI organized hands-on training on “Laboratory diagnosis of brucellosis” with the sponsorship of NCDC under the National One Health Programme for Prevention & Control of Zoonoses (NOHPPCZ) during 27 February 2023 to 3 March 2023. Dr. S. B. Barbuddhe, Director, ICAR-NMRC, Hyderabad graced the inaugural day of the training program, released the laboratory manual and he insisted the need for such training programs for the field level laboratory personnel for rendering their services effectively to the community. Around 35 medical and veterinary professionals participated in the training program and received hands-on training on various serological (RBPT, STAT. ELISA and LFA) and molecular (PCR, qPCR) tests for diagnosis of brucellosis. The program was coordinated by Dr. V. Balamurugan and Dr. Chethan Kumar HB and the course directors were Dr. Rajeswari Shome and Dr. M. Nagalingam.

First annual review meet of National Animal Disease Epidemiology Network



The first annual review meet of National Animal Disease Epidemiology Network (NADEN) was organized at ICAR-NIVEDI during 6-7 July, 2023. The dignitaries present during the meeting were Dr. B.R. Gulati, Director, Dr. Abhijit Mitra, AHC, GOI, Dr. Ashok Kumar, ADG (AH), ICAR, Dr. P.S. Mahesh, Director, CEAH and Dr. Manjunath Palegar, Director, AH&VS, Karnataka. They emphasized the important role of ICAR-NIVEDI and the NADEN centres in effective disease surveillance, monitoring and reporting for the purpose of disease control and providing accurate forewarning and forecasting of livestock diseases. Dr. Divakar Hemadri, Nodal Officer, NADEN presented the overall status of livestock diseases reported during 2021 and 2022. During the meeting, livestock disease status in each state and epidemiological investigations carried out by individual centre along with budget utilization and future plan of work, were discussed.

ICAR-NIVEDI joins hands with IVRI for PG teaching in the Bengaluru academic hub



A delegation from the ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar visited NIVEDI on 7 August 2023 to foster collaboration and explore synergistic opportunities under the National Education Policy (NEP) 2020 framework. The delegation comprised Dr. Triveni Dutt, Director, Dr.S.K. Mendiratta, Joint Director (Academic) cum Dean, Dr.S. Bandhopadhyay, Head, Division of Parasitology, Dr. Gyanendra Singh, Controller of Examinations from IVRI, Izatnagar and Dr. Pallab Chaudhuri, Joint Director, IVRI (Bengaluru Campus). Director, IVRI articulated his vision in alignment with the principles of the NEP-2020 framework. In the pursuit of advancing education, IVRI, Bengaluru has been designated as the educational hub and both ICARNIVEDI and ICAR-NIANP were identified as integral components of this educational network in Bengaluru. The Director and scientists of ICAR-NIVEDI expressed willingness to be a part of this educational hub and to focus on two disciplines viz., Veterinary Public Health and Epidemiology and Veterinary Microbiology at ICAR-NIVEDI for teaching.

Technical workshop for veterinarians on national animal disease control program



ICAR-NIVEDI conducted one-day technical workshop on “Empowering veterinarians for tackling diseases through National Animal Diseases Control Program” on 23 August 2023. A total of 30 veterinary officers participated in the workshop. During the workshop, expert lectures on zoonotic diseases (brucellosis, anthrax, KFD, rabies, porcine cysticercosis and JE), overview on NADCP, epidemiology of LSD and ASF were delivered. In Scientist-Veterinarian interactive session feedback from field on livestock diseases was obtained.

ICAR-NIVEDI supports ICAR-NIANP in organising G20 technical workshop on “One Health”



ICAR-NIVEDI collaborated with ICAR-NIANP in organizing G20 technical workshop on “One Health: Challenges and Opportunities” held at ICAR-NIANP, Bengaluru during 29-31 August 2023. The workshop was inaugurated by Km Shobha Karandlaje, Union Minister of State for Agriculture and Farmers’ Welfare. Dr Himanshu Pathak, Secretary DARE and Director General, (ICAR) and Dr Joykrushna Jena, Deputy Director General (Fisheries and Animal Science) and Chair, G20 graced the occasion. Participants from G20 countries namely Australia, Canada, France, Italy, Saudi Arabia, UK and USA, and Oman attended the event to discuss the challenges and opportunities in One Health. The workshop recommended the need for multilateral collaborations from human, animal, plant and environmental sectors to address the health challenges across multiple sectors. During the workshop, technologies, posters, diagnostic kits, technical bulletins on One Health, Zoonoses and Emerging Diseases developed by ICAR-NIVEDI were exhibited to the national and international delegates.

Workshop on subclinical mastitis



The launch workshop for the BIRAC-BIPP Project entitled “Detection of Subclinical Mastitis and Disease Management Program at Farm Level for Dairy Farmers” was organized on 12 September 2023 at Devanahalli camp office, BAMUL, Bangalore Rural District. The program was attended by Shri B. Srinivas, Director, BAMUL (Devanahalli), Dr. M. Gangaiah (General Manager), Deputy Manager, Assistant Manager, veterinary doctors, MPCs secretaries and farmers. In the workshop, FaunaTech SCC device was demonstrated for participants for improved detection of subclinical mastitis over conventional California mastitis test. The participants were also sensitized on problems associated with AMR and advised to minimize the usage of antibiotics for prevention and treatment of mastitis.

Hands-on-training on leptospirosis diagnosis for laboratory staff



Under the National One Health Programme for Prevention and Control of Zoonoses (NOHPPCZ) of NCD, ICAR-NIVEDI, Bengaluru, (Regional Coordinator, South) organized the pan-India “Hands-on training on laboratory diagnosis of leptospirosis” during 9-13 October 2023. To mark the inception, the inaugural ceremony was graced by Dr. Pallab Chaudhuri, Joint Director, ICAR-IVRI, Bengaluru, Dr. B. R. Gulati, Regional Coordinator & Director, ICAR-NIVEDI, Bengaluru and the Chief Guest was Dr. Triveni M.G. Director (IDSP)/JD (CMD), Directorate of Health and Family Welfare, Karnataka. A total of 35 participants from nine states of India including district microbiologists, medical officers, professors, and research officers attended the training. During the training participants had hands-on experience on isolation and identification of *Leptospira*, serological assays (ELISA, MAT, LFA, LAT) and molecular techniques (conventional and real-time PCR). Shri. Atul Kumar Gupta, Registrar, Trans-Disciplinary University (TDU), was the chief guest during the valedictory program

Training on enhancing skills in research for postgraduate students of Maharashtra



A training on “Enhancing Skills in Research” for Masters’ students of MAFSU, Nagpur was organised during 20-24 November, 2023 at ICAR-NIVEDI. The objective was to enhance the research skills of veterinary students in important areas of veterinary epidemiology and zoonotic diseases. There were 15 participants in the NAHEP-CAAST-MAFSU sponsored workshop. The topics covered in the workshop were basic veterinary epidemiology concepts, hands on experience in Epi-Info and QGIS softwares, biosafety and biosecurity practices and diagnosis of zoonotic diseases.

Invited lecture/talk/presentation/expert

1. Dr. P P Sengupta delivered an invited lecture on Diagnosis of bovine neosporosis in ICAR- CFT’s XXIV National training programme held at Veterinary College KVFSU, Hebbal Bengaluru during 5-25 January 2023.
2. Dr. M M Chanda delivered an invited lecture on emerging zoonotic diseases with special reference to Kyasanur Forest disease in India in Ten days training programme on Microbiological Methods organised by Department of Veterinary Microbiology & Immunology, Faculty of Veterinary Sciences & Animal Husbandry Shuhama, SKUAST-Kashmir during 7-17 March 2023.
3. Dr. M M Chanda delivered an invited lecture on Risk mapping and weather based forecasting in session on Integrating climate and weather data into decision support tools in workshop organized by ILRI, India on digital and financial services in the livestock sector on 31 August 2023.
4. Dr. M M Chanda delivered an invited lecture on outbreak investigation and hands on demonstration of QGIS software for disease mapping in workshop on Epi-Biostat-Integrating Epidemiology & Biostatistics for implementation Research and Policy planning in One Health during 4-9 September 2023.
5. Dr. R Shome delivered an invited lecture on Brucellosis: Zoonotic Disease of Public Health Importance in India. Abstract presented in XVII National Technical Conference of IAWV on strengthening veterinary profession towards one health through diversity, equity and inclusiveness, NTR College of Veterinary Science, Gannavaram during 29-30 November 2023.

6. Dr. P P Sengupta delivered an invited lead paper presentation on Advance techniques in haemoprotozoan parasitic diseases in large ruminants in XXXII National Congress of Veterinary Parasitology & National Symposium held at BVC, BASU Patna during 29-1 December 2023.
7. Dr. G B Manjunatha Reddy delivered an invited lecture on Molecular Genetic Diversity of Lumpy Skin Disease Viruses in India held at Trichy during 1-3 December 2023.
8. Dr. R Shome delivered an invited lecture on National Animal Disease Control Program: National Guidelines and Review of Progress. Lead paper presented in XXVIII National Conference VIBCON-2023 held at SVVU, Tirupati, during 12-14 December 2023.

Post Graduate Teaching and Research

Memorandum of Understanding (MoUs)

The Institute has established MoU with various university/organisation of mutual interest in the area of R& D activities, including post graduate research, exchange of faculty for training, research, and study as per the guideline of ICAR. Institute provided exposure, and training and facilitated to the projects/ dissertation work of post graduate student in the field of animal health.

Tata Institute for Genetics and Society (TIGS), Bengaluru



ICAR- NIVEDI signed MoU with Tata Institute for Genetics and Society (TIGS) Bengaluru. TIGS, under the aegis of Tata Trusts, champions the cause of harnessing state-of-the-art science and technology in genetics and genomics to address pressing societal challenges in India. The collaboration between ICAR-NIVEDI and TIGS will focus on the identification of joint opportunities for exchange, cooperation, and mutual research and development in key research areas of shared interest

Karnataka Veterinary, Animal and Fisheries Sciences University (KVAFSU), Bidar



An MoU was formalized between ICAR-NIVEDI and KVAFSU, Bidar on 2 May 2023. As per the agreement, KVAFSU, Bidar will officially recognize ICAR-NIVEDI as a research institution for MVSc/ PhD student thesis-related endeavours. ICAR-NIVEDI scientists will actively mentor and guide KVAFSU-Bidar students in their research pursuits. Both institutes commit to sharing their research instrumentation and library facilities for the benefit of faculty and research scholars.

Dayananda Sagar University, Bengaluru

The alliance between ICAR-NIVEDI and Dayananda Sagar University was sealed on 6 March 2023. As part of this collaboration, scientists from ICAR-NIVEDI will offer guidance to students at Dayananda Sagar University, assisting them in research pertinent to MVSc/PhD thesis requirements.

SKUAST, Kashmir



An MoU was signed between ICAR-NIVEDI and SKUAST, Kashmir for collaboration in research on livestock disease epidemiology on 5 September 2023 at Faculty of Veterinary Sciences and Animal Husbandry, Srinagar. Dr Nazir Ahmad Ganai, Vice Chancellor, SKUAST-K and Dr B.R Gulati, Director, ICAR-NIVEDI signed the MoU. This MoU will cater to the need of better management of livestock diseases in J&K.

Channabasaveshwara Institute of Technology, Gubbi, Tumkur



MoUs were executed with 3rd, 4th & 5th Cohort incubates of NaaViC on 14 September and 13 October 2023, respectively and a total of 23 start-ups received grant-in-aid of Rs. 92.40 Lakhs. With an aim to expand the horizons of the agri-startup ecosystem, MoU were signed with Channabasaveshwara Institute of Technology, Gubbi, Tumkur (on 19 July 2023), CMR University, Bengaluru and Yenepoya Institute of Technology, Moodbidiri.

Students guided by NIVEDI faculties for their M.Sc. dissertation work

Name of student	Name of University / College	Name of the supervisor	Duration
Ms. Anagha Nair	REVA University, Bengaluru	Dr. M. Nagalingam	Six months
Ms. Deekshitha M	Dayananda Sagar University, Bengaluru	Dr. M. Nagalingam	Six months
Ms. Deepika S	Dayananda Sagar University, Bengaluru	Dr. M. Nagalingam	Six months
Ms. Mamatha S S	REVA University, Bengaluru	Dr. Jagadish Hiremath	Three months
Ms. Nahid Parveen	REVA University, Bengaluru	Dr. P. Krishnamoorthy	Three months
Mr. Pradeep N	REVA University, Bengaluru	Dr. P. P Sengupta	Three months
Ms. Swetha	REVA University, Bengaluru	Dr.R. Sridevi	Three months
Ms. Tejashwini N	Dayananda Sagar University, Bengaluru	Dr. M. Nagalingam	Six months

05

Participation in Training/ Workshop/Conference/Meeting

Conferences/Symposium/Conclaves

Topic/ Event	Venue/Organized by	Date	Attended by
International satellite symposium of VIROCON brainstorming workshop on TADs/ EIDs	College of Veterinary Science, Assam Agricultural University, Assam	16 February 2023	Dr. K.P. Suresh
National horticulture fair (NHF) 2023	ICAR- Indian Institute of Horticulture Research, Bengaluru	22-25 February 2023	Dr. S.B. Shivachandra Dr. R. Yogisharadhya Dr. A. Prajapati
27th Annual conference of Indian association of medical microbiology, Karnataka Chapter	Bengaluru Medical College, Bengaluru	10 March 2023	Dr. Chethan Kumar H.B
International conference on current technologies & opportunities in bioscience (CTOB-2023)	College of Agriculture, Hassan	27-29 March 2023	Dr. K.P. Suresh
Role of biostatistics in modelling One Health interventions (IPHACON 2023)	ICMR-Regional Medical Research Centre, Dibrugarh	1 April 2023	Dr. K.P. Suresh
XXXV Annual convention & national conference of IAVMI	College of Veterinary and Animal Sciences, Palampur	7-8 April 2023	Dr. K.P. Suresh
National conclave: Uniting for One Health	National Center for Disease Control, Delhi	6 -7 July 2023	Dr. H.B. Chethan Kumar

XXVII Annual convention of ISVIB and national conference (VIBCON-2022)	Sher-e-Kashmir University of Agricultural Sciences and Technology - Kashmir	27-29 July 2023	Dr. V. Balamurugan
11 th International conference of LASA India LASACON 2023	JN Tata Auditorium, IISc, Bengaluru	6-8 November 2023	Dr. P. Krishnamoorthy
Krishi Mela - 2023	University of Agricultural Sciences- Bangalore, GKVK, Bengaluru	17-20 November 2023	Dr. S.B. Shivachandra Dr. A. Prajapati
XVII National technical conference of IAWV on strengthening veterinary profession towards one health	NTR College of Veterinary Science, Gannavaram	29-30 November 2023	Dr. R. Shome
32 nd National congress of veterinary parasitology	Bihar Veterinary College, Patna	29 November - 1 December 2023	Dr. P.P Sengupta Dr. P. Krishnamoorthy Dr. S.S Jacob
Advancements in global virus research towards one health (VIROCON-2023)	ICAR- National Research Centre for Banana, Tiruchirappalli	1-3 December 2023	Dr. D. Hemadri Dr. G.B.M. Reddy
International symposium on promotion of one health: Opportunities, challenges and solutions	Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar	7-8 December 2023	Dr. H.B. Chethan Kumar
National conference on advanced concepts, strategies in immuno-biotechnology for disease diagnosis and control (VIBCON-2023)	Sri Venkateshwara Veterinary University, Tirupati	12-14 December 2023	Dr. R. Shome Dr. N. Shivasharanappa Dr. A. Prajapati

Webinars attended

Topic/ Event	Venue/ Organized by	Date	Attended by
IPR copyright and compliance	ICAR-NIVEDI, Bengaluru	6 February 2023	Dr. M. Nagalingam

Trainings

Topic	Venue/Organized by	Date	Attended by
Application of diagnostic tools for Parasitic Diseases of Veterinary and Public Health Importance	Veterinary College, Bengaluru	2-25 January 2023	Dr. G.B.M. Reddy
DST sponsored winter school on Geospatial Science and Technology	Indian Statistical Institute, Kolkata	1-21 February 2023	Dr. H.B. Chethan Kumar
NABL laboratory assessor's training ISO17025:2017	ICAR-NIVEDI, Bengaluru	6-10 February 2023	Dr. V. Balamurugan Dr. J. Hiremath Dr. P. Krishnamoorthy Dr. N. Shivasharanappa
Long-read genome sequencing by nanopore technology organized by the diagnostics division of CDFD	Centre for DNA Fingerprinting and Diagnostics, Hyderabad	27 February - 3 March 2023	Dr. D. Hemadri
Online training of holistic approach to human-wildlife conflict mitigation and one health	ICAR- National Academy of Agricultural Research Management and GIZ -GmbH	15-16 May 2023	Dr. R. Sridevi
CRISPR/Cas based molecular diagnostic platforms	Tamil Nadu Veterinary and Animal Science University, Chennai	3-7 July 2023	Dr. M. Nagalingam
One-day training in malaria and vector borne disease control for medical officers held at district health office, Bangalore urban district	District Health Office, Bengaluru	22 August 2023	Dr. H.B. Chethan Kumar
Hands on training on sample processing, isolation and characterization of Mycobacterial species	National Institute for Research in Tuberculosis, Chennai	21-30 September 2023	Dr. P. Krishnamoorthy Dr. M. Nagalingam
Next generation sequencing (NGS) data analysis	ICAR- National Academy of Agricultural Research Management, Hyderabad	16-20 October 2023	Dr. D. Hemadri
Basic bioinformatics tools for genome analysis (Online)	ICAR- National Bureau of Animal Genetic Resources, Karnal	16-20 October 2023	Dr. R. Sridevi Dr. S. S. Jacob
FAO sponsored training on strengthening institutional capacity in surveillance and monitoring of antimicrobial use (AMU) in the animal health sector through training on use of AMU protocol	ICAR-Directorate of Poultry Research and National Institute of Plant Health Management, Hyderabad	26-27 October 2023	Dr. P. Krishnamoorthy
Field epidemiology program in one health	National Center for Disease Control, Delhi	6-8 December 2023	Dr. M.M. Chanda
J-Gate@CeRA regional workshop cum awareness training	Tamil Nadu Agricultural University, Coimbatore	7 December 2023	Dr. P. Krishnamoorthy

Workshops

Topic	Venue/organized by	Date	Attended by
Japanese encephalitis for physicians and pediatricians of health and family welfare department	District Health Training center, Shivamogga	7 January 2023	Dr. H.B. Chethan Kumar
Lumpy skin disease in India: current scenario and future challenges	ICAR-NIVEDI, Bengaluru	27 January 2023	Dr. M. Nagalingam Dr. P. Krishnamoorthy Dr. N. Shivasharanappa Dr. A. Prajapati
Role of veterinarian in augmenting rural economy through animal husbandry practices	Gandhi Krishi Vigyana Kendra, Bengaluru	28-29 January 2023	Dr. S.B. Shivachandra
Technical orientation workshop on the action plan for surveillance and monitoring of PPR in India	ICAR-NIVEDI, Bengaluru	20 February 2023	Dr. V. Balamurugan Dr. N. Shivasharanappa Dr. K.P. Suresh
Health analytics and disease modelling (Online)	Indian Institute of Technology-Bombay, Mumbai	23-24 February 2023	Dr. K.P. Suresh
ICAR-NBAIR and I-STEM workshop on linking research and resources	ICAR- National Bureau of Agricultural Insect Resources, Bengaluru	14-16 June 2023	Dr. R. Sridevi
One day technical workshop on Digit All	Veterinary College, Hassan	24 June 2023	Dr. R. Shome
Sensitization workshop on New Education Policy	Southern Regional Station, ICAR-National Dairy Research Institute, Bengaluru	18 August 2023	Dr. M. Nagalingam
BIMSTEC online workshop on recent advances in diagnosis and control of emerging and reemerging zoonoses	National Institute on Foot and Mouth Disease	25-30 September 2023	Dr. H.B. Chethan Kumar
SAMAGRAH: Sensitization workshop for ICAR-ABIs	Intellectual Property and Technology Management, New Delhi	17-18 October 2023	Dr. S.B. Shivachandra Dr. M.M. Chanda
ICAR KRISHI geoportal workshop on National geospatial policy 2022	ICAR- National Bureau of Soil Survey and Land Use Planning, Nagpur	20-21 October 2023	Dr. P. Krishnamoorthy
Livestock master plan development and livestock sector modelling	International Livestock Research Institute, Senegal	4-7 December 2023	Dr. G. Govindraj
Biorisk management workshop for research institutions with BSL3 laboratory (Online)	Federation of Asian Biotech Associations, Hyderabad	7-9 December 2023	Dr. J. Hiremath

Meetings

Topic	Venue/organized by	Date	Attended by
9 Annual research meet-ARM 2023	Centre for Research and Innovation of Vivekananda International Foundation, Chennai	7 January 2023	Dr. R. Sridevi
Post-budget webinar addressing the implementation of the accelerator fund for agri tech-startups (Online)	Ministry of Agriculture and Farmers Welfare, New Delhi	24 February 2023	Dr. S.B. Shivachandra Dr. R. Yogisharadhya
FAO-WOAH PPR vaccine producers and thermotolerant vaccine meeting	Hester Bioscience, Ahmedabad	27-30 March 2023	Dr. V. Balamurugan
NAAS Foundation day-meeting (Online)	National Academy of Agricultural Sciences, New Delhi	5 June 2023	Dr. S.B. Shivachandra
Brainstorming session on greening of livestock and poultry sector: policy options for developing sustainable approaches	National Academy of Agricultural Sciences, New Delhi	1 September 2023	Dr. S.B. Shivachandra

Agrinnovate takes up NIVEDI technologies for commercialization



On 6 February 2023, a meeting was organized for the techno-commercial evaluation and the formulation of standard terms for various technologies developed by ICAR-NIVEDI. The meeting was attended by Dr. B.R. Gulati, Director of ICAR-NIVEDI, and Dr. Praveen Malik, CEO of Agrinnovate, along with other esteemed Techno Commercial Assessment (TCA) members. During the meeting, several innovative technologies were presented and subsequently six technologies received approval for commercialization. The commercialization of these tools is expected to have a significant impact on the broader animal health sector.

FAO (India) and NIVEDI to join hands to combat AMR and field epidemiology trainings



An interactive meet and discussion was held at ICAR-NIVEDI with FAO officials on 21 September 2023 on strengthening surveillance of antimicrobial resistance (AMR) and antimicrobial use (AMU). The meeting was attended by Dr. Jyoti Misri, National Consultant (AMR and Zoonoses) and Dr. Acty George, Technical Officer (Epidemiology and Zoonoses), from FAO (I), New Delhi and Dr. B.R Gulati, Director, Dr. Rajeswari Shome, Dr. Diwakar Hemadri, Dr. K.P. Suresh, Dr. Shivasharanappa N from ICAR-NIVEDI. The Director, ICAR-NIVEDI briefed about ongoing research programs and achievements of the institute including AMR programs. The need for strengthening laboratories and capacity building of research staffs on AMR and AMU was emphasized. A detailed project proposal on strengthening of laboratories on AMR and AMU research in livestock was discussed for funding through FAO.



During 14-15 December 2023, Dr. R.K. Singh, Dr. Acty George and Mr. Rajesh Kumar from FAO (I) visited ICAR-NIVEDI to discuss regarding initiation of field epidemiology training program for veterinarians (FETP-V) in India. Dr. Gulati, presented the overall activities of ICAR-NIVEDI including capacity building programs in the institute. The team held in-depth discussion with Director and scientists of ICAR-NIVEDI, on development of curriculum, mode of training, number of trainings and resources and expertise available with NIVEDI for field epidemiology training program for veterinarians (FETP-V). Dr.R.K. Singh appreciated the efforts of ICAR-NIVEDI in the area of veterinary epidemiology.

06

Outreach, Extension and Institutional Activities

ICAR-NIVEDI Celebrates Republic Day



ICAR-NIVEDI celebrated 74th Republic day of nation by hoisting tricolor in the campus. The important dignitaries participated were Dr. Ashok Kumar, ADG (AS), ICAR, Dr. Aniket Sanyal, Director, ICAR-NIHSAD, Bhopal.

Special livestock health camp organized in Tamil Nadu

In a concerted effort to bolster livestock health and awareness in Tamil Nadu, a Special Livestock Health Camp was organized on 7 March 2023 in Ramachandrapuram village, Andipatti Taluk, Theni district. At the camp, livestock were administered the Foot and Mouth Disease vaccine and were provided with deworming medications, ensuring their overall well-being. In addition, farmers received essential mineral mixtures to enhance the nutritive intake of their animals. Notably, a total of 241 animals, belonging to around fifty SC farmers, received comprehensive healthcare services. Advanced ultrasound sonography was employed to assess cattle for pregnancy and potential infertility issues. Alongside these health services, the camp also included an educational segment. A training program titled “Scientific Rearing of Farm Animals in Tamil Nadu” was conducted, aiming to enlighten farmers on modern and efficient farming techniques. To supplement this, an informative

lecture on prevalent animal diseases was delivered, particularly benefiting SC farmers in the village. Through these multifaceted efforts, the camp aimed to improve livestock health while empowering local farmers with crucial knowledge and resources.



Celebration of International Women's Day



As part of Celebration of International Women's Day on 10 March 2023, NIVEDI in collaboration with National Animal Disease Control Program (NADCP-Brucellosis Control Program) and Indian Association of Women Veterinarians (IAWV), Karnataka Chapter, organized a one-day Technical Workshop on Empowering Women Veterinarians for tackling emerging diseases with the theme on "DigitALL: Innovation and Technology for Gender Equality".

NIVEDI helping the marginalized farmers for economic development



On 19 March 2023, NIVEDI distributed Nandidurg goat breed to the most under privileged peoples belonging to Scheduled Caste community of Suthahalli village, Doddaballapur taluk,

Bengaluru Rural district of Karnataka. About 46 beneficiaries got benefited. They were given with 2 female and one male 8 months old goat for breeding programme by the farmers.

Celebration of World Environment Day



On the occasion of world environment day 5 June 2023, the estate section of ICAR-NIVEDI conducted a plantation drive in the campus. More than 1200 saplings of different fruit trees were planted in about 8 acre of land. The Director and all the staff of ICAR-NIVEDI actively participated in the plantation drive.

Scientists-veterinarians interactive meet organized on Foundation Day of NIVEDI



ICAR-NIVEDI celebrated its 36th Foundation day on 1 July 2023. Dr. Shiva Prasad Kimothi, Member, Agricultural Scientist Recruitment Board (ASRB), New Delhi, was the Chief Guest. Dr. P.S. Mahesh, Joint commissioner and Director, CEAH, Dr. J. Pampapathi, MD, KSWDC, Dr. Ravindra Hegde, Director, IAH&VB, Dr. Gangaiah, M, General Manager, BAMUL, Bengaluru were the Guests of Honours. The Chief Guest spoke about the contribution of the livestock sector in the growth of Indian economy. Dr. Mahesh stressed the necessity of establishing a disease free poultry production hub. The retired employees of NIVEDI were also felicitated on this occasion. The staffs of NIVEDI took part in a brief cultural program.

On this occasion Scientists-Veterinarians Interactive meeting on “Livestock Disease Epidemiology: Present Scenario” was organised. Dr Shiv Prasad Kimothi, Member, AS&FS, ASRB chaired the meet and panellists were from diverse scientific field. The panellist deliberated on farm biosecurity, vaccination policy, food safety issues, alternate medicines in veterinary sector and emerging and transboundary diseases. The important recommendations of the meet were the need for biosecurity certifications for livestock and poultry farms, establishment of GMP licensed vaccine production facilities in various states, need for the development of vaccines for AFSV and bluetongue and encouraging use of ethno-veterinary medicine in managing the livestock diseases.

Awareness campaign on zoonotic diseases to school children



On the occasion of “World Zoonoses Day” 2023, ICAR-NIVEDI organized an awareness program and poster making competition on Zoonotic Diseases and AntiMicrobial Resistance for the school children at Ananya Public School, Dodda Byalkere, Bengaluru, Karnataka on 12 July 2023 and at Government High School, Jadigenahalli village, Hosakote taluk, Bengaluru Rural district on 21 July 2023, in collaboration with Department of Animal Husbandry and Veterinary Services, Karnataka. Dr. Manjunatha Reddy GB, Dr. Shivasharanappa N and Dr. Chethan Kumar HB, Scientists from ICAR-NIVEDI and Dr. Paramananda, SVO educated students on aetiology, transmission, symptoms, prevention and control of major zoonotic diseases and emergence, spread and prevention of AMR.

Independence Day celebration



ICAR-NIVEDI celebrated 77th Independence Day on 15 August 2023 with full of pride and patriotism. Dr. B.R. Gulati, Director, hoisted the national flag in the presence of staff and employees. He remembered the freedom fighters and martyrs’ on the occasion and he urged the entire staff to work for betterment of livestock and farming community of the country. He called for application of modern tools in disease diagnosis, surveillance and epidemiology. Dr. Rachna Gulati, Head, Dept. of Aquaculture, College of Fisheries Science, CCS HAU was also present during the Independence Day celebration.

Celebration of Hindi Saptah



ICAR-NIVEDI celebrated Hindi Week during 14-20 September 2023. During this week several events viz. extempore, essay writing, quiz, debate, Hindi typing were organised in order to promote Hindi usage and staff members took active participation in the events. The winners of the events were Dr. J.B. Hiremath (Extempore speech), Smt. Samar Shamshad (Essay writing), Dr. Sangeetha (Quiz), Mr. Vijay Raj K (Hindi typing), Ms. Damini Sharma (Debate) and Ms. Shilpa (Hindi poem singing).

ICAR-NIVEDI empowers rural women and youth through poultry farming



ICAR-NIVEDI, Bengaluru, in collaboration with Centre of Excellence for Animal Husbandry, Bengaluru, organized four workshops on poultry farming for farmers of Chikballapur district in July, August and October 2023. A total of 150 Scheduled Caste farmers were trained on scientific housing, nutrition and disease management in poultry. After the training Kaveri breed chicks were distributed to each of them, along with extension literatures on better poultry management practices in their local settings.

Community awareness about anti-rabies vaccination in elimination of dog mediated human rabies



On the occasion of '17th World Rabies Day 2023', ICAR-NIVEDI in collaboration with Department of Animal Husbandry and Veterinary Services, Karnataka organized an outreach awareness programme on Rabies for school children of SJCR School, BGS Campus, Doddaballapura, on 23 September 2023. Dr. Chethan Kumar H.B, Scientist and Dr. Ravikiran, SVO, Veterinary Dispensary, Melekote, delivered a talk to create awareness about rabies among students. ICAR-NIVEDI also organized an anti-rabies vaccination drive for dogs and cats during 24–28 September 2023 in collaboration with Dr. Arif Basha, SVO, Doddatumkur, Bengaluru Rural District. A total of 100 pets were vaccinated against rabies to prevent transmission among pets and subsequently reduce the risk of rabies to humans. During the vaccination drive, awareness was created among pet owners on rabies and stressed the importance of regular vaccination.

Technologies developed by NIVEDI showcased in the 16th Agricultural Science Congress



ICAR-NIVEDI participated in the 16th Agricultural Science Congress held at ICAR-CMFRI, Kochi, Kerala from 10-13 October, 2023. The ICAR-NIVEDI stall showcased the technologies and products to the visitors including researchers, officials from different departments, and farmers. Dr. Joykrushna Jena, DDG (AS&FS), ICAR other esteemed dignitaries visited ICAR-NIVEDI Stall and appreciated the technologies developed by the institute.

Vigilance awareness week



ICAR-NIVEDI organized vigilance awareness week 2023 during 30 October to 5 November 2023 with the theme “Say No to Corruption; Commit to the Nation”. On this occasion different activities were undertaken viz., taking integrity pledge, essay competition for NIVEDI staff, quiz competition at College of Horticulture, Bengaluru and sensitization of project staff and contractual staff to increase public awareness about the perils of corruption.

Rashtriya Ekta Diwas (National Unity Day)



ICAR-NIVEDI, Bengaluru celebrated Rashtriya Ekta Diwas (National Unity Day) on 31 October, 2023 to commemorate the Birth Anniversary of Sardar Vallabhbhai Patel. The Rashtriya Ekta Diwas Pledge was taken by the staff of ICAR-NIVEDI.

Kannada Rajyotsava celebrated at NIVEDI



ICAR-NIVEDI celebrated 68th Kannada Rajyotsava on 17 November, 2023. The year 2023 also marked the Golden Jubilee of renaming of Mysore state as “Karnataka”. On this occasion, Dr. C. Somashekar, IAS (Retd.), former Chairman, Karnataka Border Area Development Authority, Govt. of Karnataka was the Chief Guest. The dignitaries were welcomed with traditional Dolu Kunita and Tamate sound. Chief guest and president joined hands in flag hoisting. Dr. B.R. Gulati, Director, in his speech urged the staff to take pride in the rich art, culture and heritage of Karnataka. The Chief Guest Mr. Somashekar highlighted the history and rich heritage of Karnataka and stressed the need for collective responsibility to safeguard and promote Kannada culture. The NIVEDI staff showcased their talents through cultural events viz., singing, dance performance and drama.

Veterinary health camp and training programme for scheduled caste farmers



ICAR-NIVEDI organized special veterinary health camp and training programs under Development Action Plan for Scheduled Caste (DAPSC) programme in Narasingapatti village, Madurai district and Thumalakundu village, Dindigul district on 17-18 November 2023, respectively. During the health camp, animals were administered foot and mouth disease vaccine, anthelmintics and were also provided mineral mixture. A total of 1645 animals belonging to 138 SC farmers, were provided diagnostic services and health care. A training program was also conducted on scientific rearing of farm animals in Tamil Nadu for the benefit of the SC farmers in the village.

World antimicrobial awareness week celebrated at NIVEDI



World Antimicrobial Awareness Week (WAAW)-2023 was celebrated during 18–24 November 2023 with the theme “Preventing Antimicrobial Resistance Together” with “GO BLUE” campaign. During WAAW 2023, several events were undertaken to create awareness and understanding about antimicrobial resistance (AMR). On 20 November, all the staff of the institute took the pledge on preventing AMR by judicious use of antibiotics. On 21 November 2023, farm school and scientist-farmer interactive program with dairy farmers in Gulur village, Tumkur District, Karnataka was organized and 120 farmers, dairy cooperative members, veterinary doctors took active participation. Judicious use of antimicrobials, clean milk production and mastitis prevention were discussed during the interaction. Other events conducted were quiz and poster competition for NIVEDI staff on 22 November 2023, scientist-student interactive program at Siddaganga Composite Junior College, Budigere, Bengaluru on 23 November 2023. The WAAW-2023 events were coordinated by Dr. Shivasharanappa N.

NIVEDI undertakes cleanliness drive to mark swachhata pakhwada



The Swachhata Pakhwada was observed at ICAR-NIVEDI from 16-31 December 2023 keeping in view of the mission mode programs of Government of India, including Digital India, Swasth Bharat,

waste water management and rain water harvesting, Atmanirbhar Bharat (waste to wealth), doubling farmer's income, and women empowerment. The program was started by taking "Swachhta Pledge" by NIVEDI staff on 16 December, 2023 and organized awareness program to sensitize general public on importance of personal and environmental hygiene in the adapted villages. The activities led to participation of staff, students, general public to fulfill the goals of Swachh Bharat Abhiyan. The overall impact of the above programmes resulted in general hygiene maintenance, beautification and making the campus safe place to work.

NIVEDI celebrates *rastriya kisan diwas*



ICAR-NIVEDI, Bengaluru celebrated "*Rastriya Kisan Diwas*" in great fervor on 23 December 2023. A total of 100 progressive farmers belonging to Scheduled Caste community participated. The programme was inaugurated by Dr. Harish, B.S. Professor, Horticulture college, Bengaluru. He explained about the importance of soil testing and commercial crops. Dr. Balraj, Farm Manager, CPDO&TI, Hessaraghatta shared information about scientific backyard poultry rearing. During the event ICAR-NIVEDI felicitated progressive farmers of SC community and provided stainless steel milk cans and cow mat to promote clean milk production and biosecurity.

07

Ongoing Research Projects

Project Title	Start Date	End Date	Project Team
Epidemiology of Bovine Diseases			
Indian network for fisheries and animal antimicrobial resistance (INFAAR) (Institute Project)	November 2018	continuing	N Shivasharanappa* R Shome P Krishnamoorthy A Prajapati
Sero-monitoring of Brucellosis control programme under NADCP for control of FMD and Brucellosis- ELISA kit supply and capacity building (DAHD-NADCP)	January 2021	March 2026	R Shome* M Nagalingam
Validation and field testing of DIVA test developed in ADMaC phase – I project for surveillance of brucellosis in North Eastern region of India under ADMaC: Phase II Validation and translation of the vaccines as well as diagnostic technologies developed in Phase I of ADMaC (DBT-ADMMac Phase II)	March 2021	March 2024	R Shome* M Nagalingam
National One health program for prevention and control of zoonotic diseases (NOHPPCZ) Intersectoral Coordination for prevention and control of zoonotic diseases (NCDC-Gol)	May 2019	March 2026	V Balamurugan* HB Chethan Kumar M Nagalingam SS Jacob J Hiremath MM Chanda KP Suresh D Hemadri GB Manjunatha Reddy

Development of population assay for detection of LSD in cattle and buffaloes (ICAR-CRP&VD)	December 2022	November 2025	GB Manjunatha Reddy* SS Patil N Shivasharanappa HB Chethan Kumar
Comparative genomics and epidemiology of capripoxviruses in India (NLM-Gol)	April 2023	March 2026	GB Manjunatha Reddy * N Shivasharanappa HB Chethan Kumar R Yogisharadhya
Epidemiological surveillance of antimicrobial use (AMU) and antimicrobial resistance (AMR) in sheep, goats and poultry with one health approach in Karnataka and Tamil Nadu (NLM, Gol)	April 2023	March 2026	N Shivasharanappa* R Shome SS Patil P Krishnamoorthy G Narayanan HB Chethan Kumar
Development of an inactivated homologous vaccine to control the rapidly spreading Lumpy Skin Disease in India (DBT)	September 2023	September 2026	GB Manjunatha Reddy* N Shivasharanappa HB Chethan Kumar
Detection of subclinical mastitis and disease management program at farm level for dairy farmers (BIRAC-BIPP)	June 2023	December 2024	R Shome* R Yogisharadhya
Epidemiology of economically important bovine diseases (Institute)	April 2023	March 2026	R Shome* PP Sengupta D Hemadri SB Shivachandra V Balamurugan SS Patil N Shivasharanappa GB Manjunatha Reddy SS Jacob
Epidemiology of bovine tuberculosis and paratuberculosis and development of CRISPR-Cas technology-based molecular diagnostic tool for diagnosis of bovine tuberculosis (Institute)	July 2023	June 2026	M Nagalingam* R Shome V Balamurugan P Krishnamoorthy N Shivasharanappa
Evaluation of status of anthelmintic and acaricide resistance in parasites of ruminants in India (Institute)	April 2022	March 2025	SS Jacob* PP Sengupta P Krishnamoorthy R Sridevi
Epidemiology of Small Ruminants Diseases			
Network unit of NCVTC under veterinary microbe component (ICAR)	July 2021	Continuing	D Hemadri* GB Manjunatha Reddy M Nagalingam
Understanding nucleotide sequence variation and dynamics of serotype distribution in the epidemiology of bluetongue in Karnataka (Institute)	September 2020	March 2023	D Hemadri* MM Chanda GB Manjunatha Reddy J Hiremath

Characterization of bluetongue virus strains/serotypes and assessment of their suitability as vaccine candidates to the current field scenario (NLM, DAHD-Gol)	March 2022	March 2025	D Hemadri* MM Chanda
Action plan for surveillance and monitoring of PPR in India under PPR-EP (LH&DCP, DAHD-Gol)	September 2022	March 2026	V Balamurugan* KP Suresh G Govindaraj
Epidemiology of respiratory infections in small ruminants with reference to Mycoplasmosis and Ovine Pulmonary adenocarcinoma (JSRV) (Institute)	May 2023	Apr 2026	R Sridevi * D Hemadri N Shivasharanappa M Nagalingam B Sumathi
Development of recombinant non-structural protein (NS1-NS3) based DIVA compliant competitive ELISA kit for population survey of bluetongue (CRP&VD)	December 2022	November 2025	D Hemadri*
Development of recombinant antigen based novel epi diagnostics and subunit vaccines for Anthrax in small ruminants (NLM, Gol)	April 2023	March 2025	SB Shivachandra * MM Chanda R Yogisharadhya (Up to 18.10.2023) A Prajapati
Design and evaluation of new generation bivalent recombinant toxoid vaccine and companion immuno-diagnostics for Anthrax and Enterotoxaemia in small ruminants (DBT)	September 2023	September 2026	SB Shivachandra * MM Chanda R Yogisharadhya (Up to 18.10.2023) A Prajapati
Epidemiology of infectious diseases of small ruminants (Institute)	April 2023	March 2025	D Hemadri * V Balamurugan MM Chanda GB Manjunatha Reddy SB Shivachandra * N Shivasharanappa R Sridevi M Nagalingam
Epidemiology of Swine Diseases			
Epidemiology and antiviral therapeutic development- Optimal sampling strategies for detecting animal COVs and risk analysis and surveillance for porcine respiratory and enteric coronaviruses (NASF)	March 2021	March 2024	KP Suresh* J Hiremath

Action plan for surveillance and monitoring of classical swine fever during implementation of control programme (CSF-CP) (LH&DCP, DAHD-Gol)	September 2022	March 2026	SS Patil* KP Suresh J Hiremath N Shivasharanappa R Sridevi G Narayanan HB Chethan Kumar
Standardization of serological and molecular tests and surveillance of Japanese encephalitis virus infection in pigs in Southern part of Karnataka state (Institute)	August 2020	March 2024	HB Chethan Kumar J Hiremath GB Manjunatha Reddy
Epidemiology of major pig diseases in India (Institute)	April 2023	March 2026	J Hiremath* N Shivasharanappa HB Chethan Kumar CS Sathish Gowda KP Suresh SS Jacob
Development of recombinant antigen-based ELISA for serosurveillance of porcine cysticercosis (CRPV&D)	December 2022	November 2025	SS Jacob* PP Sengupta
Animal Disease Informatics and Socio-economics			
National initiative on climate resilient agriculture (NICRA) (ICAR)	February 2015	March 2024	KP Suresh* P Krishnamoorthy SS Jacob
Upgradation and implementation of the knowledge-based system (KBS) in NER of India an extended activity of advanced animal disease diagnosis and management consortium (ADMaC) (Under ADMaC: Phase II Validation and translation of the vaccines as well as diagnostic technologies developed in Phase I of ADMaC) (DBT-ADMaC Phase II)	March 2021	March 2024	KP Suresh* SS Patil D Hemadri, G Narayanan
Sampling plan generation for carrying out sero-surveillance and sero-monitoring and data analytics for FMD and Brucellosis. (DAHD-NADCP)	January 2021	March 2026	KP Suresh* SS Patil D Hemadri
Establishment of a consortium for one health to address zoonotic and transboundary diseases in India, including the Northeast Region. (Development of artificial intelligence enabled early warning system for zoonotic and transboundary diseases in india including NER) (DBT-One Health)	August 2021	August 2024	KP Suresh* SS Patil D Hemadri V Balamurugan

Quantifying ecological drivers for emerging zoonotic diseases in India (Institute)	January 2021	December 2023	MM Chanda* SB Shivachandra R Yogisharadhya (Up to 18.10.2023) A Prajapati
Socioeconomic upliftment of the Scheduled caste livestock farmers and farm women in rural areas through improved livestock production technologies (Institute)	September 2020	September 2024	G Narayanan* CS Sathish Gowda R Sridevi M Nagalingam HB Chethan Kumar R Yogisharadhya (Up to 18.10.2023)
Risk estimation & prediction and risk mapping communication of Anthrax using artificial intelligence systems (DTRA, USA)	February 2023	February 2028	KP Suresh* D Hemadri SS Patil BR Gulati
Socio-economic impact of important livestock diseases in India (Institute)	April 2023	March 2026	G Govindaraj * CS Sathish Gowda G Narayanan
Integrating data-driven disease surveillance and predictive analytics for live-stock diseases (NADRES V2) (Institute)	April 2023	March 2026	KP Suresh * R Shome D Hemadri SS Patil P Krishnamoorthy SS Jacob
IndoZooRisk: Using One Health approaches to understand and co-develop interventions for zoonotic diseases affecting forest communities in India (UKCEH)	August 2023	July 2025	MM Chanda BR Gulati B Purse S Burthe
NAVIC			
R-ABI RAFTAAR funded MoAFW, GOI (DAHD – Gol)	April 2019	March 2025	SB Shivachandra * GB Manjunatha Reddy R Yogisharadhya (Up to 18.10.2023) MM Chanda A Prajapati
ICAR-Agri-Business Incubator (ABI) – ICAR funded NAIF-IP-and TM Division, ICAR, GOI (ICAR)	January 2020	Continuing	SB Shivachandra* GB Manjunatha Reddy R Yogisharadhya (Up to 18.10.2023) MM Chanda A Prajapati

*Principal Investigator

The Director, ICAR-NIVEDI interacting with Veterinarians of Department of Animal Husbandry, Government of Goa on 31 August 2023



08

Technology Development and Commercialization

Patents granted

- Hemadri D, Mohanty N N and Shivachandra S B. Recombinant non-structural proteins NS1 and NS3 as fusion protein (rNS1-NS3) based immuno-diagnostic assay for blue-tongue (Patent No. 419435, dated 27.01.2023).
- Balamurugan V, Prajakta P B, Vinodkumar K, Nagalingam M, and Shome B R. Recombinant chimeric protein for detection of anti-leptospiral antibodies and methods thereof (Patent No. 452381, dated 18.09.2023).

Copyrights registered

- Krishnamoorthy P, Suresh K P, Ramesh D, Dharshan H V, Roy P. Cattle disease diagnosis expert system – web application- CaDDES. (Date of registration 06.02.2023; RoC No-SW-15961/2023).
- Suresh K P, Kumar G S M. Epidemiological calculator (EPI CAL) Web Application. (Date of registration 09.02.2023; RoC No SW-16034/202309-02-2023).

Technologies certified by ICAR

- ABrC-ELISA kit / PPR Ab Chek kit for detection of Peste des petits ruminants (PPR) virus-specific antibodies for sero-surveillance/monitoring of PPR in sheep and goats developed by Dr. V. Balamurugan (Lead Developer).
- Indirect ELISA for population survey of bluetongue developed by Dr. Divakar Hemadri (Lead Developer).
- National animal disease referral expert system (NADRES V2) developed by Dr. K.P Suresh (Lead Developer).
- Bovine Lepto LAT Kit (Rapid Test) for the detection of Leptospira-specific antibodies developed by Dr. V. Balamurugan (Lead Developer)

Technology released

Bovine LeptoLAT Kit-Recombinant OMP antigen-based diagnostic kit for detection of Leptospira antibodies. Bovine LeptoLAT Kit is a simple, accurate, rapid, bedside test that detects the presence of Leptospira-specific antibodies in bovine sera in less than 5-10 minutes. On mixing with positive sera interlinking of the antigenic bead complex occurs which is visible as agglutination. The bovine LeptoLAT kit was released by Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD, GoI, during NIVEDI-National Animal Disease Epidemiology Network Annual Review meet on 6 July 2023, in the presence of Dr. Ashok Kumar, ADG (AH), ICAR and the Director, ICAR-NIVEDI, and Director, Animal Husbandry and Veterinary Services, GOK.



Revenue generation

ICAR-NIVEDI generated revenue through sale of diagnostic kits and by providing diagnostic services. During the year a total of Rs. 42.15 lakhs was generated through sale of various diagnostic kits, including brucellosis and IBR diagnostics, leptospirosis staining kit.

09

Publications

Research Publications

1. Archana, M., Sundarraj, R., Mruthyunjaya, A.G., Ghosal, T., Mazumdar, A., Hemadri, D., Sengupta, P.P., Prasad, M., Reddy, Y.N., Yarabolu, K.R., Ummer, J. Misri J., Rahman, H., Shome B. R., Shivachandra, S.B. and Chanda, M.M. (2023). Abundance and diversity of *Culicoides* species (Diptera: Ceratopogonidae) in different forest landscapes of Karnataka, India: implications for *Culicoides* borne diseases. *Transboundary and Emerging Diseases*, 2023(3):1-16,6250963. <http://krishi.icar.gov.in/jspui/handle/123456789/81567>.
2. Balamurugan, V., Bokade, P.P., Kumar, K.V., Sowjanya Kumari, S., Nagalingam, M., Hemadri, D. and Shome, B.R. (2023). Comparative diagnostic efficacy of avidin-biotin recombinant nucleoprotein competitive ELISA for serosurveillance and monitoring of *peste des petits ruminants* in sheep and goats. *Journal of Immunological Methods*, 512, 113409. <http://krishi.icar.gov.in/jspui/handle/123456789/81568>.
3. Chanda, M.M., Kharkwal, P., Dhuria, M., Prajapathi, A., Yogisharadhya, R., Shome, B.R. and Shivachandra, S.B., 2023. Quantifying the influence of climate, host and change in land-use patterns on occurrence of crimean congo hemorrhagic fever (CCHF) and development of spatial risk map for India. *One Health*, 17: 100609. <http://krishi.icar.gov.in/jspui/handle/123456789/81573>.
4. Chanda, M.M., Prajapati, A., Yogisharadhya, R., Umesh, L., Palegar, M.S., Hemadri, D., Shome, B.R. and Shivachandra, S.B. (2023). Elevation determines the spatial risk of anthrax outbreaks in Karnataka, India. *Acta Tropica*, 240: 106848. <http://krishi.icar.gov.in/jspui/handle/123456789/81574>.
5. Cheeran, K., Suresh, K.P., Jacob, S.S., Sathish Gowda, C.S., Gejendiran, N., Sridevi, R and Patil, S.S. (2023). Analysis of codon usage bias of six genes of replicase/coat protein of tobacco mosaic virus. *Indian Journal of Agricultural Research*, 1-7, doi: 10.18805/IJARE.A-6107. <http://krishi.icar.gov.in/jspui/handle/123456789/81575>.
6. Govindaraj, G., Balamurugan, V., Tapase, J., Verma, N., Mohanty, B.S., Kumar, N., Shome, B.R. and Roy P. (2023). Financial viability of *peste des petits ruminants* (PPR) control programme (PPR-CP) implemented in Madhya Pradesh. *Indian journal of animal science*, 93(11): 1040-1045. <http://krishi.icar.gov.in/jspui/handle/123456789/81576>.

7. Govindaraj, G., Naveenkumar, G.S., Balamurugan, V., Shome, B.R. and Roy, P. (2023). *Peste des petits ruminants* (PPR) vaccine R&D investment: financial assessment of vaccine development and administration In India. *Journal of Veterinary Medical Science*. 85(7): 755-762. <http://krishi.icar.gov.in/jspui/handle/123456789/81577>.
8. Govindaraj, G., Balamurugan, V., Reddy, G.B.M., Yogisharadhya, R., Reddy, T.S., Naveenkumar, G.S., Kumar, K.V., Chaithra, H.R., Bi, A.Z. and Parida, S. (2023). Towards eradication of PPR: disease status, economic cost and perception of veterinarians in Karnataka, India. *Animals*, 13: 778. <http://krishi.icar.gov.in/jspui/handle/123456789/81578>.
9. Hiremath, J., Hemadri, D., Nayakvadi, S., Kumar, C., Gowda, C.S.S., Sharma, D., Ramamoorthy, R., Mamatha, S.S., Patil, S., Ranjini, R.A. and Jayamohan, T.V., (2023). Epidemiological investigation of ASF outbreaks in Kerala (India): detection, source tracing and economic implications. *Veterinary Research Communications*, 1-11. <http://krishi.icar.gov.in/jspui/handle/123456789/81579>.
10. Krishnamoorthy, P., Dharshan, H., Chandrasekhar, T. and Suresh, K.P. (2023). Development of cattle disease diagnosis expert system (CaDDes): A web application for the diagnosis of cattle diseases. *The Indian Journal of Animal Sciences*, 93(12): 1180-1186. <http://krishi.icar.gov.in/jspui/handle/123456789/81089>.
11. Krishnamoorthy, P., Lakshmi, H.K., Jacob, S.S., Suresh, K.P. and Shome, B.R. (2023). Scientometric analysis of gastrointestinal parasites prevalence in sheep and goats of India. *Acta Parasitologica*, 68(3): 496-519. <http://krishi.icar.gov.in/jspui/handle/123456789/78418>.
12. Krishnamoorthy, P., Lakshmi, H.K., Jacob, S.S., Suresh, K.P. and Patil, S.S. (2023). Dairy cattle and buffaloes harbouring gastrointestinal parasites in various zones and climatic regions established by scientometrics. *Veterinary Parasitology: Regional Studies and Reports*, 47:100966. <http://krishi.icar.gov.in/jspui/handle/123456789/81093>.
13. Krishnamoorthy, P., Parween, N., Sangeetha, T.R., Jacob, S.S., Ballari, S. and Suresh, K.P. (2023). Epidemiological analysis of cattle ticks and tick-borne pathogens in Gadag district, Karnataka state in India. *Journal of Parasitic Diseases*, 47(2):387-399. <http://krishi.icar.gov.in/jspui/handle/123456789/76864>.
14. Kumar, K.V., Bokade, P.P., Pal, A., Swathi, M., Kumar, C.H.B., Gulati, B.R. and Balamurugan, V. (2023). Application of one health concept for understanding the epidemiology and control of leptospirosis in India. *Epi-Dis-PHERE* NCDC (in Press).
15. Manjunatha Reddy, G.B., Pabbineedi, S.M., Nagaraj, S., Bijalwan, S., Tadakod, S., Bhutia, Z., Palmu, D., Rai, S., Bhutia, P.D., Bhutia, P.T., Shenga, E. and Gulati B.R. (2023). Lumpy skin disease (LSD) in Yak (*Bos grunniens*): An evidence of species spillover from cattle in India. *Microorganisms*, 11(12): 2823. <http://krishi.icar.gov.in/jspui/handle/123456789/81593>.
16. Menamvar, S., Kumar, K.V., Alamuri, A., Kumar, E., Swamy, H.M., Govindaraj, G., Nagalingam, M., Belaganahally, V.M., Reddy, Y.N., Shome, B.R. and Balamurugan V. (2023). Seroprevalence and associated risk factors of leptospirosis in bovine dairy farms in Telangana state, India. *Tropical Animal Health and Production*, 55: 352. <http://krishi.icar.gov.in/jspui/handle/123456789/81594>.

17. Murugesan, D., Shome, B.R., Venugopal, N., Am, P.K., Tewari, R., Revanaiah, Y., Kumar, N., Papanna, M. and Shome, R. (2023). Prevalence of antibiotic residues in milk samples of small-scale dairy households in Bengaluru, India. *The Indian Journal of Animal Sciences*, 93(11): 1118-1122. <http://krishi.icar.gov.in/jspui/handle/123456789/81597>.
18. Narayanan, G., C.S. Sathish Gowda, G. Govindaraj and M. Nagalingam. (2023). Social network analysis (SNA) and biosecurity assessment index (BAI): Prospective tools for veterinary epidemiological studies *International Journal of Agricultural Sciences*. DOI:10.15740/HAS/IJAS/19, RAAAHSTSE-2023/120-126.
19. Narayanan, G., Sathish Gowda, C.S., Sridevi, R., Nagalingam, M., Yogisharadhya, R and Chethan Kumar H.B (2023). Introducing kalinga brown: Assessing performance and economic benefits for landless scheduled caste farmers of rural Karnataka. *International Journal of Agricultural Sciences*. DOI:10.15740/HAS/IJAS/19, RAAAHSTSE-2023/31-36.
20. Naveesh Y.B., Raaga R., Ashwini M., Sagar N., Jayashree A., Sushma R., Krishnamoorthy P., Siju S.J., Patil S. S. and Suresh K.P. (2023). Farmer's sagaciousness on climate change and adaptation strategies in agriculture: A Case study in Hyatimundaragi village of Koppala district of Karnataka, India. *International Journal of Environment and Climate Change*, 13(11): 1537-1545. <http://krishi.icar.gov.in/jspui/handle/123456789/81616>.
21. Natarajan, S., Joseph, J., Vinayagamurthy, B. and Estrela, P. (2023). A lateral flow assay for the detection of *Leptospira* lipL32 gene using CRISPR technology. *Sensors (Basel)*, 23(14):10. <http://krishi.icar.gov.in/jspui/handle/123456789/81598>.
22. Patil, S.S., Suresh, K.P., Velankar, A., Nayakvadi, S., Hiremath, J., Jacob, S.S., Sridevi, R., Gowda, C.S.S., Gejendiran, N. and Shome, B. (2023). Seroprevalence of infectious bovine rhinotracheitis (IBR) in Indian buffaloes. *Indian Journal of Animal Research*, 1: 6. <http://krishi.icar.gov.in/jspui/handle/123456789/81599>.
23. Prajapati, A., Mohanty, N. N., Yogisharadhya, R., Chanda, M.M., Dhayalan, A., and Shivachandra, S.B. (2023). Development of recombinant sialidase (NanH) protein based indirect-ELISA for epidemiological survey of *Pasteurella multocida* specific antibodies in bovine sera samples. *Indian Journal of Experimental Biology*, 61: 697-704. <http://krishi.icar.gov.in/jspui/handle/123456789/81600>.
24. Prajapati, A., Yogisharadhya, R., Mohanty, N.N., Mendem, S.K., Chanda, M.M., Siddaramappa, S. and Shivachandra, S.B. (2023). Comparative genome analysis of *Pasteurella multocida* strains of porcine origin. *Genome*, 67(1): 13-23. <http://krishi.icar.gov.in/jspui/handle/123456789/81602>.
25. Prajapati, A., Yogisharadhya, R., Sridevi, R., Nayakvadi, S., Shivamallu, C. and Patil, S.S. (2023). Antimicrobial resistance and its mitigation strategies-One health perspective. *Indian Journal of Comparative Microbiology, Immunology and Infectious Diseases*, 44(1): 45-54.
26. Sagar, N., Suresh, K.P., Naveesh, Y.B., Jayashree, A., Hemadri, D., Patil, S.S., Sushma, R. and Archana, C.A. (2023). Suspected anthrax outbreaks or sudden animal deaths in Hyati Mundaragi village in Koppal, Karnataka, India: A Farmer prospective. *International Journal of Environment and Climate Change*, 13(11): 4319-4325. <http://krishi.icar.gov.in/jspui/handle/123456789/81603>.

27. Sagar. N, Suresh. K.P, Jayashree. A, Naveesh. Y.B, Sushma. R, Hemadri. D, Patil. S.S, Archana. C.A. (2023). Anthrax outbreak study in Hatti Village, Karnataka: Insights, implications, and strategies. *Journal of Animal and Veterinary Sciences*, 8:1-5. <http://krishi.icar.gov.in/jspui/handle/123456789/81604>.
28. Shivasharanappa, N., Dheeraj Reddy, B.N., Apoorva, K.N., Rashmi, L., Suresh, K.P., Gulati, B. and Patil S.S. (2023). Ovine pulmonary adenocarcinoma (OPA) in sheep: an update on epidemiology, pathogenesis and diagnosis. *Journal of Experimental Biology and Agricultural Sciences*, 11(6). <http://krishi.icar.gov.in/jspui/handle/123456789/81605>.
29. Shome, R., Kilari, S., Sahare, A., Kalleshmurthy, T., Shome, B.R., Skariah, S., Hiremath, J., Misri, J. and Rahman, H. (2023). Characterization of humoral and cellular immune responses elicited by reduced doses of *Brucella abortus* S19 (calfhood) vaccine in cattle calves of India. *Research in Veterinary Science*, 158: 124-133. <http://krishi.icar.gov.in/jspui/handle/123456789/81606>.
30. Shome, R., Natesan, K., Kalleshmurthy, T., Yadav, C., Sahay, S., Skariah, S., Mohandoss, N., Kumar, O.R.V., Shome, B.R. and Rahman, H. (2023). Management of bovine brucellosis in organized dairy herds through the identification of risk factors: A cross-sectional study from Karnataka, India. *Veterinary World*, 16(5):1122-1130. <http://krishi.icar.gov.in/jspui/handle/123456789/81607>.
31. Shome, R., Patra, S., Sahib, M.M., Shanmugam, G., Dubey, S., Skariah, S., Shamshad, S., Barman, N.N., Bora, D.P., Shome, A. and Mohandoss, N. (2023). Evaluation of an in-house IgM/IgG lateral flow assay for serodiagnosis of human brucellosis. *Indian Journal of Medical Microbiology*, 42: 55-58. <http://krishi.icar.gov.in/jspui/handle/123456789/81608>.
32. Siju S.J., Sengupta P.P., Pavithra B.S., Chandu A. G.S. and Raina O.K. (2023). Development of an enzyme linked immunosorbent assay using recombinant cathepsin B5 antigen for sero-surveillance of bovine tropical fasciolosis. *Veterinary Parasitology*, 316: 109901. <http://krishi.icar.gov.in/jspui/handle/123456789/81609>.
33. Sowjanya Kumari, S., Bokade, P.P., Kumar, K.V., Bharath, V., Shome, B. and Balamurugan, V. (2023). Potential diagnostic application of the baculovirus-expressed recombinant truncated nucleocapsid protein of Peste des Petits Ruminants virus in ELISA. *Journal of Immunological Methods*, 516: 113469. <http://krishi.icar.gov.in/jspui/handle/123456789/81610>.
34. Suresh, K.P., Sagar, N., Jayashree, A., Naveesh, Y.B., Hemadri, D., Patil, S.S., Doddamani, R. and Sushma, R. (2023). Epidemiological insights into the anthrax outbreak in Muddaballi Village, Karnataka: A case report. *European Journal of Biomedical and Pharmaceutical sciences*, 10(11):112-115. <http://krishi.icar.gov.in/jspui/handle/123456789/81611>.
35. Suresh, K.P., Barman, N.N., Bari, T., Jagadish, D., Sushma, B., Darshan, H.V., Patil, S.S., Bora, M. and Deka, A. (2023). Application of machine learning models for risk estimation and risk prediction of classical swine fever in Assam, India. *Virus Disease*, 34(4): 514-525. <http://krishi.icar.gov.in/jspui/handle/123456789/81612>.
36. Suresh, K.P., Indrabalan, U.B., Shreevatsa, B., Dharmashekar, C., Singh, P., Patil, S.S., Syed, A., Elgorban, A.M., Eswaramoorthy, R., Amachawadi, R.G. and Shivamallu, C. (2023). Evaluation of codon usage patterns and molecular evolution dynamics in Japanese encephalitis virus: An integrated bioinformatics approach. *Infection, Genetics and Evolution*, 109: 105410. <http://krishi.icar.gov.in/jspui/handle/123456789/81613>.

37. Suresh, K.P., Sagar, N., Jayashree, A., Patil, S.S., Naveesh, Y.B., Sushma, R., Hemadri, D. and Archana, C.A. (2023). Investigating a sheep anthrax outbreak in Karkihalli Village, Karnataka, India: An integrated study of demographic, ecological, socio-economic, and risk factors. *International Journal of Veterinary Sciences and Animal Husbandry*, 8(5): 292-297. <http://krishi.icar.gov.in/jspui/handle/123456789/81614>.
38. Vijaykumar, L.K., Chikkachowdappa, P.G., Venkatappa, M.H., Gowda, A.K.J., Jacob, S.S., Mani, S. and Bayyappa, M.R.G. (2023). Analysis of genetic diversity of *cytb* gene from *Babesia gibsoni* isolates from naturally infected dogs in Karnataka, India. *Acta Parasitologica*, 1-9. <http://krishi.icar.gov.in/jspui/handle/123456789/81615>.

Collaborative Research Publications from other institutes

1. Asaaga, F.A., Sriram, A., Chanda, M.M., Hoti, S.L., Young, J.C. and Purse, B.V. (2023). 'It doesn't happen how you think, it is very complex!' Reconciling stakeholder priorities, evidence, and processes for zoonoses prioritisation in India. *Frontiers in Public Health*, 11. 1228950.
2. Bhagat, D., Manzoor, A., Mahajan, A., Sanjeev, U.K., Sharma, B.C., Krishnamoorthy, P., Samuel, D.K. and Sushil, S.N. (2023). Nature to nurture: Chitosan nanopowder a natural carbohydrate polymer choice of egg parasitoid, *Trichogramma Japonicum Ashmead*. *Heliyon*, 9(10): e20724. <http://krishi.icar.gov.in/jspui/handle/123456789/81569>.
3. Bhat, S., Chaudry, W., Mittal, P., Ahmad, B., Haroon, Z., Shaheen, S., Mir, M., Reddy, G.B.M. and Wani, M. (2023). Complete genome sequence of the lumpy skin disease virus reported from Jammu and Kashmir, India, during 2022 outbreak. *Microbiology Resource Announcements*, 12(11): e00317-23. <http://krishi.icar.gov.in/jspui/handle/123456789/81570>.
4. Bhat, S.S., Pradeep, S., Patil, S.S., Flores-Holguín, N., Glossman-Mitnik, D., Frau, J., Sommano, S.R., Ali, N., Mohany, M., Shivamallu, C. and Prasad, S.K. (2023). Preliminary evaluation of *Lablab purpureus* phytochemicals for anti-BoHV-1 activity using in vitro and in silico approaches. *ACS Omega*, 2023 (8): 22684-22697. <http://krishi.icar.gov.in/jspui/handle/123456789/81571>.
5. Buragohain, L., Barman, N.N., Sen, S., Bharali, A., Dutta, B., Choudhury, B., Suresh, K.P., Gaurav, S., Kumar, R., Ali, S. and Kumar, S. (2023). Transmission of African swine fever virus to the wild boars of Northeast India. *Veterinary Quarterly*, 43(1):1-10. <http://krishi.icar.gov.in/jspui/handle/123456789/81572>.
6. Chethankumar, H.B., Chandisha, D., Rajkumar, S., Shivasharanappa, N., Susitha, R., Udharwar, S. and Chakurkar, E. (2023). Copro-prevalence of *Cryptosporidium* in pigs of selected districts in west coast of India: A preliminary study. *The Indian Journal of Animal Sciences*, 93(12): 1140-1144.
7. Dey, T.K., Lindahl, J.F., Lundkvist, A., Grace, D., Deka, R.P., Shome, R., Bandyopadhyay, S., Goyal, N.K., Sharma, G. and Shome, B.R. (2023). Analyses of extended-spectrum- β -lactamase, metallo- β -lactamase, and AmpC- β -lactamase producing Enterobacteriaceae from the dairy value chain in India. *Antibiotics*, 12(9): 1449.
8. Dey, T.K., Shome, B.R., Bandyopadhyay, S., Goyal, N.K., Lundkvist, A., Deka, R.P., Shome, R., Venugopal, N., Grace, D., Sharma, G. and Rahman, H. (2023). Molecular characterization of methicillin-resistant staphylococci from the dairy value chain in two Indian states. *Pathogens*, 12(2): 344.

9. Dharmashekar, C., Shreevatsa, B., Jain, A.S., Harendra, B., Pradeep, S., Vishwanath, P.M., Singh, P., V, B., Kk, V., Patil, S.S. and Shati, A.A. (2023). Evaluating the antimicrobial and anti-hemolytic activity of synthesized pseudopeptide against leptospiral species: In Silico and In Vitro Approach. *Molecules*, 28(3): 1106.
10. Jayaprakasam, M., Chatterjee, N., Chanda, M. M., Shahabuddin, S. M., Singhai, M., Tiwari, S. and Panda, S. (2023). Human anthrax in India in recent times: A systematic review & risk mapping. *One Health*, 100564.
11. Kanthala, S., Patel, D.R., Balamurugan, V., Makwana, P.M., Parasana, D.K., Chaudhary, P.S. and Kalyani, I.H., (2023). Seroprevalence and molecular detection of canine leptospirosis in and around Navsari, South Gujarat, India. *Indian Journal of Veterinary Sciences & Biotechnology*, 19: 58-64.
12. Lavanya, K. V., Puttalakshamma G.C., Mohan H. V., Anand K. J., Siju S J., Saminathan M. and Manjunatha Reddy G.B. (2023). Analysis of genetic diversity of cytb gene from *Babesia gibsoni* Isolates from naturally infected dogs in Karnataka, India. *Acta Parasitologica*. 38133744.
13. Menamvar, S., Bokade, P., Kumar, K., Sowjanya Kumari, S., Alamuri, A., Veeregowda, B., Reddy, Y., Rathnamma, D., Isloor, S., Ramesh, P. and Balamurugan V. (2023). Production of recombinant *Leptospira* surface adhesion-44 protein in *Escherichia coli* and its diagnostic application in the latex agglutination test for the detection of anti-leptospiral antibodies. *Applied Biochemistry and Microbiology*, 59: 723-732.
14. Mullakkalparambil Velayudhan, S., Sejian, V., Devaraj, C., Manjunathareddy, G.B., Ruban, W., Kadam, V., König, S. and Bhatta, R. (2023). Novel insights to assess climate resilience in goats using a holistic approach of skin-based advanced NGS technologies. *International Journal of Molecular Sciences*, 24(12): 10319.
15. Narayanan, G., Sathish Gowda, C.S., Reddy, K.K., Ajay B.C., Murlidhar, M., Jat R.A. and Kumar N. (2022). Resource use management (RUM) behaviour of farmers of major rainfed groundnut growing states of India: Productivity improvement at crossroads. *International Journal of Agricultural Sciences*. DOI:10.15740/HAS/IJAS/18-OCAEBGD/20-25.
16. Narayanan, G., Rathnakumar, A.L., Sathish Gowda, C.S. and Gowda H.G.R. (2023). Resource use efficiency and farm managerial abilities of groundnut farmers of Gujarat and Karnataka: Achieving higher profit by enhancing RUE and FPO based extension system. *International Journal of Agricultural Sciences*. doi:10.15740/HAS/IJAS/19, RAAAHSTSE-2023/8-12
17. Nayak, N., Bhanja, S.K., Chakurkar, E.B., Sahu, A.R., Ashitha, K., Shivasharanappa, N. and D'Mello, A.D. (2023). Impact of bioclimatic factors on physio-biochemical and molecular response of slow-growing poultry reared in tropics. *Tropical Animal Health and Production*, 55(4): 253.
18. Oso, O., Reddy, G.B.M., Malik, P., Pushpadass, H.A. and Awachat, V. (2023). Serum biochemistry, meat quality and oxidative stability in broiler chicken supplemented with a novel phyto-genic feed additive formulated from *P. betle*, *P. nigrum*, *A. lanata* and *C. dactylon*. *The Indian Journal of Animal Sciences*, 93(6): 617-625.
19. Pal, A., Sarkar, A., Kar, S., Mondal, A., Banerjee, P., Maitra, M.S., Chanda, M.M and Mazumdar, A. (2023). Elucidation of population structure of *Culicoides oxystoma* a vector of BTV in India and its genetic variability within conspecifics. *Biologia* 11-1.

20. Patra, S., Sahib, M.M. and Shanmugam, G. (2023). Evaluation of an in-house indirect ELISA for differential detection of IgM and IgG anti-*Brucella* antibodies in human brucellosis. *Journal of Pure and Applied Microbiology*, 17(3):1650-1658.
21. Prabhu, V., Veeregowda, B., Rathnamma, D., Basavarajaiah, D.N., Manjunatha Reddy, G.B., Leena, G. and Ramesha, P.T. (2023). The incidence of lumpy skin disease outbreaks in Karnataka during the year 2022 a study report. *International Journal of Veterinary Sciences and Animal Husbandry*, 8: 162-165.
22. Pradeep, S., Patil, S.M., Dharmashekara, C., Jain, A., Ramu, R., Shirahatti, P.S., Mandal, S.P., Reddy, P., Srinivasa, C., Patil, S.S., Ortega-Castro, J., Frau, J., Flores-Holgún, N., Shivamallu, C., Kollur, S.P. and Glossman-Mitnik, D. (2023). Molecular insights into the in silico discovery of corilagin from *Terminalia chebula* as a potential dual inhibitor of SARS-CoV-2 structural proteins. *Journal of Biomolecular Structure and Dynamics*, 41(20):10869-10884. doi: 10.1080/07391102.2022.2158943.
23. Rani, S., Mamathashree, M.N., Bharthi I, U., Patil, S.S., Krishnamoorthy, P., Shueb, M., Pandey, R.K. and Suresh, K.P. (2023). Comprehensive examination on codon usage bias pattern of the bovine ephemeral fever virus. *Journal of Biomolecular Structure and Dynamics*, 1-11.
24. Rao, S.B.N., Elangovan, A.V., Madijagan, B., Rajendran, D., Franklin, M.E.E., Gopi, M., Pal, D., Parthipan, S., Nalina, M., Dey, D.K. and Manjunatha Reddy, G.B. (2023). Production and evaluation of encapsulated zinc oxide on performance, ileal digestibility and zinc transporter gene expression in broiler chicken. *Biological Trace Element Research*, 1-12.
25. Roopadevi, Y.S., Rao, S., Nadoor, P., Byregowda, S.M., Narayanaswamy, H.D., Krishnamoorthy, P. and Girish, M.H. (2023). Evaluation of protective effects of gallic acid on cisplatin induced hematological alteration in rats. *The Pharma Innovation Journal*, 12(2): 626-632.
26. Roopadevi, Y.S., Rao, S., Nadoor, P., Byregowda, S.M., Narayanaswamy, H.D., Krishnamoorthy, P. and Girish, M.H. (2023). Pathomorphological alterations in cisplatin induced testicular toxicity and its amelioration by gallic acid. *The Pharma Innovation Journal*, 12(5): 2129-2136.
27. Sajjanar, B., Aalam, M.T., Khan, O., Tanuj, G.N., Sahoo, A.P., Manjunathareddy, G.B., Gandham, R.K., Dhara, S.K., Gupta, P.K., Mishra, B.P. and Dutt, T. (2023). Genome-wide expression analysis reveals different heat shock responses in indigenous (*Bos indicus*) and crossbred (*Bos indicus* X *Bos taurus*) cattle. *Genes and Environment*, 45(1):17.
28. Sanjeevakumar, L., Suguna, Rao., Byregowda, S.M., ChethanKumar, H.B., Yogisharadhya, R., Girish, M.H. and Manjunatha Reddy, G.B. (2023). Molecular detection of lumpy skin disease virus (LSDV) in different organs of post-mortem cases in naturally affected cattle. *The Pharma Innovation Journal*, 12: 2582-2584.
29. Sanjeevakumar, L., Suguna, Rao., Byregowda, S.M., ChethanKumar, H.B., Shivasharanappa, N., Patil, S.S., Yogisharadhya, R., Leena, Gowda., Girish, M.H. and Manjunatha Reddy, G.B. (2023). Haematological and biochemical profile of cattle naturally infected with lumpy skin disease (LSD) virus. *The Pharma Innovation Journal*, 12: 2913-2916.
30. Sindhoora, D., Dhanalakshmi, H., Sandeep, N., Shrikrishna, Isloor., Rashmi, R., Ananda, K.J. and Manjunatha Reddy, G.B. (2023). Evaluation of different DNA

- extraction methods from blood for LAMP reaction. *Biological Forum – An International Journal*. 15: 530-533.
31. Shyamsundar, K.A., Rathnamma, D., Chandranaik, B.M., Shivashankar, B.P., Sharada, R., Isloor, S., Suresh, K.P. and Patil, S. (2023). Sheep associated-malignant catarrhal fever: past, present, and future. *Journal of Experimental Biology and Agricultural Sciences*, 11(1): 16-23.
 32. Vadari, B., Lakkundi, J., Shilpa, V.T, Mamatha, G.S., Sengupta, P.P., Ravikumar, C. and Krishna Murthy, C.M. (2023). Pathological studies on experimental infection of buffalo isolate of *Trypanosoma evansi* infection in Swiss albino mice. *The Pharma Innovation Journal*, 12(7): 1821-1825.
 33. Venugopal, N., Tewari, R., Ganaie, F.A., Mitra, S., Shome, R. and Shome, B.R. (2023). Prevalence and epidemiological characteristics of methicillin-resistant *Staphylococcus aureus* isolated from cattle as a part of the One Health approach. *Access Microbiology*, 000627-v1.
 34. Verma, R., Das, G., Singh, A.P., Kumar, S., Nath, S., Sengupta, P.P., Sankar, M., Tiwari, A., Gupta, V. and Srivastava, S. (2023). Molecular and genetic diversity in isolates of *Trypanosoma evansi* from naturally infected horse and dogs by using RoTat 1.2 VSG gene in Madhya Pradesh, India. *Molecular Biology Reports*, 50:7347–7356.

Policy paper

1. Balamurugan, V., Kumar, K.V., Govindaraj, G., Suresh, K., Shome, B. and Gulati, B. (2023). Status Paper on Peste des petits ruminants Indian Perspective, ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI), pp. 1-47.

Abstract Presentation in Conferences/Symposia/Workshops/Seminars

1. Asha, A., Swathi, M., Pal, A., Dsouza, A.H., Bokade, P.P., Ashraf, S., Ojha, R., Kumar, K.V., Gulati, B.R., Balamurugan, V. (2023). Isolation and molecular characterization of peste des petits ruminants viruses from goat outbreaks in India. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli, during 1-3 December 2023.
2. Balamurugan, V., Kumar, K.V., Ojha, R., Swathi, M., Dsouza, A.H., Pal, A., Asha A., Bokade, P.P., Ashraf, S., Harshitha, S.K., Deshpande, R., Govindaraj, G., Suresh, K.P., Hemadri, D., Gulati, B.R. (2023). Current status of peste des petits ruminants in India. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli, during 1-3 December 2023.
3. Balamurugan, V., Ojha, R., Kumar, K.V., Asha A., Suhail A., Dsouza, A.H., Pal, A., Bokade, P.P., Harshitha, S.K., Deshpande, R., Suresh., K.P., Govindaraj, G., Prasad, S.H., Sekar, C., Hemadri, D., Guha, A., Gulati, B.R. (2023). Towards eradication of peste des petits ruminants: Serosurveillance and post-vaccination seromonitoring of PPR in sheep and goats in Karnataka state, India. In VIBCON-2022, XXVII Annual Convention of ISVIB and National Conference, at Sher-e-Kashmir University of Agricultural Sciences & Technology (Kashmir), during 27-29 July 2023.

4. Bokade, P.P., Kumar, K.V., Bharath V., Swathi M., Neha P., Hemadri, D., Gulati, B.R., Balamurugan, V. (2023). Prevalence of anti-leptospiral antibodies and frequency distribution of *Leptospira* serovars in buffaloes in enzootic states of India. In VIBCON-2022, XXVII Annual Convention of ISVIB and National Conference, Sher-e-Kashmir University of Agricultural Sciences & Technology (Kashmir), during 27-29th July 2023
5. Bokade, P.P., Kumar, K.V., Pal, A., Nagalingam, M., Shome, B.R., Gulati, B.R., Balamurugan, V. (2023). Diagnostic application of the recombinant *Leptospira* outer-membrane chimeric protein(s) in latex agglutination test for rapid detection of anti-leptospiral antibodies. In VIBCON-2022, XXVII Annual Convention of ISVIB and National Conference, at Sher-e-Kashmir University of Agricultural Sciences & Technology (Kashmir), during 27-29 July 2023.
6. Bokade, P.P., Pal, A., Dsouza, A.H., Asha, A., Swathi, M., Kumar, K.V., Vikram, R., Somagond, Y.M., Ragulra, S., Pal, S., Khate, K., Patil, S.G., Gulati, B.R., Balamurugan, V. (2023). Evidence of peste-des-petits-ruminants virus-specific antibodies in the semi-domesticated Mithun (*Bos frontalis*) in Nagaland, India. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli, during 1-3 December 2023.
7. Bokade, P.P., Pal, A., Kumar, K.V., Sonali, M., Balamurugan, V. (2023). Seroprevalence of peste des petits ruminants virus antibodies in large ruminants in disease-controlled Telangana state of India. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) and National Conference, at LCSK-HPKV, Palampur during 7-8 April 2023.
8. Chamuah, J.K., Raina, O. K., Joshi, V., Jacob, S.S., Goswami. P., Khate, K., Hanah, S.S. and Patil G.S. (2023). Naturally occurrence of different parasitic infestations in Mithun (*Bos forntalis*). In 34th National Congress of Veterinary Parasitology and National Symposium on Sustainable Control of Parasitic Diseases for Improved Productivity of Livestock in Current Scenario, at Bihar Animal Sciences University, Patna, Bihar during 29 November-1 December 2023.
9. Chanda, M.M., Bhimangoud, K. and Shivachandra, S.B. (2023). One Health approach for emerging zoonotic diseases with special reference to Kyasanur Forest Disease (KFD) and Crimean Congo Hemorrhagic Fever (CCHF) in India. In National Conference on Leveraging Emerging Biotechnologies for One Health, Indian Society for Veterinary Immunology & Biotechnology (ISVIB) at SKUAST, Kashmir during 27-29 July 2023.
10. Chethan Kumar, H.B., Asha, B.R., Hiremath, J., Siju, S.J., Manjunatha Reddy, G.B., Patil, S.S and Gulati, B.R. (2023). Investigation of Japanese encephalitis outbreak in Kollengode, Palakkad, Kerala. In International Symposium on Promotion of One Health: Opportunities, Challenges and Solutions. In XIXth Annual Conference of IAVPHS, at Veterinary College, LUVAS, Hisar, Haryana during 7-8 December 2023.
11. Deekshitha, M., Shome, R., Balamurugan, V., Reddy G.B.M., Sridevi. R., Triveni, K., Gulati, B.R. and Nagalingam, M. (2023). Molecular detection of *Brucella* spp. in sheep by SYBR Green I based Real-time PCR. In National Conference on Contextual Approaches in Applied Microbiology, at DSU, Bengaluru during 8-9 June 2023.
12. Deepika, S., Shome, R., Balamurugan, V., Reddy G.B.M., Sridevi. R., Triveni, K., Gulati, B.R. and Nagalingam, M. (2023). Molecular characterization of *Brucella* strains/

- isolates DNA by Bruce ladder multiplex PCR and protein profiling by sodium dodecyl sulphate polyacrylamide gel electrophoresis. In National Conference on Contextual Approaches in Applied Microbiology, at DSU, Bengaluru during 8-9 June 2023.
13. Govindaraj, G., Kumar, N.G.S., Wanyoike, F., Bahta, S., Reddy, Y.R., Bardhan, D., Balamurugan, V., Kennady, V. and Rahman H. (2023). Assessment of PPR vaccination impact in Karnataka, India: A system dynamics model approach. In 6 PPR GREN meeting at Bengaluru during 28-30th November 2023.
 14. Gulati, B.R., Chanda, M.M., Reddy, G.B.M. and Suresh, K.P. (2023). Emergence and spread of transboundary animal diseases in India: Mitigation strategies. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) and National Conference at LCSK-HPKV, Palampur during 7-8 April 2023.
 15. Gulati, B.R., Suresh, K.P., Jayashree, A. and Dikshitha, J. (2023). Climatic risk assessment and early warning systems for transboundary and emerging infectious animal diseases. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli during 1-3 December 2023.
 16. Hemadri, D. (2023). Nano string counter technology: Its application to virus research, with special reference to bluetongue. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli during 1-3 December 2023.
 17. Jayashree, A. and Suresh, K.P. (2023). Automated detection and classification of coffee leaf rust disease with deep learning. In National Symposium on Crop Health Management: Safeguarding Crop through Diagnostics and Innovations, at ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora during 29 August- 30 September 2023.
 18. Kanthala, S., Patel, D.R., Balamurugan V., Kumar, K.V., Parasana, D.K., Pushpa, M.M., Chaudhary, P.S., Kalyani, I.H., Ramani, U.V. and Mehta, S.A. (2023). Sero-surveillance of leptospirosis in dogs in and around Navsari district of southern Gujarat. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) and National Conference, at LCSK-HPKV, Palampur, Himachal Pradesh during 7-8 April 2023.
 19. Krishnamoorthy, P. and Lakshmi, H.K. (2023). Spatiotemporal analysis of organizations conducting experiments on animals in India. In: LASACON 2023 on “Advancements of 3R’s in Biomedical Research, Laboratory Animal Science and Welfare: International Perspectives”, at JN TATA Auditorium, Indian Institute of Science, Bengaluru during 6-8 November 2023.
 20. Krishnamoorthy, P., Jacob, S.S., Suresh, K.P. and Patil, S.S. (2023). Scientometric analysis of gastrointestinal parasites prevalence in dairy cattle and buffaloes in India. In 34th National Congress of Veterinary Parasitology and National Symposium on Sustainable Control of Parasitic Diseases for Improved Productivity of Livestock in Current Scenario, at Bihar Animal Sciences University, Patna, Bihar during 29 November-1 December 2023.
 21. Lalawmpuii, K., Lalrinkima, H. and Jacob, S.S. (2023). Screening of ticks for its potential role in the transmission of haemoparasites and phylogenetic inference on the endosymbionts in the Myanmar border of India. In 5th National Conference

- Society for Veterinary and Animal Husbandry Extension (SVAHE) on Smart Livestock Extension for Enhancing Farmers' Income- An Extension Bounty”, at Khalsa Veterinary and Animal Sciences, Amritsar, Punjab during 12-14 October 2023.
22. Lalawmpuii, K., Lalrinkima, H. and Jacob, S.S., Lalmuanpuia, J., Behera, P., lalrintluanga, K., Tolengkomba, T.C., Lalremsanga, H.T., Lalchhandama, C. and Lalrinkima H. (2023). Analysis of diversity of ticks and their endosymbiont prevalent in Indo Myanmar border. In 34th National Congress of Veterinary Parasitology and National Symposium on Sustainable Control of Parasitic Diseases for Improved Productivity of Livestock in Current Scenario, at Bihar Animal Sciences University, Patna, Bihar during 29 November-1 December 2023.
 23. Lalawmpuii, K., Lalrinkima, H. and Jacob, S.S., Lalmuanpuia, J., Behera, P., lalrintluanga, K., Tolengkomba, T.C., Lalremsanga, H.T., Lalchhandama, C. and Lalrinkima H. (2023). Reappraisal on the diversity of ticks prevalent in Indo Myanmar border. In 34th National Congress of Veterinary Parasitology and National Symposium on Sustainable Control of Parasitic Diseases for Improved Productivity of Livestock in Current Scenario, at Bihar Animal Sciences University, Patna, Bihar during 29 November-1 December 2023.
 24. Madhaba, S.M., Siju, S.J., Sengupta P.P., Samer, S., Sudhagar, S. and Chandu, A.G.S. (2023). Evaluation of indirect ELISA utilizing two recombinant antigens for the detection of porcine cysticercosis. In 34th National Congress of Veterinary Parasitology and National Symposium on Sustainable Control of Parasitic Diseases for Improved Productivity of Livestock in Current Scenario, at Bihar Animal Sciences University, Patna, Bihar during 29 November-1 December 2023.
 25. Ojha, R., Swathi, M., Kumar, K.V., Dsouza, A.H., Pal, A., Asha A., Bokade, P.P., Ashraf, S., Harshitha, S.K., Deshpande, R., Suresh, K.P., Govindaraj, G., Singh, B., Qureshi, S.R., Sharma, D., Dhawan, V., Sekar, C., Hemadri, D., Gulati, B.R. and Balamurugan, V. (2023). A step towards eradication of PPR: Seroprevalence of PPR in sheep and goats in Northern States of India before implementation of PPR-EP vaccination. In XXVIII Annual Convention of ISVIB & National Conference-VIBCON-2023, at Sri Venkateshwara University Tirupati, Andhra Pradesh during 12-14 December 2023.
 26. Pal, A., Kumar, K.V., Bokade, P.P., Swathi M., Bharath, V., Veena, R.K., Devaraj, S., Jagadeesha, K., Chethan Kumar, H.B., Gulati, B.R., Balamurugan, V. (2023). Augmenting the isolation efficiency of pathogenic *Leptospira* from environmental and rodent samples. In VIBCON-2022, XXVII Annual Convention of ISVIB and National Conference, at Sher-e-Kashmir University of Agricultural Sciences & Technology (Kashmir) during 27-29 July 2023.
 27. Patil, S.S., Suresh, K.P., Hiremath, J., Nayakvadi, S., Chethan Kumar, H.B. and Siju, S.J. (2023). Transboundary animal diseases: Re-emerging threats. In International Symposium on Promotion of One Health: Opportunities, Challenges and Solutions. In XIXth Annual Conference of IAVPHS, at Veterinary College, LUVAS, Hisar during 7-8 December 2023.
 28. Patil, S.S., Velankar, A., Mouna, V., Manjunatha, J., Reddy, D., Suresh, K.P., Shivasharanappa, N., Hiremath, J., Sridevi, R. and Gulati, B.R. (2023). Seropositivity of Infectious Bovine Rhinotracheitis (IBR) in cattle of Chhattisgarh state of India. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) and National Conference at LCSK-HPKV, Palampur during 7-8 April 2023.

29. Prajapati, A., Manishchandana, S., Yogisharadhya, R., Chanda, M. M., Hemadri, D., and Shivachandra, S. B. (2023). Development and evaluation of indirect-ELISA for detection of *Pasteurella multocida* specific antibodies in bovines. In XXVIII Annual convention of ISVIB & National Conference-VIBCON-2023, at Sri Venkateshwara University Tirupati, Andhra Pradesh during 12-14 December 2023.
30. Prajapati, A., Yogisharadhya, R., Mohanty, N.N., Mendem, S.K., Siddaramappa, S., Chanda, M.M., and Shivachandra, S.B. (2023). Genomic characteristic of *Pasteurella multocida* serogroup A strains isolated from small ruminants. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) and National Conference at LCSK-HPKV, Palampur during 7-8 April 2023.
31. Ramesh, V., Suresh, K.P., Shijili, M., Rani, S., Ojha, R., Kumar, K.V., Balamurugan, V., (2023). A comprehensive study on evolutionary rate and codon usage bias analysis of N and F genes of peste des petits ruminants virus in goats and sheep hosts: Insights from India Current status of peste des petits ruminants in India. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli during 1-3 December 2023.
32. Reddy, G.B.M. (2023). Molecular genetic diversity of lumpy skin disease viruses in India. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli during 1-3 December 2023.
33. Reddy, G.B.M., Mounica, S., Sunil, T., Sharddha, B. and Sudeep, N. (2023). Epidemiology and pathology of lumpy skin disease in India. In XXXX Annual Conference of the Indian Association of Veterinary Pathologists and XIV Annual meeting of the Indian College of Veterinary Pathologists and National Symposium on Advances in Veterinary Pathology for Diagnosis and Control of Emerging Diseases of Livestock and Poultry at ICAR-Indian Veterinary Research Institute Izatnagar, Bareilly during 20-22 December, 2023.
34. Reddy, G.B.M., Sudeep, N., Chethan Kumar, H.B., Yogishardhya, R., Chanda, M.M. and Gulati, B.R. (2023). Molecular epidemiology and pathology of lumpy skin disease outbreaks in Karnataka, India. In the Agricultural Science Congress, Kochi during 10-13 October 2023.
35. Shanmugam, G., Skariah, S., Mohandoss, N., Suresh, K.P. and Shome, R. (2023). Sero-monitoring of *Brucella abortus* S19 vaccine at different intervals of post-vaccination under NADCP brucellosis control program. In XXVIII Annual Convention of ISVIB & National Conference-VIBCON-2023, at Sri Venkateshwara University Tirupati, Andhra Pradesh during 12-14 December 2023.
36. Shivasharanappa, N., Kavya, P., Sangeetha, T.R., Ranjitha, G., Kumar P.A.M and Shome, R. (2023). Epidemiological and molecular studies of MRSA and ESBLs from livestock, animal handlers and environment in Bengaluru Rural district, Karnataka. In XXVIII Annual Convention of ISVIB & National Conference-VIBCON-2023, at Sri Venkateshwara University Tirupati, Andhra Pradesh during 12-14 December 2023.
37. Shome, R. (2023) Brucellosis: zoonotic disease of public health importance in India. In XVII National Technical Conference of Indian Association of Women Veterinarians on Strengthening Veterinary Profession Towards One Health Through Diversity, Equity and Inclusiveness, at NTR College of Veterinary Science, Gannavaram during 29-30 November 2023.

38. Shome, R. (2023). National animal disease control program: national guidelines and review of progress. In XXVIII Annual Convention of ISVIB & National Conference-VIBCON-2023, at Sri Venkateshwara University Tirupati, Andhra Pradesh, India during 12-14 December 2023.
39. Siju, S.J., Sengupta, P. P., Chethan Kumar, H. B., Madhab, M.S. Goudar A., Chandu, A.G. S., Shivakumar, V., Gulati, B.R. and Reddy, G.B.M. (2023). Unveiling genotypic diversity of *Theileria orientalis* in lethal outbreaks among bovines in Karnataka, India. In 34th National Congress of Veterinary Parasitology and National Symposium on Sustainable Control of Parasitic Diseases for Improved Productivity of Livestock in Current Scenario at Bihar Animal Sciences University, Patna, Bihar during 29 November-1 December 2023.
40. Sridevi, R., Jacob, S.S., Manjunath, J., Kavana, D., Krishnamoorthy, P, Patil, S.S and Suresh, K.P. (2023). Meta-analysis of pooled prevalence of pasteurellosis among large and small ruminants. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and specialists in Infectious Diseases (IAVMI) and National Conference at LCSK-HPKV, Palampur during 7-8 April 2023.
41. Sridevi, R., Lavanya.V, Padmaja, D., Nagalingam, M., Reddy, G.B.M., Roy, P. and Shome B.R. (2023). Molecular detection and characterization of *Pasteurella multocida* isolates from small ruminants with healthy and respiratory illness status. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and specialists in Infectious Diseases (IAVMI) and National Conference at LCSK-HPKV, Palampur during 7-8 April 2023.
42. Tejashwini, N., Shome, R., Balamurugan, V., Reddy G.B.M., Sridevi. R., Triveni, K., Gulati, B.R. and Nagalingam, M. (2023). Standardization of *Brucella* micro titre agglutination test (B-MAT) for the detection of brucella antibodies in bovine serum samples. In National Conference on Contextual Approaches in Applied Microbiology, DSU, Bengaluru during 8-9 June 2023.
43. Varsha, R., Suresh, K.P., Shijili, M., Swati, R., Ojha, R., Kumar, V.K. and Balamurugan, V. (2023). A comprehensive study on evolutionary rate and codon usage bias analysis of N & F genes of peste des petits ruminants virus in goats and sheep hosts: Insights from India. In VIROCON 2023, Advancements in Global Virus Research Towards One Health, Indian Virological Society, at ICAR-National Research Centre for Banana, Trichirapalli, during 1-3 December 2023.
44. Yogisharadhya, R., Prajapati, A., Chetan Kumar, H.B., Chanda, M. M., Mohanty, N.N., and Shivachandra, S. B. (2023). Isolation and whole genome characterization of *Pasteurella multocida* from septicaemic pigs, Karnataka. In XXXV Annual Convention of Indian Association of Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) and National Conference, at LCSK-HPKV, Palampur during 7-8 April 2023.

Training manuals

1. Balamurugan, V. Kumar, V., Swathi, M., Arun, Y.P., Nagalingam, M. and Chethan Kumar H.B. (2023). Training manual on laboratory diagnosis of leptospirosis. Organized by ICAR-NIVEDI during 9-13 October 2023. pp 1-105.
2. Chanda, M.M., Neha, P., Sridevi, R. and Gulati, B.R. (2023). Training manual on Enhancing skills in research organized by ICAR-NIVEDI during 20-24 November, 2023. pp 1-124.

3. Chanda, M.M., Neha, P, and Gulati, B.R. (2023). Workshop manual on Epidemiological approaches to prevent and control transboundary animal diseases with special focus on foot and mouth disease and zoonotic diseases. Jointly organized by ICAR-NIVEDI and ICAR- ICAR-NIFMD during 3-12 October 2023.
4. Nagalingam, M., Shome, R., Balamurugan, V. and Kumar, V.K. (2023). Training manual on hands-on training on laboratory diagnosis of brucellosis. Organized by ICAR-NIVEDI during 27 February 2023 to 3 March 2023. pp 1-64.
5. Suresh, K.P., Balamurugan, V., Kumar K.V., Govindaraj, G. and Hemadri, D. (2023). Sampling plan for sero-surveillance and seromonitoring of peste des petits ruminants (PPR). ICAR-NIVEDI, Bengaluru, pp 1-235.

Chapters in training manual

1. Shome, R., Sakariah, S. and Shanmugam, G. (2023). Standard diagnostic protocol (SDP) for rose bengal plate test (RBPT) for diagnosis of brucellosis. In workshop manual on Enhancing skills in research held during 20-24 November 2023.
2. Shome, R., Sakariah, S. and Shanmugam, G. (2023). Standard diagnostic protocol for standard tube agglutination (SAT) for diagnosis of brucellosis. In workshop manual on Enhancing skills in research held during 20-24 November 2023.
3. Shome, R., Sakariah, S. and Shanmugam, G. (2023) Recombinant protein G based indirect ELISA for bovine brucellosis for diagnosis of brucellosis. In workshop manual on Enhancing skills in research held during 20-24 November 2023.

Technical bulletins/Folders/Popular articles

1. Balamurugan V. (2023). Technical folder on Bovine LeptoLAT kit for the detection of ant-leptospiral antibodies in the serum samples of bovine. ICAR-NIVEDI, Bengaluru. pp 1-8.
2. Suresh, K.P., Hemadri, D., Patil, S.S., Krishnamoorthy, P. and Siju, S.J. (2023). Livestock disease risk forewarning monthly bulletin, January 2023, ICAR-NIVEDI, Bengaluru, 11(1): 1-51.
3. Suresh, K.P., Hemadri, D., Patil, S.S., Krishnamoorthy, P., Siju, S.J. and Gulati, B.R. (2023). Livestock disease forewarning monthly bulletin, February-December 2023. Published by ICAR-NIVEDI, Bengaluru. 11(2-12).

10

Awards, Recognitions and Personal Milestones

Awards and Recognitions

1. Dr B.R. Gulati, Director, ICAR-NIVEDI has been awarded as Fellow of Indian Association of Veterinary Microbiologists, Immunologists, and Specialists in Infectious Disease (IAVMI) in 35th National conference of IAVMI held at Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh during 7-8 April 2023.



2. Dr. N Shivasharanappa, Senior Scientist received oral presentation award (3rd prize) in National Conference on Advanced Concepts, Strategies in Immune-biotechnology for Disease Diagnosis and Control organized by Indian Society for Veterinary Immunology and Biotechnology (ISVIB), Sri Venkateshwara Veterinary University, Tirupati during 12-14 December 2023.
3. Dr. N Shivasharanappa, Senior Scientist received Dr. C M Singh Memorial award (IAVP), 2022 for full research article paper published in Indian Journal of Veterinary Pathology during Veterinary Pathology Congress 2023 XXXX Annual Conference of the Indian Association of Veterinary Pathologists (IAVP), XIV Annual Meeting of the Indian College

of Veterinary Pathologists (ICVP), and National Symposium on “Advances in Veterinary Pathology for Diagnosis and Control of Emerging Diseases of Livestock and Poultry” jointly organized by the Centre for Animal Disease Research and Diagnosis (CADRAD) and Division of Pathology, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, Uttar Pradesh in association with the IAVP and ICVP during 20 to 22 December, 2023.

4. Dr. Rajeswari Shome, Principal Scientist, elected as National Academy Veterinary Science (NAVS) Governing Council Executive Member for the period 2024-2026.
5. Dr. S S Patil, Principal Scientist awarded fellow of National Academy Veterinary Science (NAVS), New Delhi, on 1 July 2023.
6. Dr. S S Patil, Principal Scientist has been admitted as Fellow of Indian Association of Veterinary Public Health Specialists (IAVPHS) at XIX Annual Conference of IAVPHS held at Veterinary College, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar, Haryana during 7-8 December, 2023.



7. Dr. V Balamurugan, Principal Scientist awarded Dr. Linghard Memorial Award for Diagnostic Application of the Recombinant Leptospira outer-membrane chimeric protein(s) in latex agglutination test for rapid detection of anti-leptospiral antibodies and Fellow of Indian Society for Veterinary Immunology and Biotechnology-2022 during 27-29 July 2023.



8. Dr. V Balamurugan, Principal Scientist was nominated as a member of the PPR-Global Research and Expertise Network (PPR-GREN) Bureau representing the South Asia.
9. Dr. V Balamurugan, Principal Scientist received two oral presentation awards in XXVII Annual Convention of Indian Society for Veterinary Immunology and Biotechnology and National Conference at Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir during 27-29 July, 2023.
10. Dr. V Balamurugan, Principal Scientist received 3rd prize in oral presentation award for the presentation in XVII Annual Convention of ISVIB and National Conference on: “Leveraging Emerging Biotechnologies for One Health” at Sri Venkateshwara Veterinary University, Tirupati during 12-14 December 2023.
11. Dr. S.S. Jacob, Scientist received 2nd and 3rd prize in oral presentation awards in XXXII National Congress of Veterinary Parasitology and National Symposium organized at Bihar Veterinary College, Patna during 29 November – 1 December 2023.



12. ICAR-NIVEDI Displayed Excellent Sportsmanship in ICAR South Zone Sports Tournament Sports contingent of ICAR-NIVEDI comprising 15 men and 3 women staff participated in ICAR Zonal Sports Meet (South Zone), during 13-16 December, 2023 organized by ICAR-IIHR, Bengaluru. In the event, ICAR-NIVEDI bagged a total of four medals (1 silver and 3 Bronze). Ms. Aaachal Palewar, Assistant Administrative Officer won one silver (200 M race), and two bronze (Long jump and 100 M race) whereas Mr. Muraleedharn P, Administrative Officer won Bronze in 400 M race.



Laboratory accreditation

The Livestock Disease Diagnosis Laboratory (LDDL) of ICAR-NIVEDI obtained NABL Accreditation (ISO/IEC 17025:2017) on 5 December 2023 in the field of testing with Scope of Accreditation for the diagnosis of PPR and Leptospirosis (Certificate No. TC-12705).



Animal Husbandry Commissioner inaugurated the PPR research laboratory



During launch programme of Action plan for Surveillance and Monitoring of PPR in India under PPR Eradication programme, LH & DCP Scheme, GoI on 8 February 2023 the Animal Husbandry Commissioner inaugurated the PPR research laboratory.

NIVEDI centre of IVRI-DU Bengaluru Educational Hub

A delegation from the ICAR-Indian Veterinary Research Institute (IVRI), Izatnagar visited NIVEDI on 7 August 2023 to foster collaboration and explore synergistic opportunities under the National Education Policy (NEP) 2020 framework. The following staff members has been assigned the overall coordination of the activities of the Educational hub.

IVRI deemed university education Bengaluru hub at NIVEDI
Dr. P P Sengupta Associate Coordinator
Dr. S S Patil Member, BOS (Veterinary Microbiology)
Dr. Z B Dubal Member, BOS (Veterinary Public Health and Epidemiology)

Superannuation/Transferred/Joining

- ✦ Dr. B.R. Shome, Principal Scientist, superannuated on 31 January 2023 after completion of a successful service of 31 years in ICAR. He served in many institutes like ICAR-CIARI, Port Blair, ICAR-RC-NEH, Barapani and finally ICAR-NIVEDI, Bengaluru. The NIVEDI family wishes him a very happy, healthy and peaceful retired life.



- ✦ Mr. A Vijaya Kumar, AF&AO relieved from this office on 31 May 2023(AN) upon promotion as F&AO to join at ICAR- IOPR, Pedavegi.
- ✦ Dr. Yogisharadhya. R, ACTO was relieved on lien to join the post of Associate Professor (Veterinary Microbiology), at College of Veterinary Science, Rampura Phul under GADVASU, Ludhiana on 18 October 2023.
- ✦ Dr. Yogisharadhya. R, joined for the post of Assistant Chief Technical Officer (ACTO) at ICAR-NIVEDI, Bengaluru on 01 December 2023.
- ✦ Mrs. Aachal Palewar, ICAR-IIHR joined as Assistant Administrative Officer on deputation / permanent absorption at ICAR-NIVEDI, Bengaluru on 21 September 2023.

Staff position as on 31 December 2023

Name of the Officers & Staff	Designation
Dr. Baldev Raj Gulati	Director
Scientific Staff	
Dr. (Mrs.) Rajeswari Shome	Principal Scientist
Dr. Divakar Hemadri	Principal Scientist
Dr. P. P. Sengupta	Principal Scientist
Dr. K. P. Suresh	Principal Scientist
Dr. V. Balamurugan	Principal Scientist
Dr. S. S. Patil	Principal Scientist
Dr. Sathish B Shivachandra	Principal Scientist
Dr. G. Govindaraj	Principal Scientist
Dr. Jagadish Hiremath	Senior Scientist
Dr. P. Krishnamoorthy	Senior Scientist
Dr. (Mrs.) R. Sridevi	Senior Scientist
Dr. Shivasharanappa. N	Senior Scientist
Dr. Md. Mudassar Chanda	Senior Scientist
Dr. G. B. Manjunatha Reddy	Senior Scientist
Dr. M. Nagalingam	Senior Scientist
Dr. Narayanan G	Senior Scientist
Dr. (Mrs.) Siju Susan Jacob	Scientist
Dr. Chethan Kumar H.B	Scientist
Dr. C. S. Sathish Gowda	Scientist
Technical Staff	
Dr. R Yogisharadhya	ACTO
Dr. Awadhesh Prajapati	ACTO
Administrative Staff	
Mr. P. Muraleedharan	AO
Mrs. Aachal Palewar	AAO
Mrs. Saranya A	PA
Mr. K. Vijayaraj	Stenographer Grade-D
Mrs. Sridevi G. C.	UDC
Mr. Hanumantharaju. B	LDC
Mr. Umesh H S	LDC
Mr. Umesh H. S.	LDC
Multi-Tasking Staff (MTS)	
Mr. M. K. Ramu	MTS

11

IRC, RAC and other Review Meetings

Research Advisory Committee Meeting



The 15th Research Advisory Committee (RAC) meeting of ICAR-NIVEDI was held on 17 March 2023.

RAC members of ICAR-NIVEDI
Dr. M P Yadav, Ex Vice-Chancellor, Sardar Vallabhbhai Patel Univ. of Agric. & Tech., Meerut
Dr. C. Madhan Mohan, Pr. Scientist, Vet. Biotechnology Division, IVRI
Dr. Rajendra Singh, Former Head, Division of Pathology, ICAR-IVRI
Dr. Mandeep Sharma, DGCN College of Veterinary and Animal Sciences, CSKAU, Palampur
Dr. S.C. Dubey, Former JD, HSADL, Bhopal
Dr. Lalith Achoth, Professor, KVAFSU
Dr. Ashok Kumar, ADG(AH), ICAR
Dr Dinesh N. Saralaya, Veterinary Doctor, Devamoole House, Ramakrishna Nagara, Dakshina Kannada District,-574240, Karnataka
Dr (Mrs) Duvvuru Yasaswini, 4-1/61/1, Behind Amaravathi, Near Amma Hospital, Sri Ram Nagar, Naidupeta SPSR, Nellore District-524126
Dr. B R Gulati, Director ICAR- NIVEDI
Dr. S.S. Patil, Principal Scientist, ICAR-NIVEDI

The meeting was inaugurated by the Chairman and Expert Members by lighting of the lamp and playing ICAR-song. In his opening remarks, Dr. M.P. Yadav, Chairman RAC emphasised the need of preparedness in view of emergence of new diseases such as LSD, ASF and monkey pox. He stressed upon the need to re-orient the research programs based on the need of stakeholders. The Chairman encouraged the scientists to work on the projects focussing on the problems of society and ultimately benefitting the livestock farmers.

Institute Research Committee Meeting

ICAR-NIVEDI conducted three IRC meetings viz., mid-term review (17 January 2023 and 16 October 2023) and 17th IRC meeting (18 May 2023) under the Chairmanship of Dr. Baldev R. Gulati, Director.



Dr. S.K. Rana, Consultant, World Bank and former Mission Director, NDLM, DAHD, GoI and Dr. Aniket Sanyal, Director, ICAR-NIHSAD also participated in the 17th IRC meeting as external experts. The committee's agenda encompassed a detailed review of the ongoing research projects, both Institute-funded and externally funded. The committee critically assessed the progress of these projects, offering valuable inputs to ensure their success and efficiency. Additionally, group in-charges presented their proposals, outlining the initiation of new group-centric projects. The meeting underscored the institute's commitment to advancing research, innovation, and collaboration in their domain.

Institute Technology Management Committee Meetings

ICAR-NIVEDI conducted three ITMC meetings on 7 March 2023, 31 May 2023 and 5 December 2023.

ITMC members of ICAR-NIVEDI
Dr. B R Gulati, Director and Chairman
Dr. M Nagalingam, Senior Scientist, Nodal Officer, ITMU and Member Secretary
Dr. B P Srinivasa, Principal Scientist, IPR expert IVRI, Bengaluru
Dr. Divakar Hemadri, Principal Scientist, Member
Dr. V Balamurugan, Principal Scientist, Member
Dr. K P Suresh, Principal Scientist, Member
Dr. G Govindaraj, Principal Scientist, Member

Committee recommended for commercialization of six technologies viz., Protein-G based indirect ELISA kit for Bovine Brucellosis, Indirect ELISA kit for Sheep and Goat Brucellosis, IBR Avidin Biotin ELISA (AB ELISA), Indirect ELISA for detection of CSFV in pigs (CSF Ag Check kit), Indirect ELISA assay for population survey of bluetongue, PPR Ab Chek kit (PPR Avidin-Biotin recombinant competitive ELISA (PPR ABrC-ELISA).

Institutional Animal Ethics Committee Meetings

ICAR- NIVEDI conducted 21st, 22nd, 23rd and 24th meetings of the Institutional Animals Ethics Committee (IAEC) on 19 January, 1st March, 20 September and 10 November 2023, respectively. During the meetings the project proposals requiring animal experiments were reviewed by the committee members.



Institutional Biosafety Committee (IBSC) Meeting

The 9th Institutional Biosafety Committee (IBSC) meeting of ICAR-NIVEDI was held on 16 February 2023. The committee reviewed and approved a total of 12 projects involving rDNA and/ or handling of biohazard material/agents.



Institute Management Committee Meeting

The 22nd Institute Management Committee (IMC) meeting of ICAR-NIVEDI, Bengaluru was held on 26 October 2023 under the chairmanship of Director, ICAR-NIVEDI. The meeting was attended by Dr. K.C. Veeranna, Vice Chancellor, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar and Dr. Nitin Virmani, Head, Division of Equine Health, ICAR-National Research Center on Equines as external members. The committee recommended to procure various equipment and also temporary conversion of Type-III and Type-IV Quarters as PG Students' Hostel facility.



Our IMC members
Dr. B R Gulati, Director, ICAR-NIVEDI, Chairman
Dr. Ashok Kumar, ADG (AH), ICAR, New Delhi, Member
Vice Chancellor, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, Karnataka, Ex-Officio Member
Director, Directorate of Animal Husbandry and Veterinary Services, Govt. of Karnataka, Bengaluru, Ex-Officio Member
Director, Directorate of Animal Husbandry, Govt. of Kerala, Thiruvananthapuram, Ex-Officio Member
Dr. Dinesh N. S., Belthangady Taluk, Dakshina Kannada District, Karnataka, Non-Official Member
Smt. Duvvuru Yasaswini, 4-1/61/1, Sri Ram Nagar, Naidupeta, SPSR, Nellore-524 126, Non-Official Member
Dr. Pallab Chaudhary, Joint Director, ICAR-IVRI, Bengaluru Campus, Hebbal, Bengaluru, Member
Dr. Nitin Virmani, HoD, Equine Health Unit, NRC Equine, Hisar, Haryana, Member
Dr. M. A. Ramakrishnan, Principal Scientist, ICAR-IVRI, Bengaluru Campus, Hebbal, Bengaluru, Member
Dr. Mamta Chauhan, Senior Scientist, Southern Regional Station, ICAR-NDRI, Adugodi, Bengaluru, Member
FAO, ICAR-NBAIR, Bengaluru, Member
Administrative Officer, ICAR-NIVEDI, Member Secretary

12

Distinguished Visitors



- ✦ Dr. Himanshu Pathak, Hon'ble Secretary, DARE and Director General, ICAR visited on 30 August 2023.
- ✦ Dr. Joykrushna Jena, Deputy Director General (AS & FS), ICAR visited on 28 November 2023
- ✦ Dr. Triveni Dutt, Director, ICAR-Indian Veterinary Research Institute, Izatnagar visited on 7 July 2023 & 30 August 2023
- ✦ Dr. K. C. Veeranna, Vice Chancellor, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar-585226, Karnataka visited on 26 October 2023
- ✦ Dr. Abhijit Mitra, Animal Husbandry Commissioner, Department of Animal Husbandry and Dairying (DAHD), visited on 8 February 2023.
- ✦ Dr Raghavendra Bhatta, Director, ICAR-NIANP, Bengaluru visited on 27 January, 2023
- ✦ Dr Aniket Sanyal, Director, ICAR-NIHSAD, Bhopal visited on 27 January, 2023

- ✦ Dr S.B. Barbuddhe, Director, ICAR- National Meat Research Institute, Hyderabad visited as part of Hands on Training on Laboratory Diagnosis of Brucellosis on 27 February 2023
- ✦ Dr. T K Datta, Director, ICAR-Central Institute for Research on Buffaloes (CIRB), Hisar visited on 9 August 2023.
- ✦ Dr S N Sushil Kumar, Director, ICAR- National Bureau of Agricultural Insect Resources, Bengaluru visited on 30 August 2023
- ✦ Dr Sanjay Kumar Singh, Director, ICAR-Indian Institute of Horticultural Research, Bengaluru visited on 30 August 2023
- ✦ Dr. Sindura Ganapathi, Visiting PSA Fellow, Office of the Principal Scientific Adviser to the Govt. of India visited on 13 January 2023
- ✦ Dr. Ashok Kumar, ADG (AH), ICAR Hqrs, New Delhi visited on 26 January 2023
- ✦ Dr R K Singh, President, Indian Virological Society & Project Director@OHSU@DAHD, Gol & Former Director/Vice Chancellor, ICAR-Indian Veterinary Research Institute (ICAR-IVRI), Izatnagar, Bareilly visited on 27 January, 2023
- ✦ Dr Pallab Chaudary, Joint Director, ICAR-IVRI, Bengaluru Campus visited on 27 January, 2023
- ✦ Dr. Sreenivasulu Kilari, Executive Director, Biovet Private Limited, Malur Taluk, Kolar Dist., Karnataka visited on 27 January, 2023
- ✦ Dr. Praveen Malik, Chief Executive Officer, Agrinnovate India Limited visited on 6 February 2023
- ✦ Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD, Gol visited on 8 February 2023
- ✦ Dr. Anirban Guha, Assistant Commissioner, DAHD, Gol, New Delhi visited on 8 February 2023
- ✦ Dr. Habibar Rahman, Regional Representative for South Asia, International Livestock Research Institute, New Delhi on 17 February 2023
- ✦ Dr Manjunath. S. Palegar, Director, Department of AH&VS, Govt. of Karnataka visited ICARNIVEDI as part of One day technical workshop on “Empowering women veterinarians for tackling emerging diseases” on 10 March 2023
- ✦ Dr. M.P. Yadav, Former Director, ICAR-IVRI, Izatnagar visited on 17 March 2023 (RAC Meeting)
- ✦ Dr. S.C. Dubey, Former Director, ICAR-NIHSAD, Bhopal visited on 17 March 2023 (RAC Meeting)
- ✦ Dr. Rajendra Singh, Former Head, Division of Vet Pathology, IVRI visited on 17 March 2023 (RAC Meeting)
- ✦ Dr. Lalith Achoth, Former Prof, Dairy Economics, KVAFSU visited on 17 March 2023 (RAC Meeting)
- ✦ Dr. Madan Mohan, Principal Scientist, Division of Biotechnology, IVRI visited on 17 March 2023 (RAC Meeting)

- ✦ Dr. Mandeep Sharma, Dean, DCGN COVS, CSKAU, Palampur visited on 17 March 2023 (RAC Meeting)
- ✦ Dr Sujit Nayak, Joint Commissioner, DAHD, Gol, New Delhi and his team interacted visited on 3 April 2023.
- ✦ Dr Agostinho Misquita, Director and his team, AHVS, Govt of Goa interacted with the Scientists of ICAR-NIVEDI, Bengaluru on 13 April 2023.
- ✦ Dr M.D. Venkatesh, Director, Institute of Animal Health and Veterinary Biologicals (IAH&VB), Bangalore visited as part of OHAI Annual Review Meeting during 22 to 23 May 2023
- ✦ Dr Rakesh Bhatnagar, Director, DIVACC Research Laboratories Private Limited, New Delhi visited as part of OHAI Annual Review Meeting during 22 to 23 May 2023
- ✦ Dr Vivek Kapur, Professor, Microbiology and Infectious Diseases, Penn State (PSU), USA, visited as part of OHAI Annual Review Meeting during 22 to 23 May 202
- ✦ Dr Shah Hossain, Regional Coordinator, CisGEN, Chennai, visited as part of OHAI Annual Review Meeting on 22 to 23 May 2023
- ✦ Dr Mohan Papanna, Assistant Research Professor of Global Health, Huck Institutes of the Life Sciences, Pennsylvania State University, USA, visited as part of OHAI Annual Review Meeting on 22 to 23 May 2023
- ✦ Dr. Himanshu Pathak, Secretary (DARE) and Director General (ICAR) visited on 30 August 2023
- ✦ Dr. V. Venkatasubramanian, Director, ICAR-ATARI, Zone-XI, Bengaluru visited on 30 August 2023
- ✦ Mr G P Sharma, Joint Secretary (Finance), ICAR, New Delhi visited on 30 August 2023
- ✦ Dr V B Patel, ADG (Fruits & Plantation Crops), ICAR, New Delhi visited on 30 August 2023
- ✦ Dr Pallab Chaudary, Joint Director, ICAR-IVRI, Bengaluru Campus visited on 30 August 2023, 9 October 2023 & 26 October 2023
- ✦ Dr. Nitin Virmani, HoD, Equine Health Unit, NRC Equine, Hisar, Haryana visited on 26 October 2023
- ✦ Dr. Shiv Prasad Kimothi, Member (AS and FS), Agricultural Scientist Recruitment Board (ASRB), New Delhi visited on 1 July 2023
- ✦ Dr. P.S. Mahesh, Joint Commissioner and Director, Centre of Excellence for Animal Husbandry, Bengaluru visited on 1 and 6 July 2023
- ✦ Dr. Manjunath S. Palegar, Director, Dept. of Animal Husbandry & Veterinary Services, Govt. of Karnataka visited on 6 July 2023
- ✦ Dr. Rachna Gulati, Head, Dept. of Aquaculture, College of Fisheries Science, College of Fisheries Science, CCS HAU visited on 15 August 2023
- ✦ Shri. Atul Kumar Gupta, Registrar, TDU, Yelahanka, Bengaluru visited on 13 October 2023

- ✦ Dr. A. P. Sugunan, Scientist G, (Retd.) ICMR-Regional Medical Research Centre, Port Blair & ICMR-NIE, Chennai visited on 13 October 2023
- ✦ Dr. J. Pampapathi, Managing Director, Karnataka Sheep and Wool Development Corporation Ltd., Bengaluru visited on 1 July 2023
- ✦ Dr. Ravindra Hegade, Director, IAH & VB, Bengaluru visited on 1 July 2023
- ✦ Dr. Gangaiah, M, General Manager, BAMUL, Bengaluru visited on 1 July 2023
- ✦ Dr. C. Somasekhara, IAS. (Retd.), Former Chairman, Karnataka Border Area Development Authority, Govt. of Karnataka
- ✦ Dr Jyoti Misri, National Consultant - AMR and Zoonoses Specialist, FAO, New Delhi visited on 21 September 2023
- ✦ Dr Acty George, Technical Officer, Epidemiology and Zoonoses, FAO, New Delhi visited on 21 September 2023 & 14 December 2023
- ✦ Felix Njeumi, FAO representative, Bryony Jones, WOAHA representative, Simon Kihu, WOAHA representative, Mark Rweyemamu, Expert PPR, Jeff Mariner, Tufts University, Zoe Campbell, ILRI, Charles Bodjo, AU-PANVAC, Cadhla Firth, Ecohealth Alliance, Abdelmalik Khalafalla, Abu Dhabi Agriculture and Food Safety Authority, Paula Irene Menzies, Prof. Emeritus, University of Gulph, Canada, visited during 30 November 2023.
- ✦ Dr. R.K. Singh, FAO-IN, New Delhi visited on 14 December 2023
- ✦ Mr. Rajesh Kumar, FAO-IN, New Delhi visited on 14 December 2023



ICAR-National Institute of Veterinary Epidemiology and Disease Informatics

Post Box No.6450, Ramagondanahalli, Yelahanka, Bengaluru-560064, Karnataka, India.

Ph: +91-80-23093110, 23093111, Fax: +91-80-23093222

Website: www.nivedi.res.in, Email: director.nivedi@icar.gov.in

