भाकृअनुप
ICAR

# ICAR-NIVEDI

*Transforming Animal Health*

भाकृअनुप-रापजसूविसं
ICAR-NIVEDI

# वार्षिक प्रतिवेदन Annual Report 2024


## भाकृअनुप-राष्ट्रीय पशुरोग जानपदिक एवं सूचना विज्ञान संस्थान

## ICAR-National Institute of Veterinary Epidemiology and Disease Informatics

# वार्षिक प्रतिवेदन

# 2024

# Annual Report

# 2024

**ICAR-National Institute of Veterinary Epidemiology and Disease Informatics**

Post Box No. 6450, Ramagondanahalli, Yelahanka, Bengaluru-560119, Karnataka, India
Ph: +91 80 23093100; 23093110; 23093111
Website: www.nivedi.res.in




## Citation:

Sengupta PP, Krishnamoorthy P, Narayanan G, Chethan Kumar HB (2025). ICAR-National Institute of Veterinary Epidemiology and Disease Informatics, Annual Report 2024. Pages vi+129

## Designed by :

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

### About the cover page :

**Front cover page :** Administrative cum Laboratory Building of ICAR-NIVEDI, Bengaluru

**Back cover page :** Dignitaries and staffs of ICAR-NIVEDI during Institute Foundation Day 2024

## Published by

The Director
ICAR-National Institute of Veterinary Epidemiology and Disease Informatics
Post Box No.6450, Ramagondanahalli, Yelahanka,Bengaluru - 560119, Karnataka.
Email:director.nivedi@icar.org.in Website:www.nivedi.res.in
Phone: 080-23093110, 23093111, 23093100

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

# TABLE OF CONTENTS

# Wrap-up of the "Ek Ped Ma Ke Naam" Campaign

# Director's Foreword

It is my privilege to present the Annual Report of ICAR-NIVEDI for the year 2024 reflecting the institute's continued leadership and significant scientific achievements in veterinary epidemiology, disease informatics and livestock health management. This year, ICAR-NIVEDI further strengthened national livestock disease surveillance, forecasting and diagnostics through focused R&D, collaborative partnerships and data-driven innovations.

A major institutional recognition was the designation of our *Peste des Petits Ruminants* (PPR) and Leptospirosis laboratories as World Organisation for Animal Health (WOAH) Reference Laboratories. Our scientists developed and validated several diagnostic kits for priority diseases such as Lumpy Skin Disease (LSD), PPR, Bluetongue, Capripox, Porcine Cysticercosis, Anthrax and Bovine Fasciolosis. Five diagnostic kits were certified by ICAR and two LSD kits were formally released by the Deputy Director General (Animal Science), ICAR.

Through the National Animal Disease Epidemiology Network (NADEN), real-time disease data from 35 centres were integrated into the AI- and ML-enabled NADRES v2.0 platform. This system generated monthly forecasts for 15 economically important livestock diseases, disseminated through over 2.1 crore SMS alerts and secure advisories across 14 states, enabling timely interventions. Disease hotspot mapping and spatial analyses provided valuable inputs for national policy and outbreak management.

Noteworthy research achievements included genomic characterization of multiple pathogens, validation of mRNA vaccine candidates for leptospirosis, development of allele-specific PCR for anthelmintic resistance and extensive studies on antimicrobial and acaricide resistance. Under One Health surveillance, integrated studies on anthrax, Japanese Encephalitis, leptospirosis and environmental contamination provided critical zoonotic risk assessments. Economic impact assessments of LSD and goat-based livelihood interventions further demonstrated NIVEDI's contribution to farmer-centric research.

The institute strengthened national capacity by organizing 21 training programs and signing MoUs with leading institutions, including Manipal Academy, GITAM University, NRC on Mithun, GBRC and NCBS. Research outputs were disseminated through high-quality publications, conferences and technology transfers.

I sincerely acknowledge the continued guidance and support of the Secretary, DARE & Director General, ICAR, Dr. M. L. Jat and former DG, Dr. Himanshu Pathak; the Deputy Director General (Animal Science), Dr. Raghavendra Bhatta; and the Assistant Director General (Animal Health), Dr. Divakar Hemadri. I also thank all NADEN Investigators, collaborating centers and my colleagues at ICAR-NIVEDI for their dedicated efforts.

I look forward to valuable feedback from stakeholders and the scientific community to further strengthen our collective mission in livestock disease surveillance and health management.

**(Baldev Raj Gulati)**

Kannada Rajyotsava Celebration at ICAR-NIVEDI, 2024

01

# Executive Summary

In 2024, ICAR-NIVEDI continued to lead national efforts in veterinary epidemiology, achieving major milestones in diagnostics, surveillance, research and capacity building. The institute's leptospirosis and PPR laboratories were designated as WOAH reference laboratories and postgraduate programs in veterinary public health and epidemiology veterinary microbiology commenced. A total of 49 research projects, including 12 new externally funded ones, addressed priority diseases such as brucellosis, tuberculosis, leptospirosis, trypanosomiasis, PPR, CSF, ASF and LSD, using advanced sero-surveillance, molecular diagnostics and genomic tools. Notable developments included validation of indigenous ELISAs, experimental mRNA vaccine studies, whole-genome sequencing of key pathogens and resistance mapping of antimicrobials and acaricides. Risk assessments and modelling through NADRES and other tools supported outbreak forecasting and One Health surveillance across agro-climatic zones. Economic impact studies on LSD and goat-based livelihood interventions demonstrated tangible benefits to farmers. The institute conducted 21 training programmes, signed five MoUs, published 71 research papers and launched certified diagnostic kits while generating ₹40.64 lakh revenue—underscoring its role as a national leader in livestock health research and innovation.

As the nation's premier institute dedicated to veterinary epidemiology, ICAR-NIVEDI continued to play a pivotal role in livestock disease surveillance, research and capacity building during 2024. Building upon its strong scientific mandate, the institute achieved several significant milestones. Notably, the leptospirosis and PPR laboratories were designated as World Reference Laboratories by the World Organisation for Animal Health (WOAH). As part of the Bengaluru hub of IVRI-Deemed University, ICAR-NIVEDI commenced postgraduate teaching and research programs in Veterinary Public Health and Epidemiology and Veterinary Microbiology, equipped with hostel facilities for students.

During the year, 12 new externally funded projects were initiated, bringing the total number of ongoing projects to 49. Under the NADCP for brucellosis, 20,364 bovine serum samples were screened for S19 vaccine antibodies, showing satisfactory seroconversion in Chhattisgarh (98.14%) and Tamil Nadu (88.64%). Additionally, 2.66% of 2,331 veterinary healthcare personnel tested positive for brucellosis, highlighting the need for sustained occupational surveillance. Subclinical mastitis screening of 977 milk samples around Bengaluru identified FaunaSCC as a cost-effective, user-friendly diagnostic tool. Antimicrobial resistance was studied using 279 environmental samples, revealing significant resistance to nalidixic acid, tetracycline, amikacin and cephalosporins. Among 157 cattle screened for tuberculosis, 62.82% tested positive via the Single Intradermal Test, 44.87% by CCT and 56.14% by IGRA, reinforcing the urgency for tailored bTB control strategies.

Significant advances were made in diagnostics and sero-surveillance. A recombinant 25 kDa flagellin protein of *Clostridium chauvoei* demonstrated high specificity, with no cross-reactivity to major bovine diseases. Heat extract-based ELISA tests revealed 51.4% seropositivity for HS in buffaloes from Andhra Pradesh, while *Leptospira* seroprevalence ranged from 4% in Andhra Pradesh to 13% in Odisha and 12% in mithun from Nagaland. Environmental sampling showed 96.2% of water samples positive for *Leptospira* by PCR. An experimental mRNA vaccine candidate against leptospirosis elicited promising immune responses in mice.

In parasitic disease surveillance, 2,026 bovine sera were screened for *Trypanosoma evansi*, with Punjab showing the highest seropositivity (65.29%), followed by Chhattisgarh (64.29%), Bihar (62.11%), Assam (54.29%) and Madhya Pradesh (49.68%). PCR analysis of 709 cattle blood samples detected high prevalence of *Theileria orientalis* (40.24%), followed by *Anaplasma sp.* (24.17%), *Babesia sp*. (6.68%), *T. annulata* (5%) and *T. evansi* (3.2%). Ticks from Karnataka revealed acaricide resistance, with 8.3% homozygous-resistant *R. microplus* and 34.7% were heterozygous resistant (RS).

In viral disease studies, 5,494 bovine serum samples from seven states showed 22.02% IBR seroprevalence, peaking at 73.25% in Manipur. The goatpox vaccine response against LSD was studied in 132 cattle, with peak humoral and cell-mediated responses recorded around 21 days post-vaccination. Molecular surveillance of MCF detected 26 ovine samples and one bovine sample positive.

Under ecological and zoonotic studies, climatic clusters for KFDV were identified one each in Karnataka and Maharashtra. In a forest fringe zoonotic surveillance project, 46.6% of 960 water samples tested positive for *Leptospira*. Additional findings included scrub typhus (15.83%) and *Leptospira* (10%) in 120 rodent and 240 urine samples.

Post-vaccination monitoring under NADCP for PPR showed overall 73.8% seroconversion in 1,209 small ruminants across 11 states, with 91.6% in Telangana and 57.8% in Madhya Pradesh. Separate screening of 3240 sheep and goats in northeastern states revealed 13.2% PPRV seroprevalence. A native PPR ELISA kit was validated with >90% sensitivity and specificity. Genome sequencing confirmed lineage IV PPRV in circulation, reinforcing its transboundary nature.

Comprehensive viral surveillance extended to Bluetongue virus (BTV), capripox, CCHF and GANV. Mixed BTV serotypes were identified, emphasizing the importance of whole-genome sequencing in monitoring viral evolution. A DIVA-compliant c-ELISA for Bluetongue and an ELISA for capripox detection were developed and validated. Capripox seropositivity was 24% in sheep and 19.12% in goats. Diagnostic recombinant antigens for CCHFV and GANV are under standardization.

In bacterial disease surveillance, *Mycoplasma*, *Pasteurella multocida* and *Clostridium perfringens* were targeted. PCR revealed 5.5% prevalence of *Mycoplasma* in 200 sheep and goats from Karnataka. Nine percent of 352 clinical samples were positive for *P. multocida*, with genetic diversity revealed through phylogenetic analysis. Whole genome sequencing of *P. multocida* strains uncovered multiple virulence factors. Screening for anti-quorum sensing activity identified promising strains such as NIVEDIPm9. Recombinant toxins of *Clostridium perfringens* and *Bacillus anthracis* were developed and found immunoreactive.

Environmental surveillance in Telangana slaughterhouses identified pathogens including *E. coli*, *S. aureus*, *Brucella spp.* and *Mycobacterium tuberculosis* complex. Antimicrobial resistance analysis of 230 sheep and environmental samples found multidrug-resistant ESBL *E. coli* in 27 isolates. Whole-genome sequencing identified CTX-M-type (blaCTX-M and blaTEM) genes.

Anthelmintic resistance in small ruminants was assessed in 120 strongyle larvae samples. Allele-specific PCR revealed 33.33% heterozygous resistance and 66.66% susceptible genotypes, emphasizing the need for region-specific resistance management.

Under NADCP-CSF, 32,074 pig serum samples from 23 states were tested during Round I and 13,049 samples from six states during Round II. Seropositivity improved post-vaccination. ASFV risk factors were identified and recombinant p22/p54 proteins were developed. Recombinant proteins of JEV and *Taenia solium* (GP50) were also produced, with the latter forming the basis of a validated ELISA (96.2% sensitivity; 98% specificity). Screening of 1,974 pig sera showed a 6.07% cysticercosis seroprevalence.

The NADRES platform was significantly strengthened with the integration of 341 district and 49 village outbreak reports. A total of 2.11 crore SMS alerts were disseminated to livestock owners via FRUITS and 75,641 secure real-time advisories to field veterinarians across 14 states via DLT-enabled systems. Risk maps and bulletins expanded the user base to 27.01 lakh. Disease modeling using kriging mapped NDVI, rainfall and THI impacts on key diseases like LSD, FMD, foot rot and blue tongue. Under NADCP, statistically robust sampling plans were developed for sero-monitoring of major diseases, including FMD, CSF, PPR and Brucellosis.

A Bayesian-MLE-based national sampling framework was designed for 14 zoonoses, generating disease prevalence data from 46,376 animals across 1,934 villages. Under OHAI, anthrax surveillance in 70 villages included socio-economic surveys of 552 farmers. In another study, Japanese Encephalitis dynamics across Karnataka and West Bengal were analyzed using genomic and spatial data, identifying mutation trends in Genotypes 1 and 3; identifying Raichur, Bellary, Haveri, Jalpaiguri, Birbhum and Bankura districts as pinpointed hotspots for JE infection.

An economic impact assessment of LSD at the farm level indicated mortality losses up to ₹89,997 per animal. A study on SC beneficiary upliftment through goat distribution showed a 27% increase in income, 76% adoption of improved housing and 69% health practices and 46% in nutrition management practices.

Over the year, ICAR-NIVEDI conducted several capacity-building initiatives with over 1,459 participants. NAAVIC independently or jointly organized 21 programs. MoUs were signed with five institutions, including Manipal Academy, GITAM University, NRC on Mithun, GBRC and NCBS. In 2024, NIVEDI scientists published 71 research articles, presented at 63 conferences, authored 21 book chapters and delivered invited lectures across national platforms. The scientists attended 52 training and workshops, both nationally and internationally to enhance their skills. Ten PG students conducted research under NIVEDI's mentorship. The staff earned 11 awards across disciplines, from sports to science.

Five diagnostic kits were certified by ICAR and two for LSD were released by DDG (AS). One copyright was granted and two applications were filed. The institute generated ₹40 lakh in revenue through the sale of 78 kits and cultures.

We gratefully acknowledge the guidance and support of the ICAR Headquarter, the Department of Animal Husbandry and Dairying (DAHD), Government of India and the State Animal Husbandry Departments, as well as the cooperation of collaborating institutions, field veterinarians and stakeholders across the country in achieving these milestones.

# 01

# कार्यकारी सारांश

वर्ष 2024 में, भाकृअनुप-निवेदी ने पशु महामारी विज्ञान के क्षेत्र में राष्ट्रीय प्रयासों का नेतृत्व करते हुए निदान, निगरानी, अनुसंधान और क्षमता-विकास में उल्लेखनीय उपलब्धियाँ हासिल कीं। संस्थान की लेप्टोस्पायरोसिस और पीपीआर प्रयोगशालाओं को विश्व पशु स्वास्थ्य संगठन द्वारा डब्ल्यू.ओ.ए.एच. संदर्भ प्रयोगशाला के रूप में मान्यता प्राप्त हुई । निवेदी ने पशुजन्य सार्वजनिक स्वास्थ्य एवं सूक्ष्मजैविकी में स्नातकोत्तर शिक्षण कार्यक्रम आरंभ किए गए। कुल 49 अनुसंधान परियोजनाओं (जिनमें 12 नई बाह्य-आर्थिक सहायता प्राप्त परियोजनाएँ शामिल थीं) ने ब्रुसेलोसिस, तपेदिक, लेप्टोस्पायरोसिस, ट्रिपैनोसोमियासिस, पीपीआर, सीएसएफ, एएसएफ और एलएसडी जैसे प्रमुख रोगों पर ध्यान केंद्रित किया, जिनमें उन्नत सीरो-निगरानी, आणविक निदान तथा जीनोमिक उपकरणों का प्रयोग किया गया। प्रमुख उपलब्धियों में स्वदेशी ELISA परीक्षणों का सत्यापन, mRNA वैक्सीन पर प्रायोगिक अध्ययन, प्रमुख रोगजनकों का सम्पूर्ण जीनोम अनुक्रमण तथा एंटीमाइक्रोबियल और कृमिनाशक रेसिस्टेंस का मानचित्रण शामिल है। NADRES एवं अन्य विधियों द्वारा पशु रोग जोखिम मूल्यांकन और मॉडलिंग के माध्यम से जलवायु क्षेत्रों में रोग प्रकोपों की पूर्वसूचना एवं 'वन हेल्थ' निगरानी को बल मिला। लंपी स्किन रोग का आर्थिक प्रभाव विश्लेषण और बकरी-आधारित आजीविका उपायों ने किसानों को प्रत्यक्ष लाभ दर्शाए। इस अवधि के दौरान, संस्थान ने ₹40.64 लाख का राजस्व अर्जित किया , 21 प्रशिक्षण कार्यक्रम आयोजित किए, पाँच एमओयू पर हस्ताक्षर किए, 71 शोध लेख प्रकाशित किए तथा पांच निदान किटों को भाकृअनुप द्वारा प्रमाणित किया गया — जो पशु स्वास्थ्य अनुसंधान एवं नवाचार में इसकी राष्ट्रीय अग्रणी भूमिका को रेखांकित करता है।

पशु महामारी विज्ञान हेतु समर्पित देश के प्रमुख संस्थान के रूप में, भाकृअनुप-निवेदी ने वर्ष 2024 के दौरान पशु रोगों की निगरानी, अनुसंधान तथा क्षमता-विकास में अपनी महत्वपूर्ण भूमिका को जारी रखा। अपने सशक्त वैज्ञानिक अधिदेश के अनुरूप, संस्थान ने कई उल्लेखनीय उपलब्धियाँ हासिल कीं। विशेष रूप से, लेप्टोस्पायरोसिस एवं पीपीआर प्रयोगशालाओं को विश्व पशु स्वास्थ्य संगठन (WOAH) द्वारा विश्व संदर्भ प्रयोगशाला के रूप में नामित किया गया। बेंगलुरु स्थित IVRI-डीम्ड विश्वविद्यालय के हब के अंतर्गत, भाकृअनुप-निवेदी ने पशुजन्य सार्वजनिक स्वास्थ्य एवं महामारी विज्ञान और पशु सूक्ष्मजैविकी में स्नातकोत्तर शिक्षण एवं अनुसंधान कार्यक्रम आरंभ किए।

वर्ष के दौरान 12 नई बाह्य वित्तपोषित परियोजनाएँ प्रारंभ की गईं, जिससे कुल संचालित परियोजनाओं की संख्या 49 हो गई। ब्रुसेलोसिस के लिए राष्ट्रीय पशुरोग नियंत्रण कार्यक्रम (NADCP) के अंतर्गत 20,364 गो-वंश सीरम नमूनों की S19 वैक्सीन एंटीबॉडी के लिए जांच की गई, जिसमें छत्तीसगढ़ (98.14%) और तमिलनाडु (88.64%) में संतोषजनक सिरोकन्वर्जन देखा गया। इसके अतिरिक्त, 2,331 पशु स्वास्थ्य कर्मियों में से 2.66% ब्रुसेलोसिस पॉजिटिव पाए गए, जो व्यावसायिक जोखिम की सतत निगरानी की आवश्यकता को दर्शाता है। बेंगलुरु क्षेत्र में लिए गए 977 दूध नमूनों में उप-नैदानिक थनैला की जांच के लिए FaunaSCC को एक किफायती और उपयोगकर्ता अनुकूल निदान उपकरण के रूप में पहचाना गया। एंटीमाइक्रोबियल रेसिस्टेंस के लिए 279 पर्यावरणीय नमूनों के विश्लेषण से नालिडिक्सिक एसिड, टेट्रासाइक्लिन, एमिकासिन और सेफालोस्पोरिन्स के प्रति महत्वपूर्ण प्रतिरोध पाया गया। तपेदिक के लिए गोवा राज्य से जांचे गए 157 गो-वंश पशुओं में, 62.82% सिंगल इंट्राडर्मल टेस्ट, 44.87% CCT और 56.14% IGRA द्वारा पॉजिटिव पाए गए, जो कि बोवाइन टीबी (bTB) नियंत्रण हेतु लक्षित रणनीतियों की तत्काल आवश्यकता को रेखांकित करता है।

निदान और सीरो-निगरानी के क्षेत्र में महत्वपूर्ण प्रगति हुई। क्लॉस्ट्रिडियम शावोवाई का रिकॉम्बिनेंट 25 किलोडाल्टन फ्लैजेलिन प्रोटीन उच्च विशिष्टता दर्शाता है, जिसमें प्रमुख गो-वंश रोगों के प्रति कोई क्रॉस-प्रतिक्रिया नहीं पाई गई। हीट एक्सट्रैक्ट-आधारित ELISA परीक्षणों में आंध्र प्रदेश के भैंसों में हैमोरजिक सेप्टीसीमिया (HS) के लिए 51.4% सिरोपॉजिटिविटी देखी गई, जबकि लेप्टोस्पायरोसिस की सिरोप्रचलन दर आंध्र प्रदेश में 4% से लेकर ओडिशा में 13% और नागालैंड के मिथुन में 12% तक पाई गई। पर्यावरणीय नमूनों में पीसीआर द्वारा किए गए परीक्षण में 96.2% जल नमूने लेप्टोस्पाइरा पॉजिटिव पाए गए। लेप्टोस्पायरोसिस के विरुद्ध एक प्रायोगिक mRNA वैक्सीन ने चूहों में आशाजनक प्रतिरक्षा प्रतिक्रिया उत्पन्न की।

परजीवी रोग निगरानी के अंतर्गत, 2,026 गो-वंश सीरम नमूनों की ट्रिपैनोसोमा ईवांसी के लिए जांच की गई, जिसमें पंजाब में सर्वाधिक सिरोपॉजिटिविटी (65.29%) देखी गई, इसके बाद छत्तीसगढ़ (64.29%), बिहार (62.11%), असम (54.29%) और मध्य प्रदेश (49.68%) का स्थान रहा। 709 गो-वंश रक्त नमूनों के पीसीआर

विश्लेषण में थीलेरिया ओरिएंटालिस की उच्च संक्रमण दर (40.24%) पाई गई, इसके पश्चात एनाप्लाज्मा प्रजाति (24.17%), बेबेसिया प्रजाति (6.68%), थीलेरिया एन्नुलेटा (5%) और ट्रिपैनोसोमा ईवांसी (3.2%) पाई गईं। कर्नाटक से संग्रहित किलनियों (टिक) में ऐकेरिसाइड प्रतिरोध देखा गया, जिसमें 8.3% *Rhipicephalus microplus* नमूने होमोजाइगस-प्रतिरोधी और 34.7% हेटेरोजाइगस-प्रतिरोधी (RS) पाए गए।

वायरल रोगों के अध्ययन के अंतर्गत, सात राज्यों से एकत्र किए गए 5,494 गो-वंश सीरम नमूनों में 22.02% संक्रामक बोवाइन राइनोट्रैकाइटिस (IBR) सिरोप्रचलन देखा गया, जिसमें मणिपुर में सर्वाधिक 73.25% की दर दर्ज की गई। एलएसडी (लंपी स्किन डिज़ीज़) के विरुद्ध गोटपॉक्स वैक्सीन की प्रतिक्रिया का अध्ययन 132 गो-वंश पशुओं में किया गया, जिसमें टीकाकरण के लगभग 21 दिन बाद उच्चतम ह्यूमरल एवं कोशिकाजन्य प्रतिरक्षा प्रतिक्रिया दर्ज की गई। मैलिग्नेंट कैटारल फीवर (MCF) की आणविक निगरानी में 26 भेड़ और एक गो-वंश नमूना पॉजिटिव पाया गया।

पारिस्थितिकीय और जूनोटिक अध्ययनों के अंतर्गत, कायसानुर वन रोग वायरस (केएफडीवी) के लिए क्लस्टर की पहचान कर्नाटक और महाराष्ट्र में एक-एक स्थान पर की गई। वन सीमावर्ती क्षेत्रों में जूनोटिक निगरानी परियोजना के तहत 960 जल नमूनों में से 46.6% लेप्टोस्पाइरा पॉजिटिव पाए गए। अतिरिक्त निष्कर्षों में 120 कृंतक और 240 मूत्र नमूनों में क्रमशः 15.83% स्क्रब टाइफस और 10% लेप्टोस्पाइरा की उपस्थिति दर्ज की गई।

पीपीआर के लिए पशु स्वास्थ्य एवं रोग नियंत्रण कार्यक्रम (LH&DCP) के अंतर्गत टीकाकरण उपरांत निगरानी में 11 राज्यों के 1,209 भेड़ और बकरी में कुल मिलाकर 73.8% सिरोकन्वर्जन पाया गया, जिसमें तेलंगाना में 91.6% और मध्य प्रदेश में 57.8% सिरोकन्वर्जन दर्ज किया गया। पूर्वोत्तर राज्यों में 3,240 भेड़-बकरी के पृथक परीक्षण में पीपीआरवी के लिए 13.2% सिरोप्रचलन पाया गया। एक स्वदेशी पीपीआर ELISA किट को 90% से अधिक संवेदनशीलता और विशिष्टता के साथ सत्यापित किया गया। जीनोम अनुक्रमण से पीपीआरवी की वंश-IV की उपस्थिति की पुष्टि हुई, जो इसके सीमा-पार प्रसार को इंगित करती है।

वायरल रोगों की समग्र निगरानी को ब्लूटंग वायरस (BTV), कैप्रिपॉक्स, सीसीएचएफ (क्राइमियन कांगो हेमोराजिक फीवर), और गंजाम वायरस तक विस्तारित किया गया। मिश्रित BTV सिरोटाइप्स की पहचान हुई, जिससे वायरल विकास की निगरानी में सम्पूर्ण जीनोम अनुक्रमण की महत्ता उजागर हुई। ब्लूटंग के लिए DIVA-संगत c-ELISA तथा कैप्रिपॉक्स की पहचान हेतु ELISA परीक्षण विकसित कर सत्यापित किए गए। भेड़ों में कैप्रिपॉक्स सिरोपॉजिटिविटी 24% और बकरियों में 19.12% पाई गई। CCHFV और गंजाम वायरस के लिए निदान हेतु पुनः संयोजित एंटीजन का मानकीकरण जारी है।

बैक्टीरियल रोग निगरानी के अंतर्गत मायकोप्लाज़्मा, पाश्चुरेला मल्टोसिडा और क्लॉस्ट्रिडियम परफ्रिंजेंस को लक्षित किया गया। कर्नाटक के 200 भेड़-बकरी नमूनों में पीसीआर द्वारा मायकोप्लाज़्मा की 5.5% संक्रमण दर पाई गई। 352 नैदानिक नमूनों में से 9% पाश्चुरेला मल्टोसिडा के लिए पॉजिटिव पाए गए, जिनमें वंशवृक्षीय विश्लेषण के माध्यम से आनुवंशिक विविधता स्पष्ट हुई। पाश्चुरेला मल्टोसिडा के जीनोम अनुक्रमण में कई विषाणुता कारकों (Virulence Factors) की पहचान की गई। एंटी-क्वोरम सेंसिंग गतिविधि के लिए की गई जांच में NIVEDIPm9 जैसे संभावनाशील स्ट्रेनों की पहचान हुई। क्लॉस्ट्रिडियम परफ्रिंजेंस और बैसिलस एंथ्रैसिस के पुनः संयोजित टॉक्सिन विकसित किए गए और ये प्रतिरक्षी प्रतिक्रियाशील पाए गए।

तेलंगाना के पशु वधशालाओं में में की गई पर्यावरणीय निगरानी में *E. coli*, *S. aureus*, *Brucella* spp., और *Mycobacterium tuberculosis* कॉम्प्लेक्स जैसे रोगजनकों की पहचान हुई। 230 भेड़ों और पर्यावरणीय नमूनों के प्रतिजैविक प्रतिरोध विश्लेषण में 27 आइसोलेट्स में मल्टी-ड्रग रेसिस्टेंट ESBL *E. coli* की उपस्थिति दर्ज की गई। संपूर्ण जीनोम अनुक्रमण से CTX-M प्रकार (*blaCTX-M* और *blaTEM*) जीन की पहचान हुई।

लघु जुगाली पशुओं में कृमिनाशक प्रतिरोध का मूल्यांकन 120 स्ट्रॉन्जाइल लार्वा नमूनों पर किया गया। एलील-विशिष्ट पीसीआर द्वारा 33.33% विषमयुग्मज प्रतिरोधी और 66.66% संवेदी (susceptible) जीनोटाइप पाए गए, जो क्षेत्र-विशिष्ट प्रतिरोध प्रबंधन की आवश्यकता को दर्शाते हैं।

पशु स्वास्थ्य एवं रोग नियंत्रण कार्यक्रम (LH&DCP) के अंतर्गत, राउंड-I में 23 राज्यों से 32,074 सूअर सीरम नमूनों की जांच क्लासिकल स्वाइन फीवर के लिए की गई, जबकि राउंड-II में छह राज्यों से 13,049 नमूनों की जांच की गई। टीकाकरण के पश्चात सिरोपॉजिटिविटी में सुधार देखा गया। अफ्रीकन स्वाइन फीवर वायरस के जोखिम कारकों की पहचान की गई और पुनः संयोजित p22/p54 प्रोटीन विकसित किए गए। जापानी इंसेफेलाइटिस वायरस (JEV) और *टीनिया सोलियम* (GP50) के पुनः संयोजित प्रोटीन भी उत्पादित किए गए, जिनमें से *टीनिया सोलियम* आधारित ELISA को 96.2% संवेदनशीलता और 98% विशिष्टता के साथ प्रमाणित किया गया। 1,974 सूअर सीरम नमूनों की जांच में 6.07% सिस्टिसरकोसिस सिरोप्रचलन पाया गया।

राष्ट्रीय पशुरोग संदर्भ विशेषज्ञ प्रणाली (NADRES) को 341 जिलों और 49 गांवों की प्रकोप रिपोर्टों के एकीकरण के साथ उल्लेखनीय रूप से सुदृढ़ किया गया। कुल 2.11 करोड़ एसएमएस अलर्ट FRUITS प्लेटफॉर्म के माध्यम से पशुपालकों को प्रेषित किए गए, तथा 14 राज्यों में 75,641 सुरक्षित रियल-टाइम सलाहें DLT-सक्षम प्रणाली के माध्यम से क्षेत्रीय पशु चिकित्सकों को भेजी गईं। जोखिम मानचित्रों और बुलेटिनों के माध्यम से निवेदी वेबसाइट उपयोगकर्ताओं की संख्या 27.01 लाख तक पहुंची। क्रिगिंग पद्धति से किए गए रोग मॉडलिंग में NDVI, वर्षा एवं THI जैसे कारकों का लंपी स्किन डिज़ीज़, मुख एवं खुर रोग, फुट रॉट एवं ब्लूटंग जैसे प्रमुख रोगों पर प्रभाव को दर्शाया गया। LH&DCP के अंतर्गत मुख एवं खुर रोग, क्लासिकल स्वाइन फीवर, पीपीआर और ब्रुसेलोसिस जैसे प्रमुख रोगों की सीरो-निगरानी हेतु सांख्यिकीय दृष्टि से मजबूत सैंपलिंग योजनाएं तैयार की गईं।

14 जूनोटिक रोगों के लिए बायेशियन-MLE आधारित एक राष्ट्रीय सैंपलिंग फ्रेमवर्क तैयार किया गया, जिसके तहत 1,934 गांवों से 46,376 पशुओं से प्राप्त आंकड़ों से रोग प्रचलन डेटा तैयार किया गया। वन-हेल्थ एंथ्रेक्स परियोजना के अंतर्गत, 70 गांवों में एंथ्रेक्स निगरानी की गई जिसमें 552 किसानों का सामाजिक-आर्थिक सर्वेक्षण भी शामिल था। एक अन्य अध्ययन में कर्नाटक और पश्चिम बंगाल में जापानी एन्सेफलाइटिस के जीनोमिक और स्थानिक आंकड़ों के आधार पर संक्रमण गतिकी का विश्लेषण किया गया, जिसमें जेई वायरस के जीनोटाइप 1 और 3 में उत्परिवर्तन की प्रवृत्तियों की पहचान की गई तथा रायचूर, बेल्लारी, हावेरी, जलपाईगुड़ी, बीरभूम और बांकुरा जिलों को जेई संक्रमण के हॉटस्पॉट के रूप में चिह्नित किया गया।

फार्म स्तर पर लंपी स्किन डिज़ीज़ के आर्थिक प्रभाव के मूल्यांकन में प्रति पशु ₹89,997 तक की मृत्युजन्य हानि का संकेत मिला। अनुसूचित जाति लाभार्थियों के सशक्तिकरण पर की गई एक बकरी वितरण आधारित अध्ययन में 27% आय वृद्धि, 76% लाभार्थियों में उन्नत आवास को अपनाना, 69% में स्वास्थ्य संबंधी प्रथाओं को अपनाना और 46% में पोषण प्रबंधन प्रथाओं को अपनाना दर्ज किया गया।

वर्ष भर में, भाकृअनुप-निवेदी ने क्षमता-विकास से जुड़ी कई पहलों का आयोजन किया, जिसमें 1,459 से अधिक प्रतिभागियों ने भाग लिया। NAAVIC (निवेदी का कृषि-व्यवसाय प्रवर्तक केंद्र) ने स्वतंत्र रूप से या संयुक्त रूप से कुल 21 कार्यक्रम आयोजित किए। मणिपाल एकेडमी, GITAM विश्वविद्यालय, राष्ट्रीय मिथुन अनुसंधान केंद्र, गुजरात जैवप्रौद्योगिकी अनुसंधान केन्द्र और राष्ट्रीय जीवविज्ञान केन्द्र (NCBS), बैंगलोर सहित पाँच संस्थानों के साथ समझौता ज्ञापन पर हस्ताक्षर किए गए। वर्ष 2024 में, निवेदी के वैज्ञानिकों ने 71 शोध लेख प्रकाशित किए, 63 सम्मेलनों में प्रस्तुतियाँ दीं, 21 पुस्तक अध्यायों का लेखन किया और विभिन्न राष्ट्रीय मंचों पर आमंत्रित व्याख्यान दिए। वैज्ञानिकों ने अपने कौशल संवर्द्धन हेतु देश और विदेश में 52 प्रशिक्षण कार्यक्रमों और कार्यशालाओं में भाग लिया। दस स्नातकोत्तर छात्रों ने निवेदी के मार्गदर्शन में अनुसंधान किया। संस्थान के कार्मिकों ने खेल से लेकर विज्ञान तक विभिन्न विषयों में कुल 11 पुरस्कार प्राप्त किए।

भाकृअनुप द्वारा निवेदी की पाँच निदान किटों को प्रमाणित किया गया, तथा लंपी स्किन डिज़ीज़ के लिए दो किटों का विमोचन उप महानिदेशक (पशु विज्ञान) द्वारा किया गया। एक कॉपीराइट स्वीकृत हुआ तथा दो आवेदन दायर किए गए। संस्थान ने 78 किटों और कल्चर की बिक्री के माध्यम से ₹40 लाख का राजस्व अर्जित किया।

हम भारतीय कृषि अनुसंधान परिषद मुख्यालय, भारत सरकार के पशुपालन और डेयरी विभाग, तथा सभी राज्य पशुपालन विभागों के मार्गदर्शन और सहयोग के लिए हार्दिक आभार व्यक्त करते हैं। साथ ही, हम सहयोगी संस्थानों, क्षेत्रीय पशु चिकित्सकों और देशभर के हितधारकों के योगदान की भी सराहना करते हैं, जिनके सहयोग से ये उपलब्धियाँ संभव हो सकीं।

# 02

# Introduction

The ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI), formerly known as the Project Directorate on Animal Disease Monitoring and Surveillance (PD-ADMAS), functions under the Indian Council of Agricultural Research (ICAR), Department of Agricultural Research and Education, Ministry of Agriculture and Farmers Welfare, Government of India. As a pioneering institute in the country, ICAR-NIVEDI is mandated to conduct research and development in veterinary epidemiology and disease informatics, with a focus on disease surveillance, monitoring, outbreak investigations and impact analysis of livestock diseases through a network of collaborative centers across various states. The Institute has a long successful history of delivering predicted informatics and epidemiological solutions for various animal diseases.

Established in Karnataka, the Institute began its journey in 1987 as the All India Coordinated Research Project (AICRP) on Animal Disease Monitoring and Surveillance, which was elevated to the status of Project Directorate (PD-ADMAS) in 2000 and subsequently re-designated as ICAR-NIVEDI in 2013. The coordinating network expanded from 4 centers in 1987 to 31 centers under AICRP-ADMAS by 2021 and since April 2021, has been reorganized as the National Animal Disease Epidemiology Network (NADEN), currently comprising 35 centers. The Institute houses a state-of-the-art Bio-safety Level 2 (BSL-2) laboratory, operating in accordance with national guidelines on laboratory biosafety and biosecurity, supporting advanced research in livestock disease epidemiology.

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

**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 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, ten applications have been registered. The scientists of the institute have published more than 390 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.

The Institute has national and international funded with various organizations and stakeholders, including DBT, ICMR, NCDC, NIE, NIMHANS, CDC, FAO, WHO, WOAH, ILRI, BBSRC, MRC-UK, UKCEH, DTRA, BMGF etc., for collaborative research, laboratory capacity building and human resource development. The institute has conducted more than 90 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 center has provided need based 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. Furthermore, MoUs were signed with five institutions, including Manipal Academy, GITAM University, NRC on Mithun, GBRC and NCBS.

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.

NIVEDI's active participation in the National Digital Livestock Mission (NDLM) of DAHD, Government of India and collaboration with other organizations focuses on disease modelling, surveillance, monitoring, forewarning, development of need-based diagnostics and population surveillance assay kits for field diagnosis. The Institute also undertakes capacity building, integrated One Health surveillance, outbreak investigations, forecasting of zoonoses and strengthening One Health support units. Estimation of economic losses from major livestock diseases, public health impacts, the economic burden of zoonotic infections and the influence of climate change on disease emergence and pathogen evolution through advanced modelling remain niche research areas for NIVEDI.

The future priority areas for ICAR-NIVEDI include strengthening the existing disease forecasting system by developing quality databases using village- and block-level livestock disease data, along with climatic and non-climatic risk factors. The Institute aims to advance research in animal disease simulation modelling for improved forecasting accuracy, model precision, validation and comprehensive risk assessment of endemic, emerging and re-emerging diseases. Development of risk maps will further enable optimal resource utilization and better disease management.

## Infrastructure Facilities

ICAR-NIVEDI houses state-of-the-art research infrastructure to support advanced veterinary epidemiology, disease surveillance and diagnostics. The institute's unique Biosafety Level 2++ containment laboratory is among the few high-containment facilities in the country, enabling safe handling and investigation of high-risk pathogens. Notably, two laboratories—Peste des Petits Ruminants (PPR) and Leptospirosis—have been designated as World Organisation for Animal Health (WOAH) Reference Laboratories, underscoring NIVEDI's global standing in livestock disease research.

The institute maintains a well-equipped Spatial Epidemiology and GIS Laboratory, Disease

Informatics Laboratory and a dedicated Disease Investigation Laboratory. A fully functional training hall with modern audio-visual facilities supports national capacity-building programs, along with a committee room for regular scientific meetings and a dedicated farmers' hostel to accommodate trainees during training programs. As a major national resource, NIVEDI hosts the National Livestock Serum Repository (NLSR), which currently holds over one lakh serum samples from various livestock species across multiple states and Union Territories, serving as a valuable archive for retrospective disease analysis and assay development.

To support its research ecosystem, the institute has established a 1000 Mbps high-speed Wi-Fi campus ensuring robust IT connectivity. In addition, recreational facilities such as table tennis and carrom boards have been created for staff and students. As part of its eco-friendly initiatives, in addition to planting over 1,200 fruit trees (mango, jackfruit, avocado), more than 2,000 forest tree saplings were planted during the year under the "Plant4Mother" campaign to enhance the green cover of the campus. Recreational facilities such as table tennis and carrom are also available for staff and students.

### FOCUS

- Improving disease monitoring and surveillance through the development of population assays and pen-side diagnostics
- Risk assessment 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.
- Promoting innovations and improving human resource capacity
- Fostering linkages and collaborations with public and private, national and international organizations

### 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.

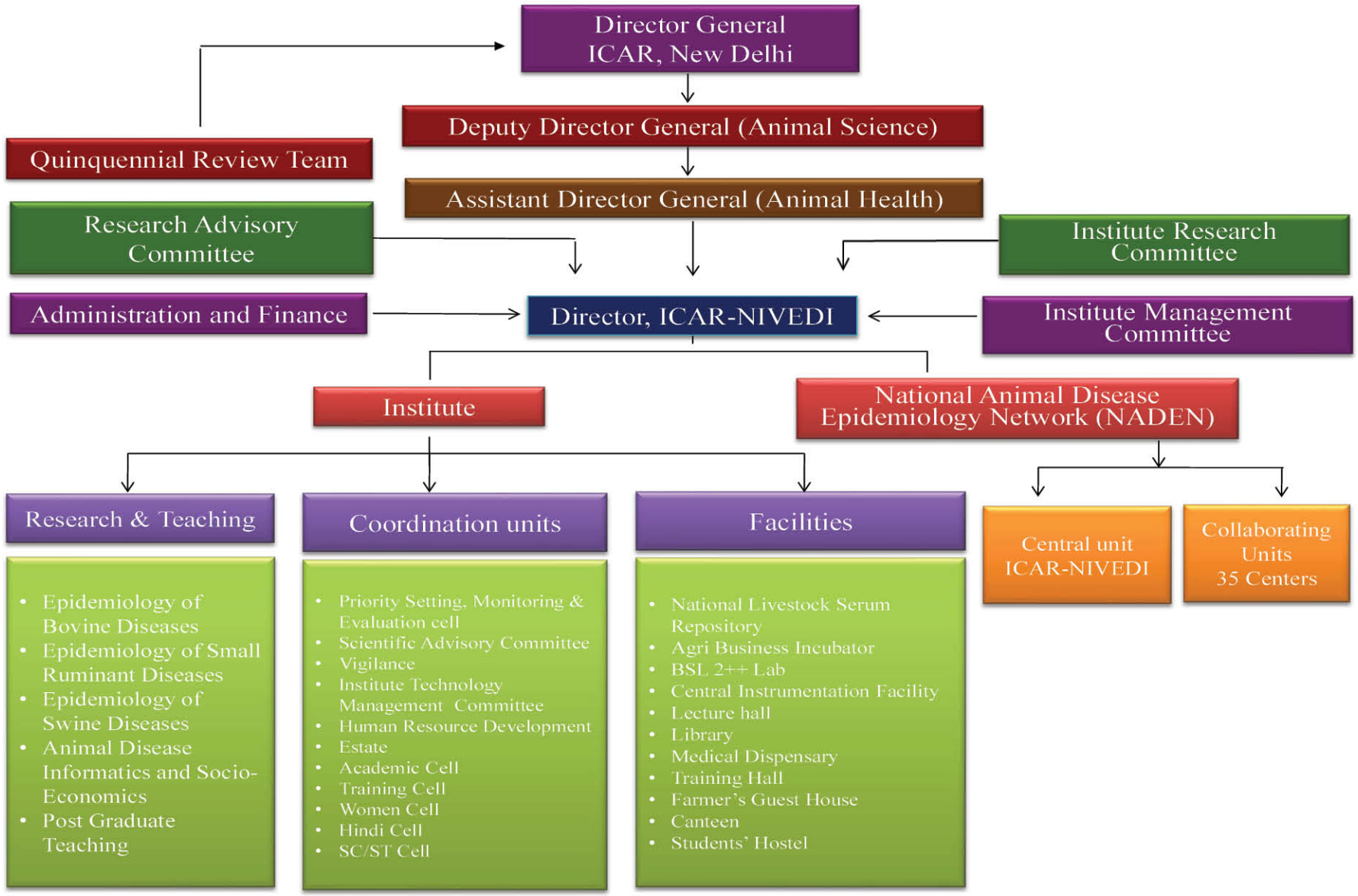
## National Animal Disease Epidemiology Network (NADEN)

The National Animal Disease Epidemiology Network (NADEN) was established in 2021-22 after the closure of the AICRP on Animal Disease Monitoring and Surveillance (ADMAS). Coordinated by ICAR-NIVEDI, NADEN operates as a nationwide network of 35 centres across all states and Union Territories, including Regional Disease Diagnostic Laboratories (RDDLs), Animal Quarantine and Certification Services (AQCS) and additional centres from Ladakh, Uttar Pradesh and Rajasthan. The network plays a central role in strengthening livestock disease surveillance and epidemiology to support timely, evidence-based disease control programs.

By systematically collecting and integrating livestock disease data from all states, NADEN has enabled the development of AI and ML-powered forecasting tools i.e. National Animal Disease Referral Expert System (NADRES v2.0). This platform generates monthly risk forecasts for 15 prioritized livestock diseases, facilitating early warnings and targeted interventions. Through outbreak investigations, sero-surveillance, risk mapping, pathogen monitoring and assessment of economic losses, NADEN continues to provide critical scientific inputs for national policy decisions, enhancing livestock health management and supporting farmer livelihoods across the country.

# Annual Review Meeting of NADEN, 2024

# Organogram


Director General
ICAR, New Delhi
Deputy Director General (Animal Science)
Assistant Director General (Animal Health)
Quinquennial Review Team
Research Advisory Committee
Institute Research Committee
Administration and Finance
Director, ICAR-NIVEDI
Institute Management Committee
Institute
National Animal Disease Epidemiology Network (NADEN)
Research & Teaching
Coordination units
Facilities
Central unit ICAR-NIVEDI
Collaborating Units 35 Centers
• Epidemiology of Bovine Diseases
• Epidemiology of Small Ruminant Diseases
• Epidemiology of Swine Diseases
• Animal Disease Informatics and Socio-Economics
• Post Graduate Teaching
• Priority Setting, Monitoring & Evaluation cell
• Scientific Advisory Committee
• Vigilance
• Institute Technology Management Committee
• Human Resource Development
• Estate
• Academic Cell
• Training Cell
• Women Cell
• Hindi Cell
• SC/ST Cell
• National Livestock Serum Repository
• Agri Business Incubator
• BSL 2++ Lab
• Central Instrumentation Facility
• Lecture hall
• Library
• Medical Dispensary
• Training Hall
• Farmer's Guest House
• Canteen
• Students' Hostel

## 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

# LANDMARK ACHIEVEMENTS

## 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
- Patent granted for:
  - Indirect ELISA kit for sero-diagnosis of brucellosis in livestock and humans on 20 April 2020
  - Diagnosis of human brucellosis by IgG and IgM based combo lateral flow assay on 30 December 2020

## 2021-2024

- Patent granted for:
  - Recombinant VSG and monoclonal antibody based competitive inhibition enzyme linked immunosorbent assay for the detection of antibodies against *Trypanosoma evansi* on 18 March 2021
  - Monoclonal Antibody based double antibody sandwich ELISA for the detection of *Trypanosoma evansi* antigen in animals on 21 June 2021
  - Recombinant non-structural proteins NS1 and NS3 as fusion protein (rNS1-NS3) based immuno-diagnostic assay for bluetongue on 27 January 2023
  - Recombinant chimeric protein for detection of anti-leptospiral antibodies and methods thereof on 18 September 2023
- Copyright registered for:
  - Advanced animal disease diagnosis and management consortium (ADMaC Mobile App), RoC No – SW-15775/2022, 24 August 2022
  - Bluetongue forewarning mobile application (BT Mobile App), RoC No–SW-15777/2022, 24 August 2022
  - ANIP on GIP Mobile Application, RoC No –SW-15776/2022, 24 August 2022
  - Cattle disease diagnosis expert system – web application- "CaDDES", RoC No–SW-15961/2023, 06 February 2023
  - Epidemiological calculator (EPI CAL) Web Application, RoC No SW- 16034/2023, 09 February 2023
  - Livestock disease forewarning (LDF Mobile App), RoC No. SW-16176/2023, 25 April 2023
  - National animal disease referral expert system version 2 (NADRES V2 Web App), RoC No. SW-18400/2024, 12 March 2024
  - NaaViC Bengaluru logo, RoC No A-153925/2024, 11 June 2024
  - NaaViC logo, RoC No A-156335/2024, 4 December 2024
  - NEXUS Logo, RoC No A-156318/2024,. 4 December 2024
- Release of Kits:
  - PPR Ab Check kit and PPR Ag Check kit released on 26 March 2022
  - Lumpy Screen rELISA and LumpySure wELISA Kits were released on 8 July 2024
- International Recognition:
  - The Leptospirosis and PPR Laboratories have been recognized as reference laboratories by World Organization for Animal Health, Paris in the year 2024

## Summary of Expenditure (as on 31st December, 2024)

| Sl. No. | Head | Funds proposed as per RE (Rs. In Lakhs) | Expenditure made up to (Rs. In Lakhs) |
|---|---|---|---|
| 1. | Capital | 109 | 56.78 |
| 2. | Establishment expenses | 1085.04 | 863.34 |
| 3. | Pension | 22.00 | 10.55 |
| 4. | General (other than TSP, NEH and SCSP) | 750 | 442.11 |
| 5. | NEH General | 128 | 61.37 |
| 6. | NEH capital | 25 | 17.04 |
| 7. | TSP General | 20 | 14.99 |
| 8. | TSP capital | 4 | -- |
| 9. | SCSP General | 60 | 44.94 |
| 10. | SCSP capital | 4 | -- |
| | **Total** | **2207.04** | **1511.12** |

## Revenue Receipts (as on 31st December, 2024)

| Sl. No. | Particulars | Amount (in ₹) |
|---|---|---|
| 1. | Sale of Kits | 1712259 |
| 2. | On-term deposits | 238267 |
| 3. | License fees | 43200 |
| 4. | Guesthouse charges | 923125 |
| 5. | Other income | 640447 |
| 6. | Program fees | 444362 |
| | **Total** | **40.01660** |

## Staff Position at ICAR-NIVEDI (as on 31st December, 2024)

| Name of the Post | Sanctioned | Filled | Vacant |
|---|---|---|---|
| Director | 01 | 01 | 00 |
| Scientific | 22 | 19 | 03 |
| Technical | 10 | 04 | 06 |
| Administrative | 14 | 13 | 01 |
| Supporting | 03 | 01 | 02 |

# Research Achievements 03

## EPIDEMIOLOGY OF BOVINE DISEASES

*The Bovine disease epidemiology group at ICAR-NIVEDI studies the patterns, causes and control of diseases affecting bovines. We also measure disease incidence, prevalence, identifying risk factors that contribute to disease outbreaks.*

*We do develop population screening assays for the purpose of surveillance of infectious diseases so that patterns, trends and distributions can be identified.*

*The ultimate goal is to design and implement effective measures for prevention, early detection and limit spread control and eradicate diseases.*

## Sero-monitoring of *Brucella* s-19 Vaccination Under NADCP

Brucellosis is a global zoonotic disease affecting both livestock and humans. Under the National Animal Disease Control Programme (NADCP), the Government of India launched the Brucellosis Control Programme (B-CP) in 2019, focusing on vaccinating 4–8-month-old female calves with the *B. abortus* S19 vaccine. Evaluating vaccination-induced sero-conversion is critical for effective program management.

During the current year, a total of 20,364 serum samples received under Phase I, II and III vaccinations were tested using indirect ELISA to detect antibodies against the S19 vaccine. Phase I included 1,232 samples from Rajasthan, Phase II had 10,420 samples from 10 states and one UT and Phase III had 8,712 samples from eight states. The highest sero-conversion rates were observed in Chhattisgarh (98.14%) and Tamil Nadu (88.65%) during Phase II and Phase III, respectively (**Fig 1**). This program supports effective management of brucellosis in bovine populations.

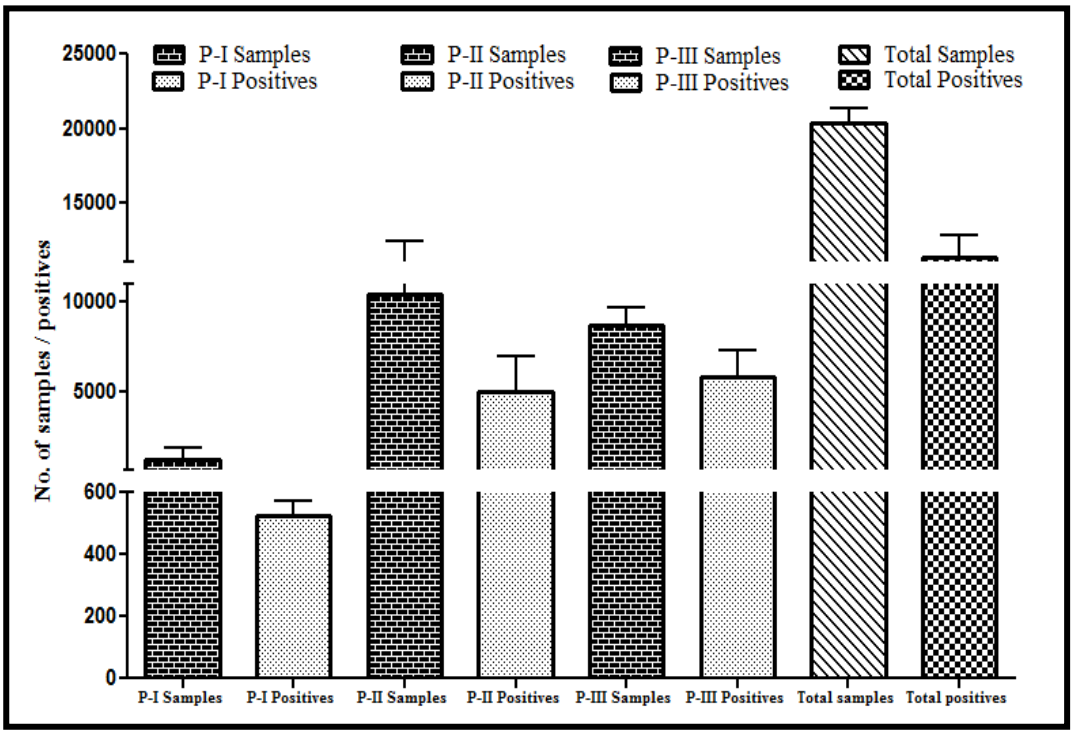
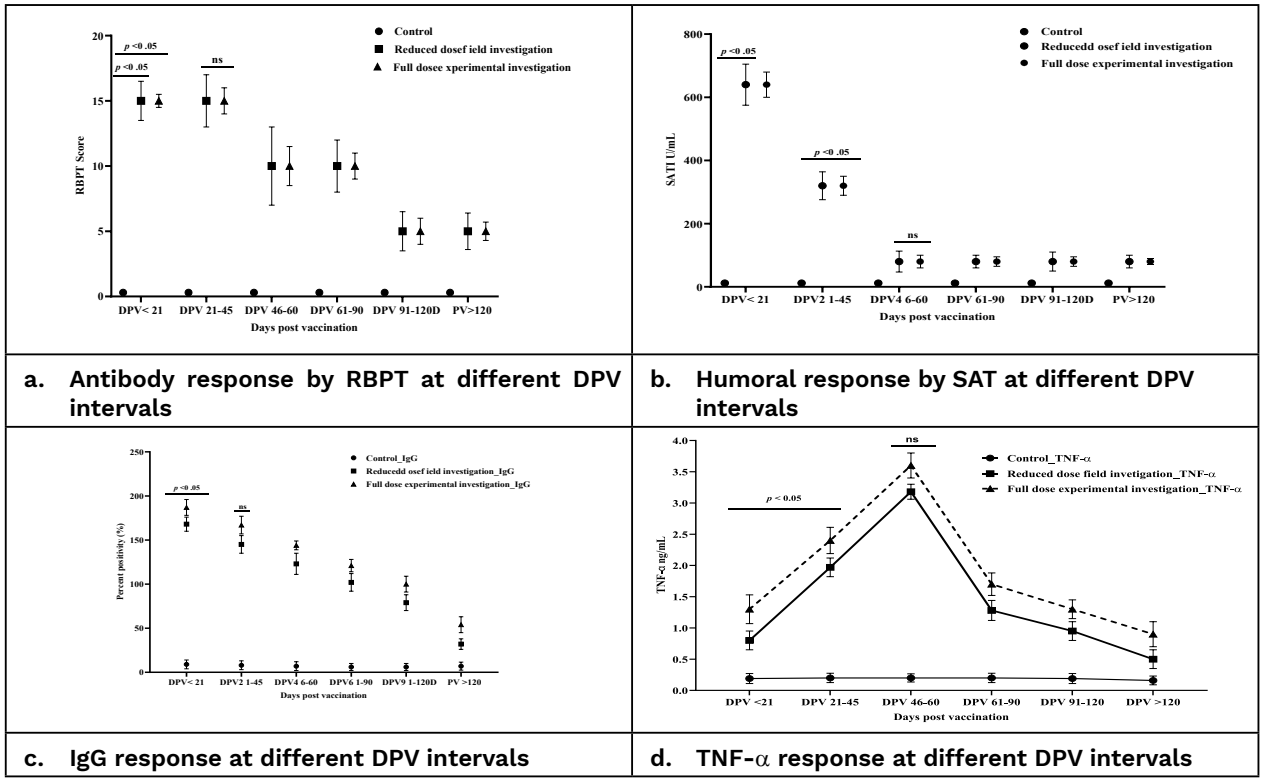



**Fig 1:** Phase-I, II&III *Brucella* S19 post-vaccination monitoring

*(R Shome and M Nagalingam)*

## Assessment of Efficacy of Reduced Dosage of *B. abortus* S19 Vaccine

This study aimed to evaluate whether reduced doses of B. abortus S19 vaccine elicit comparable immune responses, potentially increasing vaccine coverage at reduced costs. The innate, humoral and cell-mediated immune responses were assessed using RBPT, SAT, IgG, TNF-α, IL-6, IL-12 and IFN-γ across various post-vaccination intervals (<21, 21–45, 46–60, 61–90, 91–120 and >120 days). Analysis using GraphPad Prism 10 and one-way ANOVA revealed that antibody titers (RBPT, SAT, IgG) and inflammatory markers (TNF-α, IL-6, IL-12 and IFN-γ) were similar between reduced and full doses until >120 DPV and significantly higher than controls ($p<0.05$). Strong immunological responses were observed through quantification of IgM, IL-8, IL-10 and IL-1β, also significantly different from controls ($p<0.05$). These findings suggest that the reduced dose is safe, immunogenic and comparable to the full dose, with peak responses at 46–60 DPV sustained up to >120 DPV (**Fig 2**).




a. **Antibody response by RBPT at different DPV intervals**

b. **Humoral response by SAT at different DPV intervals**

c. **IgG response at different DPV intervals**

d. **TNF-α response at different DPV intervals**

**Fig 2:** Antibody response by RBPT, SAT, IgG & IgM at DPV intervals

*(R Shome and M Nagalingam)*

## Diagnosis of Brucellosis in Various Animals

In 2024, 1,730 serum samples were tested for brucellosis from equine (11), canine (8), swine (613), small ruminants (391) and bovine (707), using RBPT and iELISA. An overall seroprevalence of 26.24% was recorded, with highest rates in swine (30.02%) and bovine (28.99%), followed by small ruminants (16.62%). No positive cases were detected in equine and canine samples **(Table 1)**.

**Table 1** Sero-prevalence of brucellosis during 2024

| Species | No. of samples tested | No. of positive samples | Percent positivity (%) |
|---|---|---|---|
| Equine | 11 | 0 | 0 |
| Canine | 8 | 0 | 0 |
| Swine | 613 | 184 | 30.02 |
| Small ruminant | 391 | 65 | 16.62 |
| Bovine | 707 | 205 | 28.99 |
| **Total** | **1730** | **454** | **26.24** |

*(R Shome and M Nagalingam)*

## Sero-prevalence of Brucellosis in Veterinary Healthcare Personnel

This study analysed 2,331 human serum samples collected from 30 districts under 15 milk unions in Karnataka. RBPT screening identified 62 (2.66%) positives, confirmed by SAT with titers ranging from 1:80 to 1:1280. Highest seropositivity was recorded in samples from BAMUL and Kolar-Chikkaballapur Milk Unions. No positives were found in districts like Bijapur, Bagalkote, Kalaburgi, Udupi and Kodagu. These results emphasize the need for occupational health monitoring and targeted surveillance strategies.

*(R Shome and M Nagalingam)*

## Detection of Subclinical Mastitis

Sub-clinical mastitis (SCM) diagnosis in the field in dairy cattle is very difficult. To control mastitis, 977 milk samples from dairy farmers in Bengaluru Rural were tested using California Mastitis Test (CMT), PortaSCC and FaunaSCC kits. CMT detected the highest SCM prevalence (15.56%), followed by PortaSCC (11.64%) and FaunaSCC (7.9%–12.79%). Despite lower detection rates, FaunaSCC showed 100% sensitivity, 94.8% specificity, 95.79% accuracy and strong agreement with CMT (kappa = 0.9026), proving it to be a reliable, rapid and user-friendly tool.

*(R Shome and M Nagalingam)*

## Surveillance of Antimicrobial Resistance in Livestock, Handlers and Environment in Karnataka (AINP-AMR)

Antibiotic resistance is an emerging problem in the livestock and fisheries sector. During this period antibiotic resistance of *Staphylococcus* spp. and *E. coli* was assessed in apparently healthy cattle, animal handlers and the surrounding environment in selected districts of Karnataka state.

A total of 279 samples (livestock=180, animal handlers=33 and environment=66) were collected using multistage random sampling, which included 8 villages in Kolar and 4 villages in Mandya district. The antibiotic resistance profile was studied based on phenotypic and genotypic methods. A Multiplex PCR assay was carried out to identify the antibiotic resistance genes (ARGs) in MRSA and ESBLs. Antibiotic sensitivity test revealed that 23 of the 82 *E. coli* isolates in livestock were MDR type. Resistance to nalidixic acid, tetracycline, amikacin and cephalosporins was highest. Based to mPCR, 8 isolates were ESBL type, while 24 were AmpC type. The *TetA* gene conferring resistance to tetracycline was detected in 12 isolates from dairy cows and poultry. Twenty-three isolates were positive for virulence genes (STX1/STX2) in poultry, sheep and goats. Cows and poultry showed the highest proportion of ESBL and AmpC *E. coli*. A total of 29 *S. aureus* from livestock and 6 from animal handlers were confirmed. Forty-two isolates were coagulase negative *Staphylococcus spp*. (CoNS) in livestock, were retrieved. Phenotypic antibiogram of *Staphylococcus* spp. revealed highest resistance to penicillin, followed by cefoxitin and linezolid and the least resistance to enrofloxacin. Two isolates with mecA positive *S. aureus* in livestock and animal handlers were documented. The TetA gene was found in 5 isolates of *Staphylococcus spp*. It is imperative to continuously monitor the emergence of AMR bacteria in livestock and fishery sector for better health management and production.

*(N Shivasharanappa, R Shome, ZB Dubal and P Krishnamoorthy)*

## Bovine Tuberculosis in Goa

Bovine tuberculosis (bTB) is a chronic zoonotic disease leading to substantial production losses in the dairy sector. It is typically diagnosed in live animals using delayed hypersensitivity reactions. ICAR-NIVEDI conducted the first surveillance study for bTB in Goa, screening 157 out of 833

animals across four farms. Positivity rates were 62.82% by single cervical test (SCT), 44.87% by comparative cervical test (CCT) and 56.41% by interferon-gamma release assay (IGRA) **(Table 2)**. Although the sample size was limited, the high proportion of positive cases signals the risk of rapid spread in the absence of intervention. This underscores the urgent need for a customized bTB control strategy in India.

**Table 2** SCT, CCT and IGRA positivity, inconclusiveness and negativity of farms screened in Goa

| Farm | Total herd size | Number of cattle Screened | SCT (%) | | | CCT (%) | | | IGRA (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | P | I | N | P | I | N | P | N |
| Farm1 | 521 | 114 | 74.34 | 12.39 | 13.27 | 53.98 | 21.24 | 24.78 | 69.91 | 30.09 |
| Farm2 | 31 | 14 | 7.14 | 35.71 | 57.14 | 0 | 7.14 | 92.86 | 0 | 100.00 |
| Farm3 | 10 | 9 | 0 | 0 | 100 | 0 | 0 | 100 | 0 | 100.00 |
| Farm4 | 271 | 20 | 65.00 | 10.00 | 25.00 | 45.00 | 20.00 | 35.00 | 45.00 | 55.00 |
| **Total** | **833** | **157** | **62.82** | **13.46** | **23.72** | **44.87** | **18.59** | **36.54** | **56.41** | **43.59** |

P-Positive; I-Inconclusive; N-Negative

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

## Active Surveillance of Haemoprotozoan Parasites in Large Ruminants in Karnataka and Chhattisgarh

Haemoprotozoan infections in bovines are a major concern due to their clinical similarity and differing treatments. Active surveillance was conducted in ten agro-climatic zones in Karnataka and three in Chhattisgarh. A structured questionnaire was used to collect qualitative and quantitative data during field visits. Blood samples from 709 cattle (492 from Chhattisgarh and 217 from Karnataka) were analyzed using PCR. The most prevalent pathogen was *Theileria orientalis* (40.24%), followed by *Anaplasma* spp. (24.17%), *Babesia* spp. (6.68%), *Theileria annulata* (5%) and *Trypanosoma evansi* (3.2%) **(Fig 3)**. The study highlighted the need for species-specific diagnosis and integrated tick management.

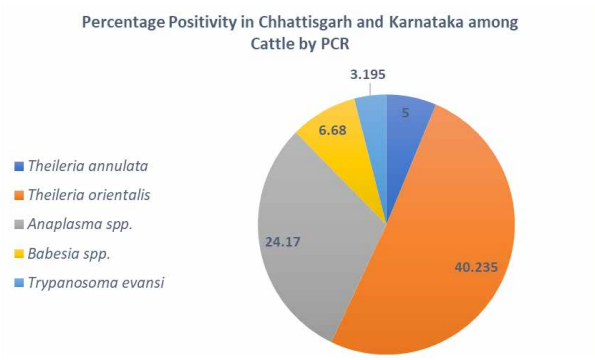



**Fig 3:** Prevalence of percentage positivity of active Haemoprotozoan parasitic disease infection in cattle in Karnataka and Chhattisgarh

*(PP Sengupta, SS Jacob and P Krishnamoorthy)*

## Sero-epidemiology of Infectious Bovine Rhinotracheitis (IBR)

Infectious bovine rhinotracheitis (IBR) causes severe production losses in dairy husbandry. The present study was conducted to screen IBR infection status in different states of India. A total of 5,494 bovine serum samples from 7 states, viz, Karnataka, Manipur andhra Pradesh, Goa, Punjab, Rajasthan and Assam were tested using IBR antibody ELISA. Overall seroprevalence was 22.02%, with highest rates in Manipur (73.25%) and Punjab (44.43%), followed by Goa (18.56%), Rajasthan (15.4%), Karnataka (12.05%) andhra Pradesh (11.35%) and Assam (6.89%) **(Fig 4)**. PCR testing of 49 bovine samples (15 tissues, 32 blood, 2 swabs) from Karnataka showed no IBR-positive cases. These results suggest the need for continued sero-surveillance and segregation of seropositive animals.

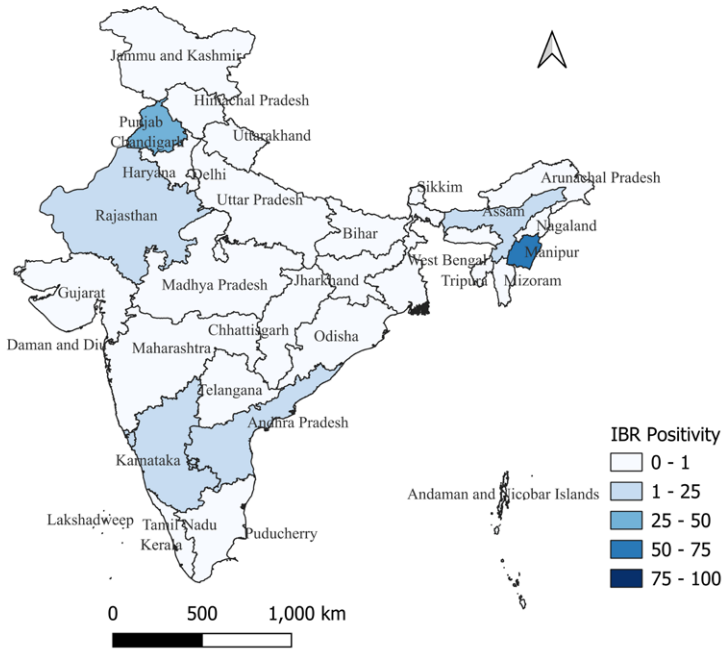



**Fig 4:** Seroprevalence of Infectious Bovine Rhinotracheitis in selected states

(*SS Patil, D Hemadri and KP Suresh*)

## Surveillance of Sheep-associated Malignant Catarrhal Fever (MCF)

MCF, caused by a gammaherpesvirus of the genus *Macavirus*, is highly contagious in bovines, with sheep acting as asymptomatic carriers. Molecular surveillance in Karnataka and Chhattisgarh included 230 blood samples (136 bovine and 94 sheep). PCR results indicated one bovine and 26 positive sheep blood samples, pointing to the potential carrier role of sheep in the epidemiology of MCF **(Fig 5)**.

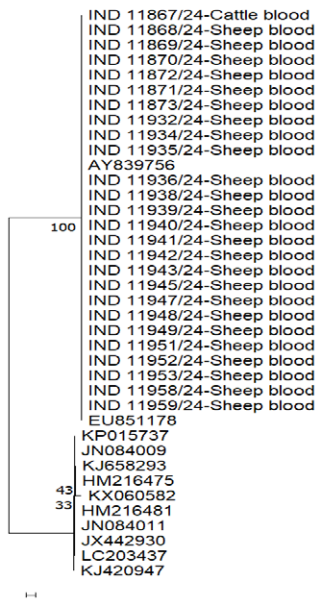



**Fig 5:** Phylogenetic analysis based on OvHV2 tegument gene

*(SS Patil and KP Suresh)*

## Sero-positivity of Haemorrhagic Septicaemia in Buffaloes of Andhra Pradesh

Haemorrhagic septicaemia (HS), a highly fatal disease of large ruminants causes significant mortality and morbidity losses in the dairy industry. An indirect ELISA using heat-extracted whole-cell antigens of *Pasteurella multocida* B:2 strain P52 was employed to assess haemorrhagic septicaemia (HS) antibody presence in 1,880 buffalo serum samples from 20 districts in Andhra Pradesh. The overall seropositivity was 51.4%, with highest rates in Guntur (80%) and lowest in East Godavari (25%) **(Fig 6)**. Vaccine coverage was estimated at 56%. Age and Murrah breed were significantly associated with higher seroconversion. Additionally, 41 clinical samples (blood, nasal swabs, tissues) from suspected HS cases in cattle were tested, with four samples testing positive for *Pasteurella multocida* by conventional and PCR assays. The extended study in other states of India would aid in assessing HS vaccine coverage as well as understanding the disease /immune status against HS in the buffalo population.

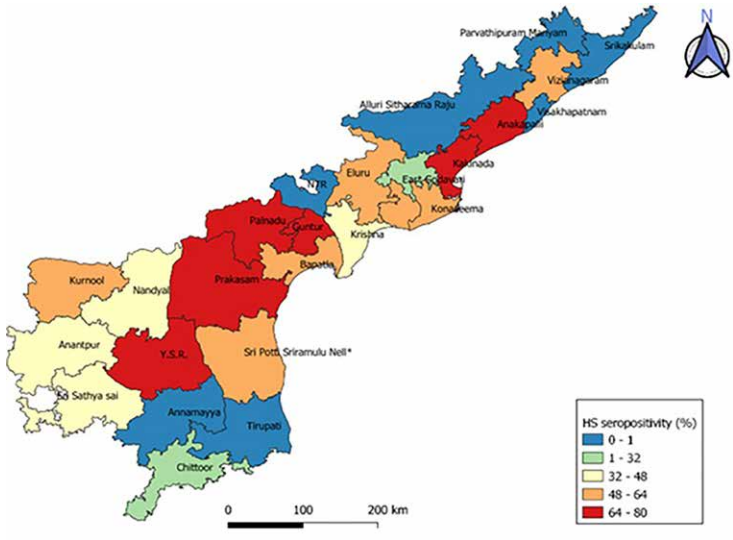



**Fig 6:** Sero-positivity of HS in buffaloes of Andhra Pradesh

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Production of Immuno-reactive Recombinant Flagellin of *Clostridium chauvoei*

*Clostridium chauvoei,* an anaerobic bacteria causes black leg or black quarter disease in large and small ruminants and causes high production losses. Flagellin, an integral component of flagellum which provides motility to several bacterial species and also act as a candidate antigen in diagnostics and subunit vaccines.

We produced highly soluble and immuno-reactive recombinant FliA(C)/ flagellin protein of *Clostridium chauvoei,* a causative agent of blackleg or black quarter (BQ) affecting cattle and small ruminants worldwide. Upon sequence and structural analysis, a partial *fliA(C)* gene (382-957nt) encoding for central region ($_{128}$T to T$_{319}$) without the N-terminal ($_{1}$M to D$_{127}$) and C-terminal ($_{320}$R to R$_{413}$) regions, from *Clostridium chauvoei* strain NIVEDIBQ1 was cloned and the recombinant mature protein was over-expressed as a His-tagged fusion protein (~25 kDa) in *Escherichia coli* (**Fig 7**). Subsequently, rFliA(C) protein was used in Western blot and ELISA to check its immunoreactivity. The rFliA(C) elicited antigen specific conformational polyclonal antibodies in rabbit and guinea pig models as well as specifically detected anti-*Clostridium chauvoei* specific antibodies in BQ vaccinated and convalescent sera of bovine in Western blot and in indirect-ELISA format (Fig 7 Panel B & C). Further, no cross-reactivity was noted with antibodies against major bovine diseases (e.g., Foot-and-mouth disease, IBR, LSDV, Haemorrhagic septicaemia, Brucellosis and Leptospirosis). The results indicated the production of conformational

recombinant flagellin- rFliA(C) antigen and its potential utility in the development of diagnostics for the detection of *Clostridium chauvoei* specific antibodies in BQ recovered and /or vaccinated animals.

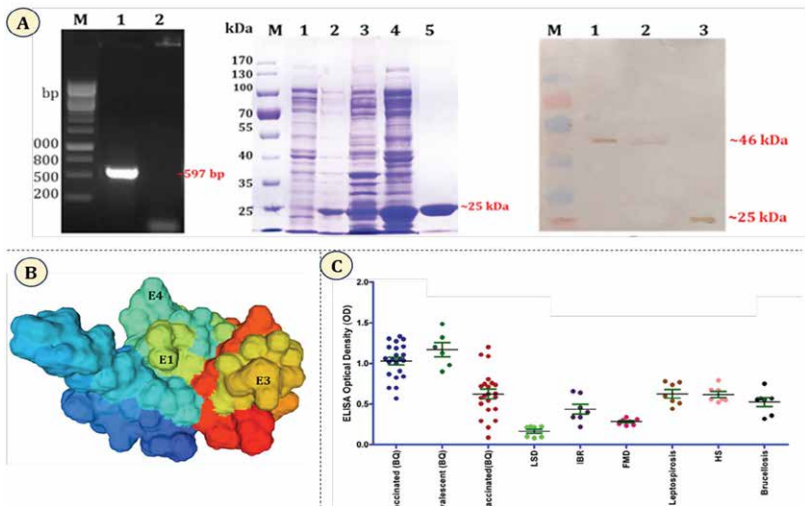



**Fig 7:** Panel A. Gene cloning, expression, purification and Western blot of recombinant flagellin, Panel B. Structural model and epitope mapping of recombinant flagellin, Panel C. Immunoreactivity of recombinant flagellin

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Sero-epidemiology of Leptospirosis in Buffaloes: Insights from Enzootic States of Andhra Pradesh and Odisha

Leptospirosis, a fatal disease in a wide range of animals causing several disorders including reproductive failures. The disease can also be transmitted to humans also. A serosurvey was conducted from 2023-2024 in Andhra Pradesh and Odisha to assess the prevalence of anti-leptospiral antibodies in healthy buffaloes and those with reproductive issues. A total of 1,162 samples (995 from Andhra Pradesh and 167 from Odisha) were randomly selected covering 64 taluks and 73 villages in Andhra Pradesh and 12 taluks and villages in Odisha for this study. Samples were tested using a microscopic agglutination test (MAT) at a 1:100 dilution, employing cultures of 20 *Leptospira* serovars as live antigens. An overall seroprevalence of 6% was observed, with 4% in Andhra Pradesh and 13% in Odisha. District-level analysis showed variability in prevalence rates, with the highest positivity recorded in SPSR Nellore at 21% and Bapatla and East Godavari at 14% in Andhra Pradesh and Cuttack at 29% and Nayagarh and Rayagada at 21% in Odisha. Predominant serogroups included Tarassovi (59%), Pomona (35%), Bataviae (9%) and Icterohaemorrhagiae (5%) **(Fig 8)**.

Repeat breeder cases had a prevalence of 6.5%. No significant differences were observed across age groups, with the highest prevalence (7%) in buffaloes over 24 months. Similarly, the prevalence was 6% in females and 5% in males, ranging from 11% in heifers to 33% in third-parity buffaloes. A significant association was found with reproductive practices, showing a higher prevalence in buffaloes bred by natural service (14%) compared to those using artificial insemination (4%) ($\chi^2 = 26.02$, $p < 0.05$). However, herds where new animals were introduced showed a significantly lower prevalence ($\chi^2 = 4.35$, $p < 0.05$). The prevalent serogroups identified in buffaloes, along with the major serogroups found in other livestock species in the region, can be useful in developing reference panels of *Leptospira* antigens for the Microscopic Agglutination Test (MAT) in human and animal disease diagnostic laboratories, facilitating accurate diagnosis of leptospirosis.

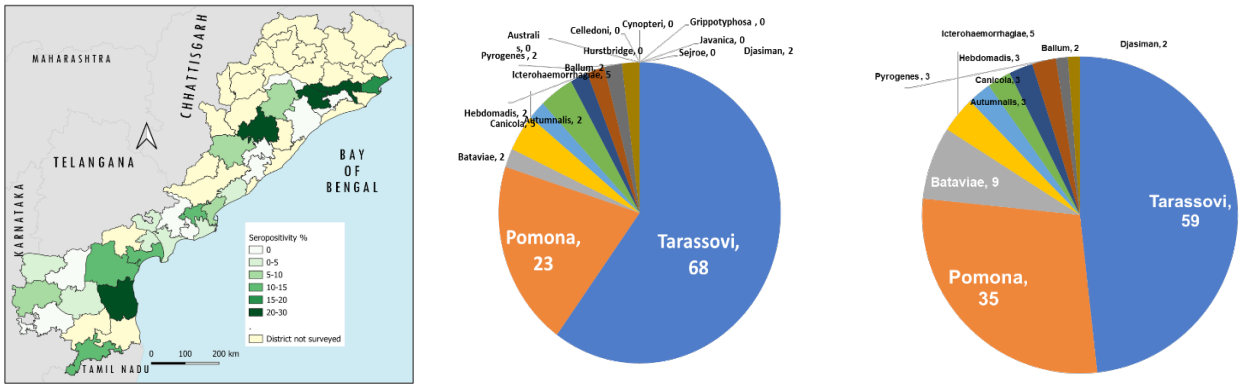



**Fig 8:** QGIS map showing district-wise seroprevalence with the most prevalent serovars of anti-leptospiral antibodies reacted; Distribution of anti-leptospiral antibodies against reacted most prevalent serogroup in Andhra Pradesh and Odisha.

*(D Hemadri and V Balamurugan)*

## First Evidence of Leptospirosis in Mithun (*Bos frontalis*) from Nagaland

A total of 187 mithun serum samples were randomly collected from Medziphema, Porba, Thuvopisu, Tening and Noklak and tested using the Microscopic Agglutination Test (MAT), employing cultures of 20 *Leptospira* serovars as live antigens. Out of the 187 samples, 22 tested positive, resulting in an overall seroprevalence of 12% (95% CI: 7-16%). The MAT analysis revealed diverse serogroup reactivity, indicating a complex epidemiological scenario. The predominant serogroups identified were Tarassovi (63.6%), followed by Icterohaemorrhagiae (31.8%) and Pomona (31.8%). Other serogroups detected included Celledoni (9.1%), Autumnalis (4.5%), Bataviae (4.5%) and Hebdomadis (4.5%) **(Fig 9)**. This study provides the first evidence on the seroprevalence of leptospirosis in Mithun, revealing a diverse range of *Leptospira* serogroups circulating in Mithun in Nagaland

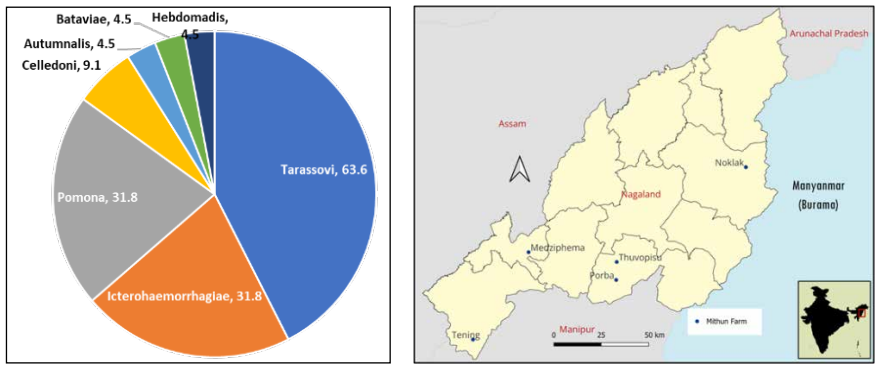



**Fig 9:** Distribution of anti-leptospiral antibodies against reacted most prevalent serogroup in Mithun

*(R Vikram, HB Chethan Kumar, S Girish Patil and V Balamurugan)*

## Sero-surveillance for Surra in Bovines

*Trypanosoma evansi*, an extracellular haemoprotozoan parasite causes chronic wasting disease 'surra' in a wide range of animals. Cattle and buffaloes are also severely affected and causes severe production losses. As a part of a nation-wide sero-surveillance study, a total of 2026 bovine serum samples from Madhya Pradesh (316), Assam (315), Bihar (483), Chhattisgarh (42) and Punjab (870) were screened for antibodies against *Trypanosoma evansi* by an in-house built recombinant VSG-based indirect ELISA. Among the states, Punjab showed the highest

seropositivity of 65.29% followed by Chhattisgarh (64.29%), Bihar (62.11%), Assam (54.29%) and Madhya Pradesh (49.68%) **(Fig 10)**.

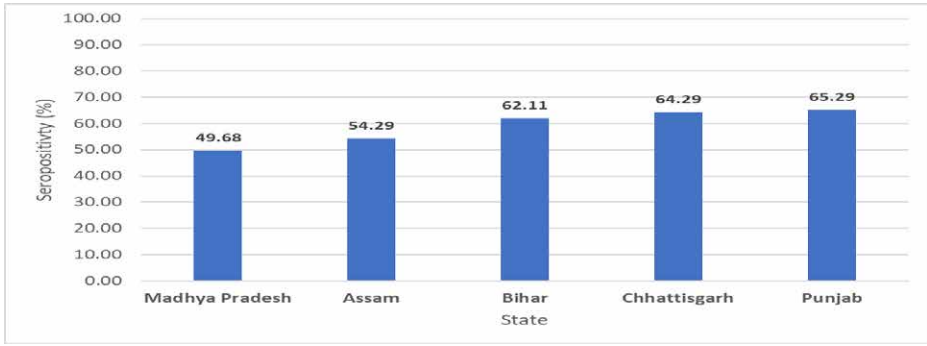



**Fig 10:** Sero-surveillance of surra in bovines in different states.

Out of 2026 samples, 348 serum samples were from cattle Bihar (307) and Chhattisgarh (41), showing seropositivity of 81.11% and 65.85%, respectively. Among 1,678 buffalo serum samples from Bihar, MP, Assam and Punjab, the highest positivity was found in Punjab (65.28%), with the lowest in Bihar (28.98%).

*(PP Sengupta and SS Jacob)*

## Molecular surveillance of Leptospirosis and Scrub Typhus in the Environment and Animals

Leptospirosis and scrub typhus are emerging zoonotic diseases of significant public health concern. Animals can serve as carriers, facilitating transmission to humans. A comprehensive molecular surveillance study was conducted in Shivamogga district, Karnataka, to detect the presence of these pathogens in environmental and animal samples **(Fig 11)**. A total of 960 water samples, 271 rodent tissue samples and 240 livestock urine samples were collected. Nested PCR testing revealed that 447 (46.56%) of water samples were positive for *Leptospira*, indicating substantial environmental contamination. Of the 120 rodent tissues tested for leptospirosis, 19 were positive. Additionally, 271 rodent spleen samples were screened for scrub typhus, with 25 testing positive. DNA was extracted from 240 livestock urine samples tested negative for leptospirosis. Furthermore, stakeholder needs were assessed through data analysis and the One Health Network Mapping Survey was completed, including fieldwork across Maharashtra. Overall, the study highlights the importance of environmental surveillance in understanding the ecology of zoonotic diseases and supporting One Health approaches.

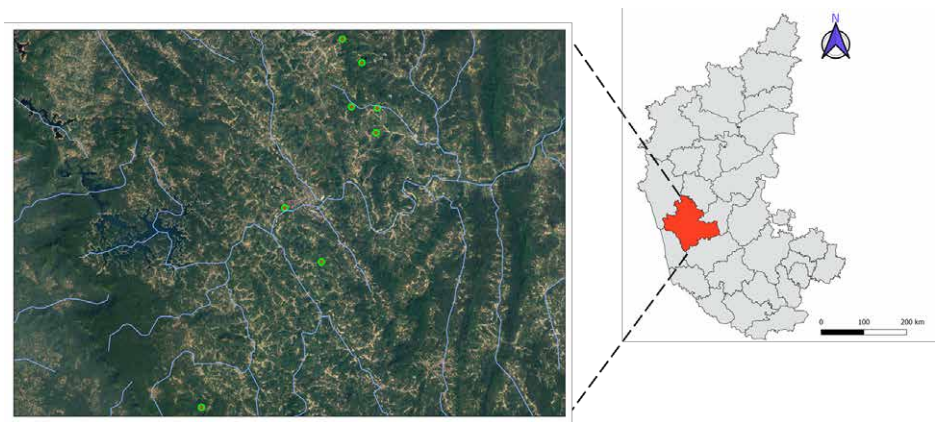


**Fig 11:** Map showing study site locations within Shivamogga district of Karnataka

*(MM Chanda and BR Gulati)*

## Transmission Pattern Modelling and Risk Factors of Kyasanur Forest Disease (KFD) and Crimean-Congo Hemorrhagic Fever (CCHF)

KFD and CCHF are two important vector-borne zoonotic diseases prevalent in India. This study investigated the risk factors of KFD and CCHF in India using a comprehensive analysis of climate, land use and host data. Phylogenetic analysis revealed two distinct KFDV clusters: Cluster A, originating in Karnataka and Cluster B, emerging in Maharashtra **(Fig 12)**. The research utilized surveillance data, molecular sequences and environmental variables to model disease transmission patterns. Key factors influencing KFDV transmission included temperature variations, precipitation patterns, forest loss and specific land use characteristics like wetlands and agricultural areas. Buffalo and duck populations emerged as significant host variables. The virus predominantly spread in regions with lower temperatures, specifically within and around the Western Ghats, with both clusters contributing to outbreaks in multiple states. This comprehensive approach enhances our understanding of disease dynamics and supports evidence-based prevention measures. For CCHF, models projected increasing risk under climate change influence, particularly in Gujarat and along the Western Ghats, with risk anticipated. The study provides insights for disease surveillance and control strategies.

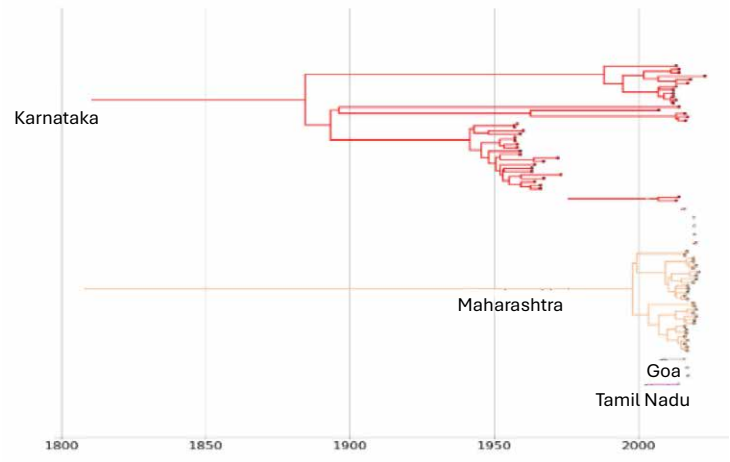



**Fig 12:** Phylogenetic tree representing KFDV arrived from two separate clusters

*(MM Chanda, SB Shivachandra, HB Chethan Kumar, R Yogisharadhya, Jeromie and P Yadav)*

## Molecular Epidemiology of Lumpy Skin Disease in Cattle

Lumpy skin disease (LSD) is a viral infection that primarily affects cattle, characterized by fever, skin nodules and enlarged lymph nodes. It is caused by the lumpy skin disease virus (LSDV), a member of the *Poxviridae* family. Although the mortality rate is generally low, LSD leads to significant economic losses due to reduced milk production, abortions and hide damage.

Phylogenetic analysis revealed that the most recent common ancestor (MRCA) of LSDV dates back to the early 17$^{th}$ century, indicating an ancient origin with ongoing viral adaptation. Maximum likelihood phylogenetic trees based on the whole genome and G-protein-coupled receptor (G-PCR) gene sequences demonstrated global clustering of LSDV strains, highlighting its transboundary transmission and genomic diversity. Additionally, TCS haplotype network analysis identified distinct haplogroups across regions such as India, South Africa, China and Russia. The presence of multiple mutation events between these haplogroups underscores the virus's continuous genetic diversification. When compared with studies on other Capripoxviruses and viral pathogens, LSDV was found to exhibit similar evolutionary dynamics, along with unique genetic pathways contributing to its widespread persistence.

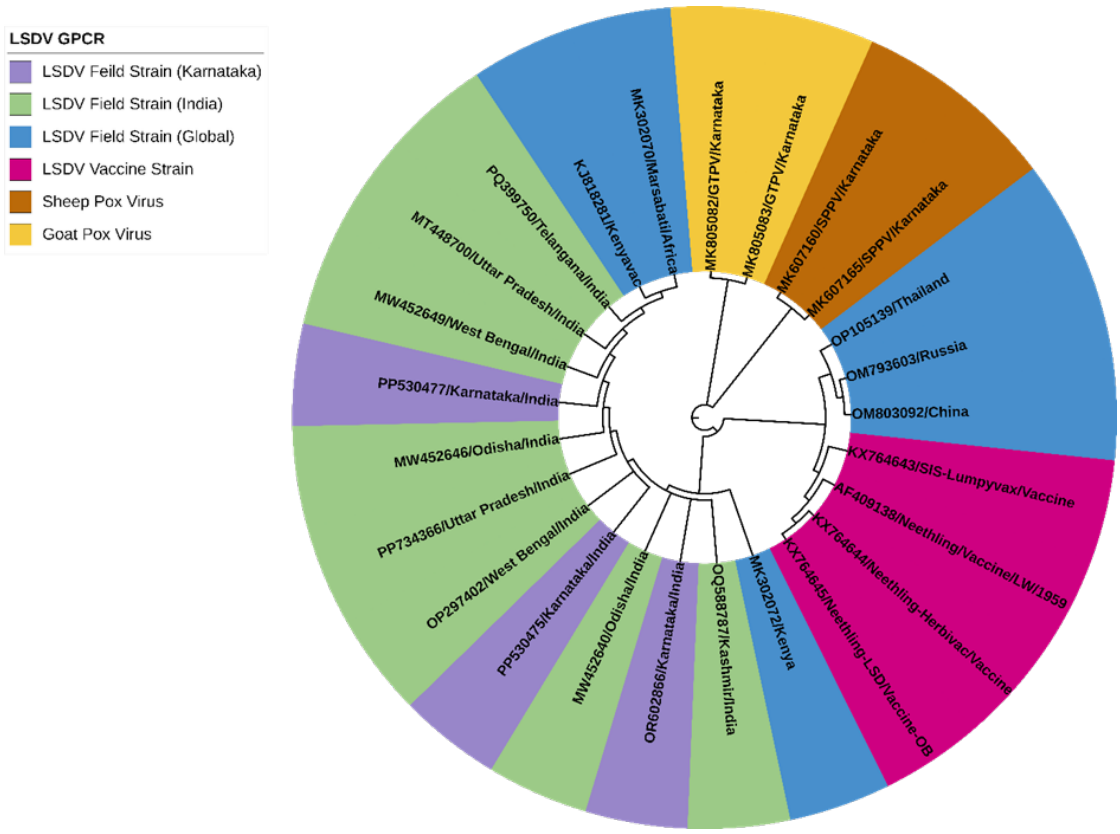



**Fig 13:** The phylogenetic analysis of the LSDV GPCR gene sequences. The maximum likelihood tree was constructed using Bayesian Evolutionary Analysis by Sampling Trees (BEAST) 2.0 software. The LSD viruses from Karnataka (purple) and India (green color) are evolutionarily more related to LSDV isolates from Kenya

*(GBM Reddy, HB Chethan Kumar and BR Gulati)*

## Immunogenicity of Heterologous Goatpox Vaccine Against Lumpy Skin Disease in Cattle

Lumpy skin disease (LSD) is a significant transboundary animal disease causing major economic losses to the cattle industry. In India, the heterologous Goatpox vaccine (Uttarkashi strain) has been used as an emergency intervention to control LSD outbreaks. A field study was conducted to evaluate the safety, immunogenicity and duration of immunity provided by this vaccine.

The study demonstrated that the vaccine was completely safe. None of the 132 vaccinated cattle showed adverse effects such as swelling at the injection site and all animals remained healthy post-vaccination. The humoral-mediated immune (HMI) response peaked between 21- and 28-days post-vaccination (dpv) and remained detectable up to 60 dpv. The cell-mediated immune (CMI) response also peaked at 28 dpv and gradually declined thereafter.

Clinical monitoring for one-year post-vaccination revealed that only 2% of the animals developed mild clinical signs of LSD at around nine months after vaccination, with no mortality reported. Among factors assessed for their influence on seropositivity, breed and geographic location were found to have a significant effect, whereas age and sex did not.

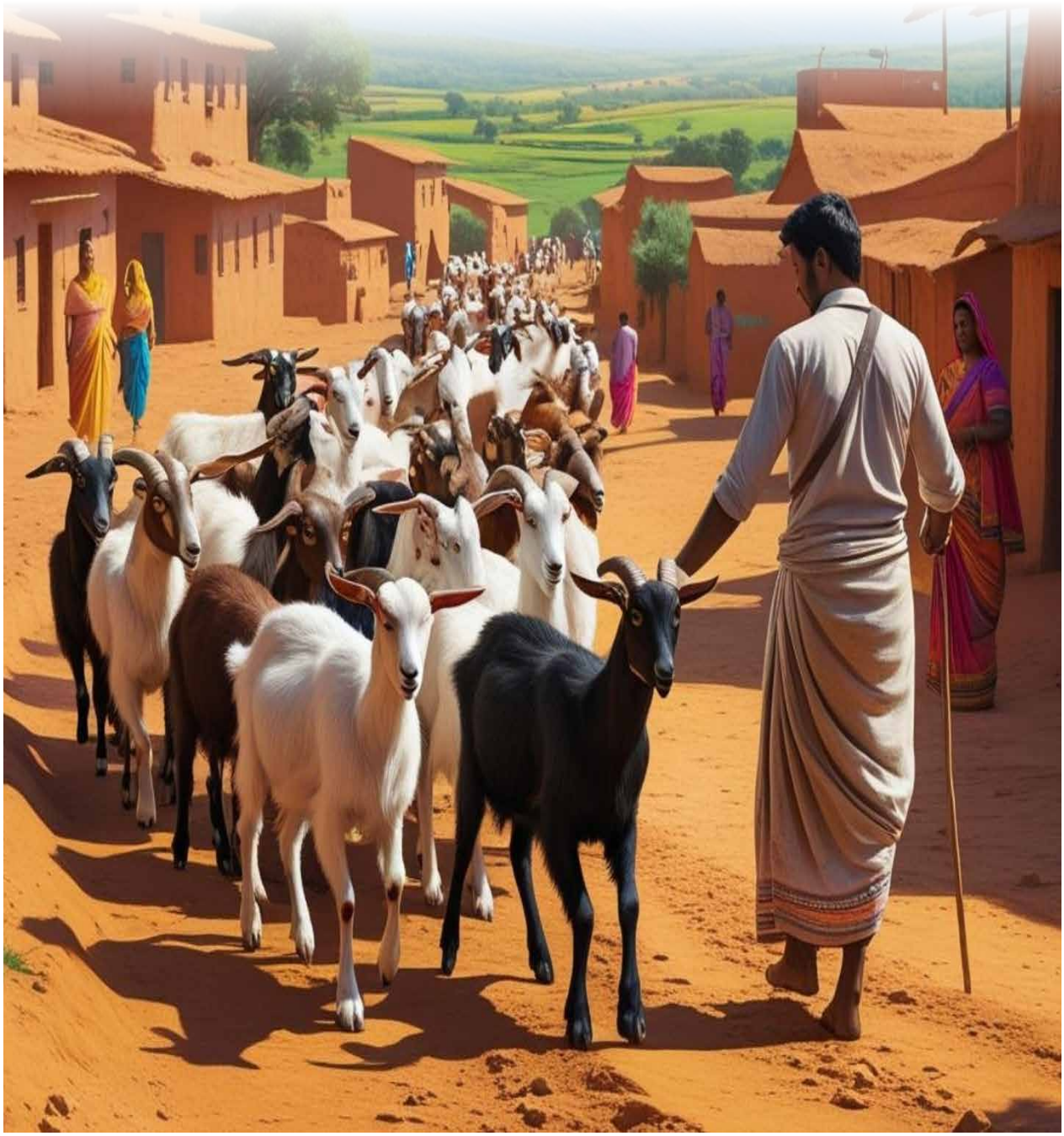
This study provides strong evidence that the Goatpox vaccine is safe, elicits a robust immune response and offers effective population-level protection against LSD in cattle—marking a significant first for the Indian subcontinent.

*(GBM Reddy, HB Chethan Kumar and BR Gulati)*

# EPIDEMIOLOGY OF SMALL RUMINANT DISEASES

At ICAR-NIVEDI, the Small Ruminant Disease Epidemiology Group is dedicated to understanding the distribution, transmission patterns, and risk factors of diseases affecting sheep and goats. This work is critical for designing targeted strategies to control infectious diseases that can severely impact animal health, farm productivity, and rural livelihoods.

The group employs a combination of active surveillance, outbreak investigations, sero-epidemiological studies, and mathematical modeling to analyse disease dynamics across regions. Insights generated from these approaches are used to inform vaccination strategies, strengthen biosecurity measures, and guide evidence-based policy decisions. The ultimate goal is to protect animal and public health while supporting the economic resilience of livestock farmers.



## Field Evaluation of the PPR (Sungri 96) Vaccination for Achieving Population Immunity and Supporting National PPR Eradication Goals

Peste des petits ruminants (PPR) is a highly contagious and economically devastating viral disease affecting sheep and goats. Recognizing the disease's severe impact, India launched the PPR Eradication Programme in 2022–2023, aiming for complete vaccination coverage of small ruminants by 2026, halting virus transmission by 2027–2028 and achieving national freedom from PPRV infection by 2030 as per the National Strategic Plan.

This study evaluated the real-world field efficacy of the PPR lineage IV Sungri 96 vaccination in achieving the targeted effectiveness and population immunity required for PPR eradication. A total of 12,079 serum samples from sheep and goats aged 6–12 months were collected 60–90 days post-vaccination across 1,229 villages (epidemiological units) in 11 Indian states **(Fig 14),** adhering to WOAH/FAO GCES guidelines under the PPR-GEP 2030. Antibodies to PPRV were assessed using a native PPR-competitive ELISA kit.

The findings revealed an overall seroconversion rate of 73.8%, with state-wise variation ranging from 57.8% in Madhya Pradesh to 91.6% in Telangana. Notably, 68.2% of the surveyed epidemiological units showed seroconversion rates above 70%, indicating that the Sungri 96 vaccine is effective under field conditions in eliciting protective immunity.

To sustain population immunity over time and move toward eradication, mass vaccination of >95% coverage in small ruminants aged above 3–4 months is recommended. Achieving >75–80% vaccine effectiveness and immunity, supported by training, awareness campaigns and real-time monitoring, will be crucial for success. These insights are essential for regional strategy development and align with global efforts toward a PPR-free world.

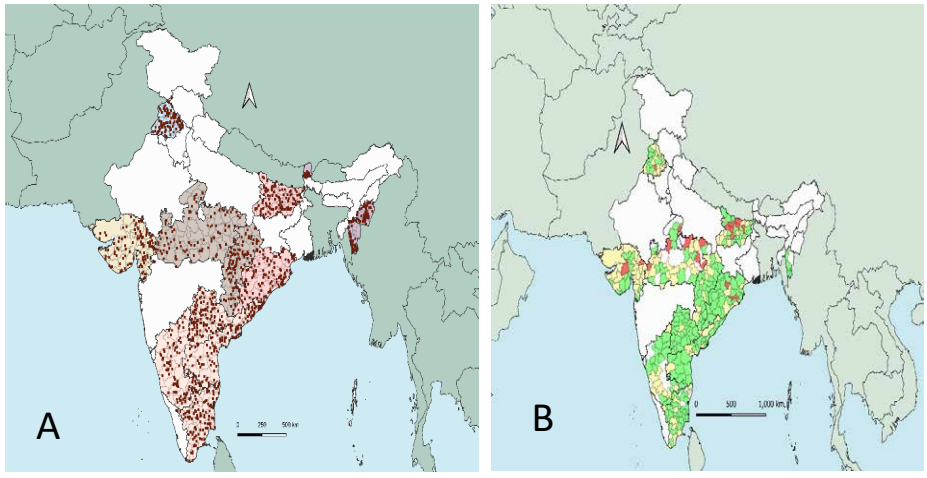



**Fig 14:** A. Sampling as per SP-2 from different epi-units covering 11 states of India
B. Seropositivity District-wise (green color indicates protective immune response)

*(V Balamurugan)*

## Whole Genome Sequencing of PPRV Reveals Epidemiological Insights into Disease Circulation in the Eastern Himalayan Region of India

This study aimed to perform whole-genome sequencing of PPRV isolates from outbreaks in goats in Arunachal Pradesh and Mizoram, representing the northeastern epidemiological system (episystem) of India. Using serological and molecular diagnostics, two confirmed PPRV isolates, viz, PPRV/Jote-Poma/Papum Pare/AR/India/08/22/359-G and PPRV/Lungpho/MZ/India/06/23/ 89-G were obtained from infected goats and processed at the WOAH Reference

Laboratory for PPR, ICAR-NIVEDI. These isolates were revived in Vero cell culture and subjected to whole genome sequencing using Illumina NovaSeq (Next-Generation Sequencing).

The assembled genome sequences (15,948 bp) were deposited in GenBank (Accession Nos. PQ310779 and PQ310780) and confirmed to belong to PPRV Lineage IV, with GC content ranging from 46% to 48%. Phylogenetic analysis showed that both isolates clustered within the Lineage IV clade, along with other PPRV isolates from neighboring countries such as China, Tibet and Bangladesh **(Fig 15)**, indicating transboundary movement of the virus.

This marks the first report of complete genome sequences of Lineage IV PPRV from the northeastern episystem of India. The close genetic relationship with Asian PPRV strains reinforces the lineage's longstanding presence in the region since the initial emergence of the disease. The findings underscore the importance of robust surveillance frameworks aligned with defined epidemiological systems and contribute meaningfully toward the global PPR eradication target set for 2030.

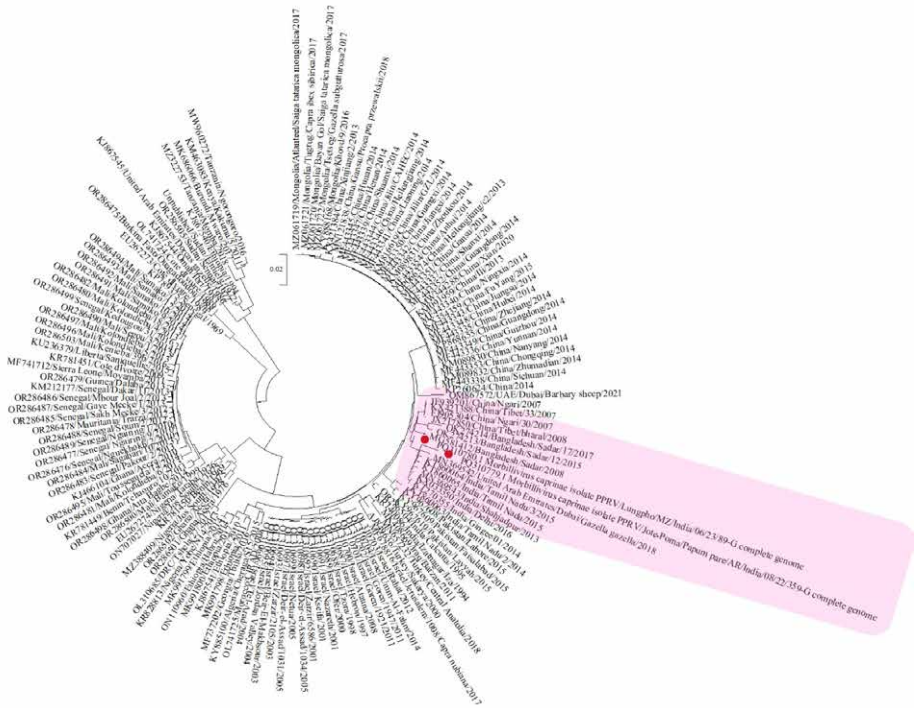



**Fig 15:** Phylogenetic tree of PPRV Lineage IV based on full genome sequences from northeastern India and related Asian strains (GenBank Acc. Nos. PQ310779–PQ310780; filled circle)

*(V Balamurugan)*

## Genetic Analysis of PPR Outbreaks Reveals Continued Circulation of Lineage IV PPRV in India

The present study documented 14 laboratory-confirmed PPR outbreaks through passive surveillance, in sheep and goat flocks across various states in India. During the outbreak investigation, morbidity and significant mortality rates were observed and clinical samples collected from the affected flocks were tested using ELISA and RT-PCR, confirming the presence of PPRV. Of the nine PPR outbreaks detailed characterization was performed and detection and sequencing of the PPRV nucleocapsid (N) and fusion (F) gene-specific RT-PCR products from these samples confirmed the presence of the PPRV genomes. Further, highly positive infected tissues and swab samples from each outbreak, selected based on serological and molecular results, were subjected to PPRV isolation in Vero cells. The PPRV was successfully isolated/ recovered from clinical samples collected during the outbreak investigation from outbreak-affected

flocks through the blind passage in Vero cell lines. Additionally, partial N gene sequencing and phylogenetic analysis of detected samples and recovered isolates, using the Maximum Likelihood method in MEGA 11 software, revealed that the isolated PPR viruses belong to Asian lineage IV (**Fig 16)**. These samples and isolates exhibit close genetic relationships with other Asian PPRV isolates and strains of lineage IV. This study monitors the genetic variability of PPRV and confirms the circulation of only lineage IV virus since disease reports began in India.

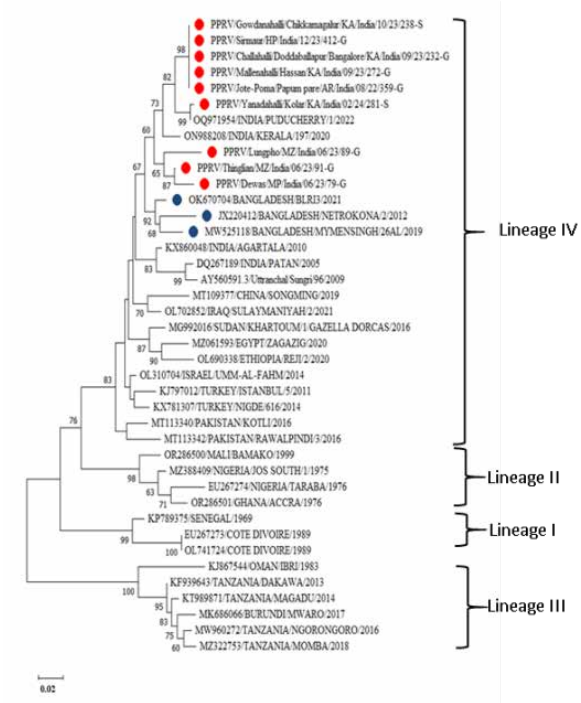



**Fig 16:** Phylogenetic tree of PPRV isolates from India based on partial N gene sequences, constructed using the Neighbor-Joining method in MEGA 11 with 1,000 bootstrap replicates.

*(V Balamurugan, D Hemadri and BR Gulati)*

## Validation of native PPR ELISA Kits for specific antibody detection and cattle sentinel surveillance

Surveillance of PPR in sheep and goats in India is primarily conducted using an indigenous competitive ELISA (PPR c-ELISA) developed by ICAR-IVRI, based on monoclonal antibodies against the PPRV H protein. As an alternative, a newly developed PPR Ab Chek kit employing polyclonal antibodies against recombinant N protein was assessed for serodiagnosis, surveillance and immunomonitoring.

To validate their use for detecting PPRV antibodies in cattle serum samples, both kits were compared with the virus neutralization test (VNT) using standard sera from sheep, goats and cattle. The c-ELISA uses anti-H protein mAbs, while the Ab Chek uses anti-N protein PAbs, both with partially purified PPRV antigens. Following initial validation in sheep and goats, the kits were optimized for cattle and used in sentinel surveillance involving 4–8-month-old calves sampled during the Brucellosis Control Program in mass-vaccinated states (Chhattisgarh and Telangana).

The PPR Ab Chek kit's cutoff (50% PI) was established using ROC analysis (AUC: 0.999), with 99.9% sensitivity and 100% specificity at 95% CI. Samples with PI ≥50% were considered positive; ≤40% negative; and 41–49% doubtful. The Ab Chek kit showed diagnostic sensitivity (DSe) and specificity (DSp) of 95.81% and 95.16%, respectively, while the c-ELISA demonstrated 90.91% and 92.42% compared to VNT.

Further validation was conducted in swine. Initially, to determine the cut-off for both kits

(PPR c-ELISA and PPR Ab Chek), a total of 68 swine serum samples with PI values of >60 (n=20) and <40 (n=20) were tested for PPRV-specific antibodies after heat inactivation of serum using VNT, results of VNT showed complete concordance with both kits and cut-off of 50% PI value was determined by ROC curve. Further, a cut-off of 50% PI was adopted for the detection of PPRV antibodies in swine. Out of 910 serum samples, tested 68 (9%) seropositivity samples showed for PPRV specific H and N antibodies. Due to variations in PPRV antibody kinetics to H and N antigens during infection, 5.7% of samples tested positive for H-specific antibodies only with the c-ELISA kit, while 2.8% tested positive for N-specific antibodies with the PPR Ab Chek kit.

*(V Balamurugan, R Shome, S. Patil, M Nagalingam, S Chandrasekar and BR Gulati)*

## Persistence of PPR Vaccine-Induced Maternal Antibodies in Yearlings from Vaccinated Sheep and Goats

This study aimed to assess the persistence and decline of maternally derived PPR antibodies in young animals born to vaccinated dams, in order to identify the optimal age for vaccination and reduce the risk period of susceptibility. The study was conducted between April and December 2024 across 10 organized sheep and goat farms in Bengaluru Urban, Bengaluru Rural and Ramanagara districts of Karnataka.

A total of 160 pre-vaccination and 185 post-vaccination serum samples were collected from sheep and goats over 6 months of age, following administration of a single field dose of the PPR Sungri 96 Lineage IV vaccine ($10^3$ TCID50/ml, subcutaneous). Additional samples were collected from pregnant or recently kidded/lambed dams and their offspring. Post-parturition, vaccinated dams and their offspring were monitored and serum samples were collected at 30-day intervals up to 150 days.

Maternal antibody titers in kids and lambs were evaluated using virus neutralization tests (VNT) and/or PPR c-ELISA kits. Four lambs were vaccinated at 90 days of age and monitored for four months to evaluate immune response **(Fig 17)**. Pre-vaccination c-ELISA results showed 74% seropositivity (118/160), while post-vaccination samples showed 95% positivity (175/185), indicating a significant increase in antibody levels following vaccination.

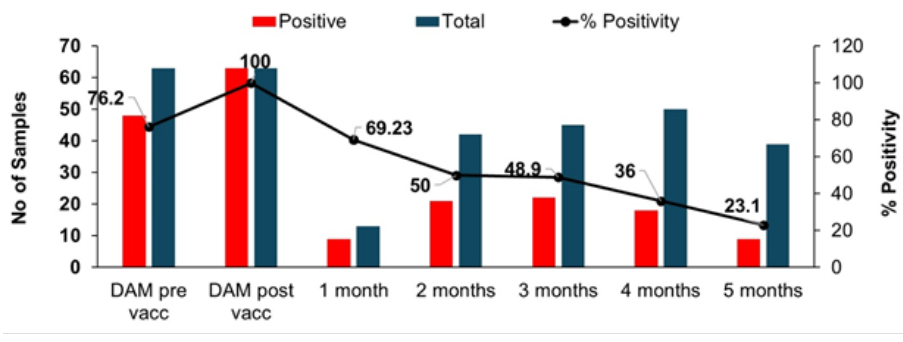



**Fig 17:** Maternal PPRV antibody titres in sera of lambs and kids born from vaccinated dam assessed by PPR c-ELISA kit

*(T Chandrasekar, GH Leena, S Madhusudhan, KM Chandrashekhar and V Balamurugan)*

## Sero-Prevalence and Sero-Monitoring of PPR in Sheep and Goats in the North-Eastern Episystem of the Eastern Himalayan Region of India

This study demonstrates the application of an episystem-based approach for conducting PPR serosurveillance and monitoring in India's border states to evaluate transboundary disease exposure and assess post-vaccination immunity after first round of vaccination. A stratified sampling design following WOAH/FAO guidelines was implemented across seven states of the

North-Eastern episystem—Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Tripura and Sikkim—representing the Eastern Himalayan Region. A total of 13,414 serum samples were collected and analyzed using a native PPR-competitive ELISA kit.

Up to 3,240 samples per state were tested from animals in various age groups (6–12 months, 1–2 years, >2 years) across 564 villages. The overall seroprevalence of PPRV antibodies was 13.2%, with state-specific prevalence ranging from 6.1% to 24.3%. In four states (Manipur, Meghalaya, Mizoram and Sikkim) **(Fig 18)**. The post-vaccination sero-monitoring was conducted using 1,922 serum samples collected from 6–12-month-old animals across 157 villages. The testing results of up to 1080 samples per state revealed a mean vaccine efficacy of 60%, with PPRV antibody prevalence exceeding 70% in more than 50% of the studied epidemiological units in each state **(Fig 19)**.

This reinforces the utility of targeted sero-monitoring in high-risk border regions and supports adaptive vaccination strategies for improved control of transboundary diseases like PPR.

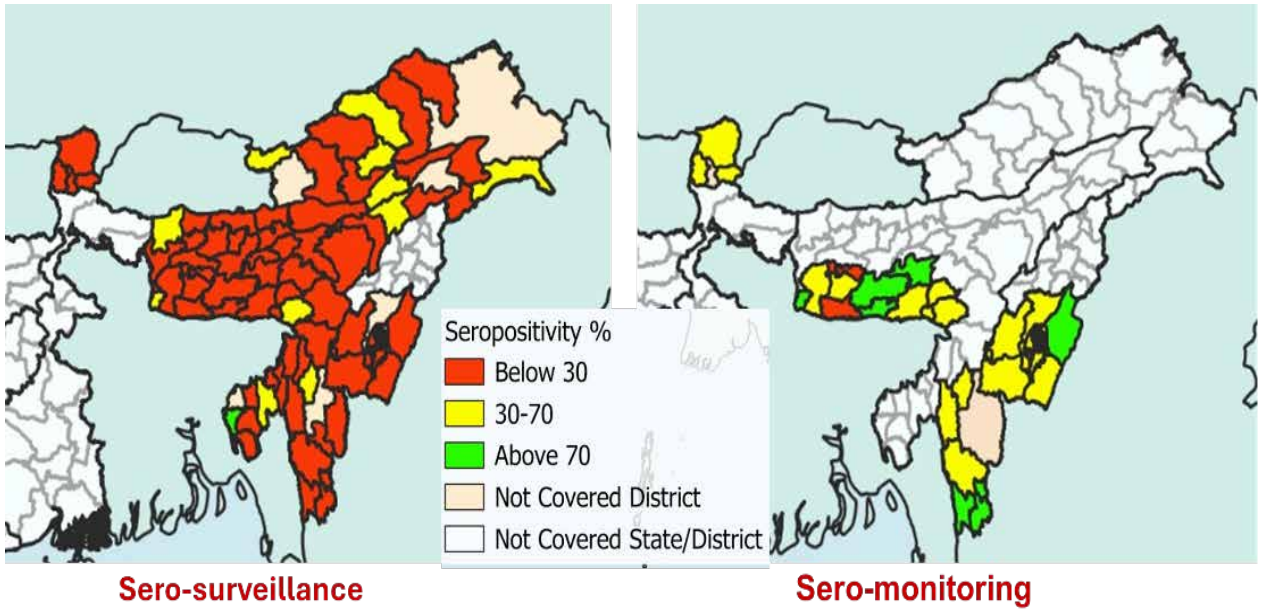



**Fig 18:** Distribution of PPRV antibody prevalence in small ruminants before and after implementation of vaccination in NE-India

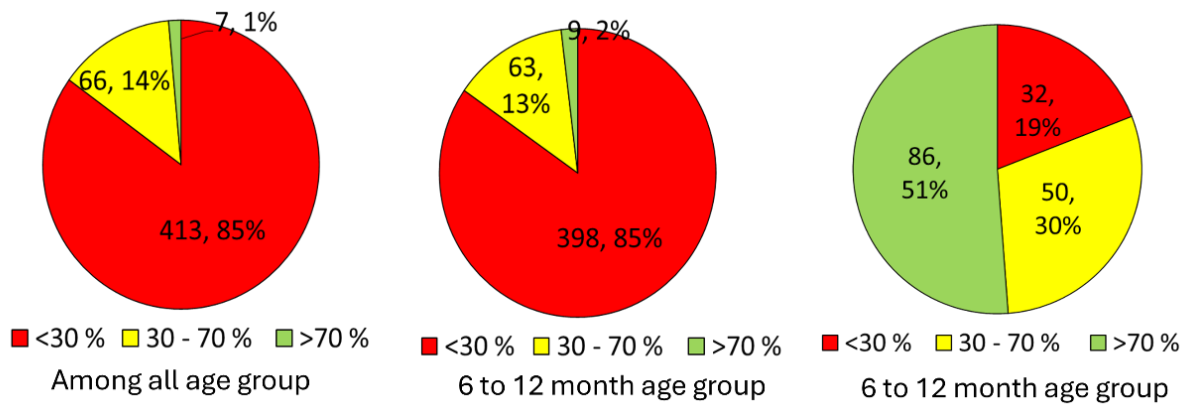



**Fig 19:** Epiunit-based analysis revealed overall and age-specific (6–12 months) seroprevalence and seroconversion rates before and after mass vaccination in Northeast India.

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

## Estimation of Antimicrobial Use (AMU) and Antimicrobial Resistance (AMR) in Small Ruminants in Karnataka

Antimicrobial resistance (AMR) is an emerging public health concern that compromises the effectiveness of treatment strategies, from critical care to routine animal health interventions. A cross-sectional study using multistage random sampling was conducted in 2024 in Tumkur district, Karnataka, to estimate antimicrobial use (AMU) and resistance (AMR) patterns in sheep.

A total of 230 samples were collected, including fecal swabs (n=123), nasal swabs (n=47), milk samples (n=8), environmental samples (n=45) and samples from animal handlers (n=7). These were tested for the presence of Methicillin-resistant Staphylococcus aureus (MRSA) and Extended Spectrum Beta-Lactamases (ESBL)-producing organisms. Antimicrobial susceptibility testing (AST) was carried out using the standard disc diffusion method and multiplex PCR (mPCR) was used to detect antimicrobial resistance genes (ARGs) in isolates. AMU was estimated using the FAO-validated methodology.

The average AMU in Tumkur district was 13.45 g, equivalent to 2.77 mg/kg of population correction unit. The prevalence of ESBL-producing *E. coli* was 2.75% (49/178) in sheep and 2% (9/45) in environmental samples. Among these, 27 isolates were identified as multidrug-resistant (MDR) and exhibited resistance to antibiotics such as cephalosporins, tetracyclines, amoxicillin/clavulanic acid, ampicillin, trimethoprim-sulfamethoxazole, enrofloxacin, ciprofloxacin and piperacillin.

The mPCR analysis detected *TEM* genes in 24 isolates, *SHV* genes in 19 and *Amp*C genes in 34 ESBL *E. coli* isolates. No evidence of the *Mec*A gene (MRSA) was found in sheep, animal handlers, or environmental samples. Furthermore, 24 *E. coli* isolates harbored virulence genes STX1 and STX2. Whole genome sequencing (WGS) of seven ESBL isolates confirmed the predominance of CTX-M-type genes (blaCTX-M and blaTEM), with IncFIB plasmids commonly associated with resistance to beta-lactam antibiotics **(Fig 20)**. These plasmids were found in isolates from both sheep and the environment, indicating possible gene flow between animal and environmental reservoirs.

Multilocus sequence typing (MLST) identified ST106 as the predominant sequence type, while ISKpn19 was the most frequently detected mobile genetic element (MGE) associated with multidrug resistance. Co-occurrence of ESBL genes with other ARGs was noted, including resistance genes for quinolones (qnrS, qnrB), tetracyclines (tetA), fluoroquinolones (oqxB, oqxA), sulfonamides-trimethoprim (sul2, dfrA1) and streptomycin (strA, strB). These findings underscore the critical need for integrated AMU/AMR monitoring in small ruminant systems to inform sustainable livestock health management strategies and antimicrobial stewardship.

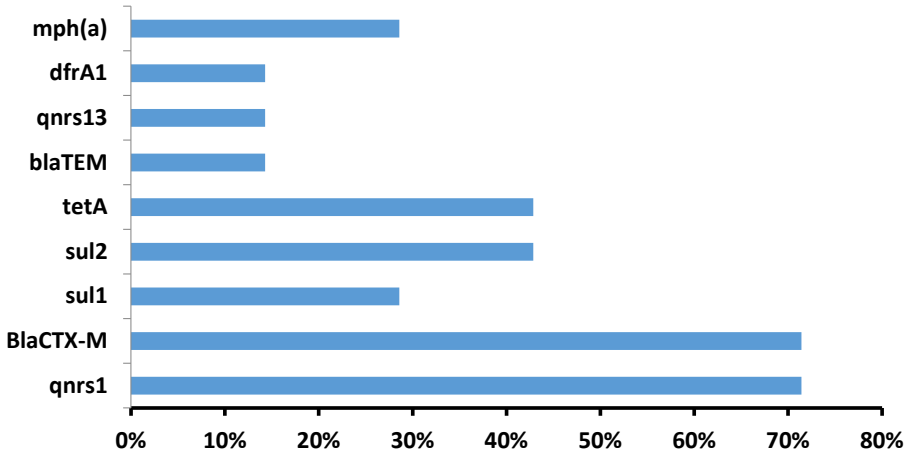



**Fig 20:** WGS analysis of % frequencies of ARGs in sheep in Tumkur District (n=7 isolates)

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

## Serological and Molecular Prevalence of Mycoplasmosis in Small Ruminants

Contagious caprine pleuropneumonia (CCPP) is a highly fatal respiratory disease affecting small ruminants. A cross-sectional study with multistage random sampling was carried out from January to December 2024 to estimate the serological and molecular prevalence of mycoplasmosis in sheep and goats in Karnataka. As per the study design, a total of 200 nasal swab and serum samples (Sheep = 132; Goats = 68) were collected. These samples were processed using Mycoplasma-specific PPLO growth media and DNA was extracted for Mycoplasma 16S rRNA genus-specific PCR.

The molecular prevalence of Mycoplasma spp. was found to be 5.5%. Serological screening revealed a 16% seroprevalence of CCPP (*Mycoplasma capricolum* subsp. capripneumoniae) using ELISA and an overall *Mycoplasma* seroprevalence of 11.6% using the agglutination test **(Fig 21)**.

In addition, a total of 327 serum samples from small ruminants from Karnataka, Himachal Pradesh and Odisha were tested, revealing a 21% seropositivity rate by the Mycoplasma agglutination test. A further 78 serum samples from Bihar were screened, showing a 30% seropositivity rate for CCPP. To support the development of a population-level seroassay, the P60 gene of *Mycoplasma capricolum* species has been cloned and transformed into BL21 cells for recombinant antigen production.

These results provide essential baseline data for implementing region-specific mycoplasmosis surveillance and control measures in small ruminant populations

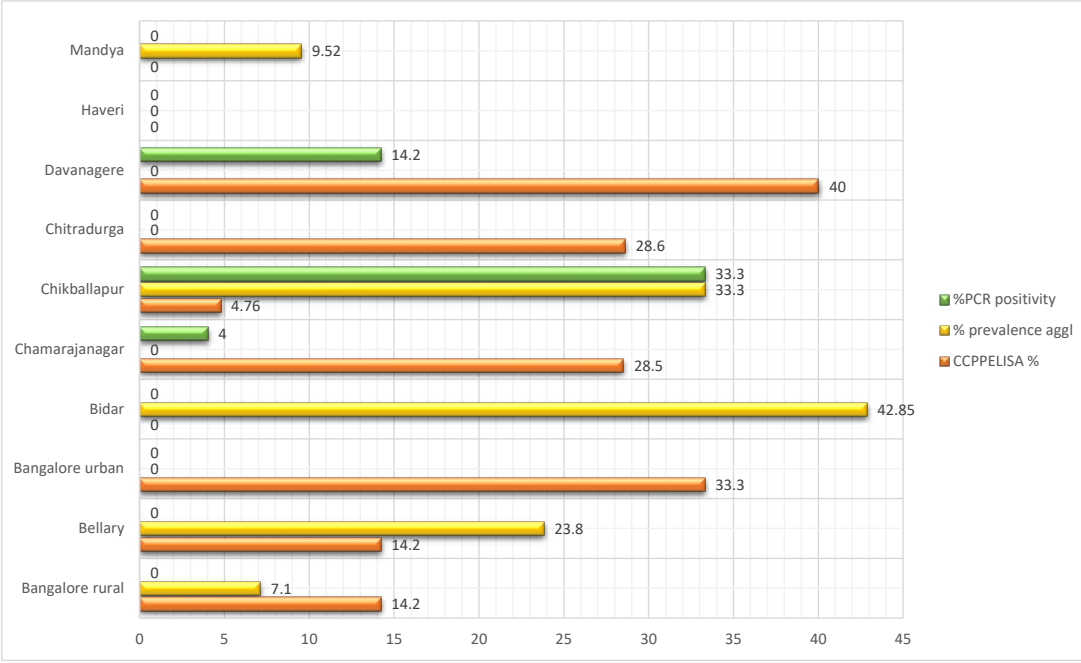



**Fig 21:** District wise serological and molecular prevalence of Mycoplasmosis in small ruminants in Karnataka

*(R Sridevi, D Hemadri, M Nagalingam and B Sumathi)*

## Metabolic Profiling of Biofilm Formation in Pathogenic and Intermediate *Leptospira*: Insights into Adaptive Strategies

This study compared the metabolomic profiles of pathogenic (*L. interrogans* strain Djasiman) and intermediate (*L. fainei* strain BUT-6) *Leptospira* species during biofilm formation. Biofilms were cultivated in EMJH medium, harvested and analyzed using untargeted LC-MS-based metabolomics. Identified compounds were processed with Compound Discoverer 3.2 and functionally analyzed using MetaboAnalyst 6.0, with emphasis on KEGG metabolic pathways.

A total of 59 and 46 metabolites were identified in *L. interrogans* and *L. fainei*, respectively, with 20 shared compounds **(Fig 22)**. Functional analysis revealed common pathways such as thiamine and alanine metabolism. Distinct metabolic signatures were also observed: *L. interrogans* exhibited elevated fatty acid, amino acid and glutathione metabolism, while *L. fainei* showed increased purine, nicotinate and glycerolipid metabolism.

These findings highlight distinct metabolic adaptations during biofilm formation in pathogenic and intermediate *Leptospira*, offering insights into virulence evolution and identifying potential targets to disrupt biofilm-associated persistence and transmission.

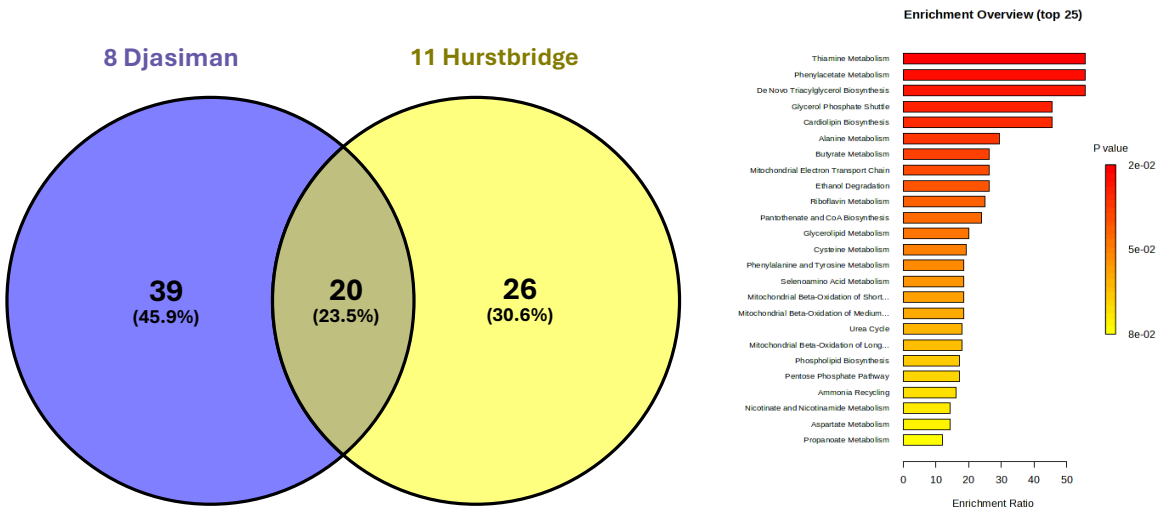



**Fig 22:** Venn diagram depicting the significantly identified metabolites in pathogenic and intermediate *Leptospira* and the overview of enrichment pathways involved by the identified metabolites

*(V Balamurugan)*

## Geospatial and Serogroup-Specific *Leptospira* Antibodies Distribution in Febrile Illness Cases of Humans from Dakshina Kannada District in Karnataka

Leptospirosis, a globally significant zoonotic disease caused by *Leptospira* spp., poses a major public health challenge in tropical and subtropical regions, including Dakshina Kannada, Karnataka, India. The district's monsoon-driven ecology exacerbates disease transmission. Despite its high burden, detailed spatio-temporal trends remain underexplored. This study aimed to examine the spatial epidemiology and serogroup-specific detection of *Leptospira* antibodies among febrile illness cases in Dakshina Kannada during 2022–2023.

Out of 80 samples tested using PCR targeting the *LipL32* pathogenic gene, 13 (16%) were positive. The most frequently identified serogroups were Djasiman, Hurstbridge, Javanica and Icterohaemorrhagiae. Mangaluru reported the highest number of positive cases, with the highest positivity rates observed in Moodabidri (29%) and Sulya (27%) Taluks **(Fig 23)**. Regarding clinical symptoms, fever was the most common, followed by chills/rigors, myalgia, abdominal pain and jaundice. The 30–39-year age group showed the highest prevalence (23%), with a significant association ($P<0.05$). Seasonal peaks aligned with monsoon and post-monsoon months, highlighting the strong association between rainfall and transmission.

This study underscores the critical need for integrated diagnostics, including early molecular detection, to enhance leptospirosis management during peak seasons. The findings inform targeted public health interventions, such as improved water sanitation and rodent control, to reduce the burden in Dakshina Kannada and similar endemic regions. Expanded surveillance of livestock, wildlife and the environment is crucial to understanding reservoirs and contamination sources.

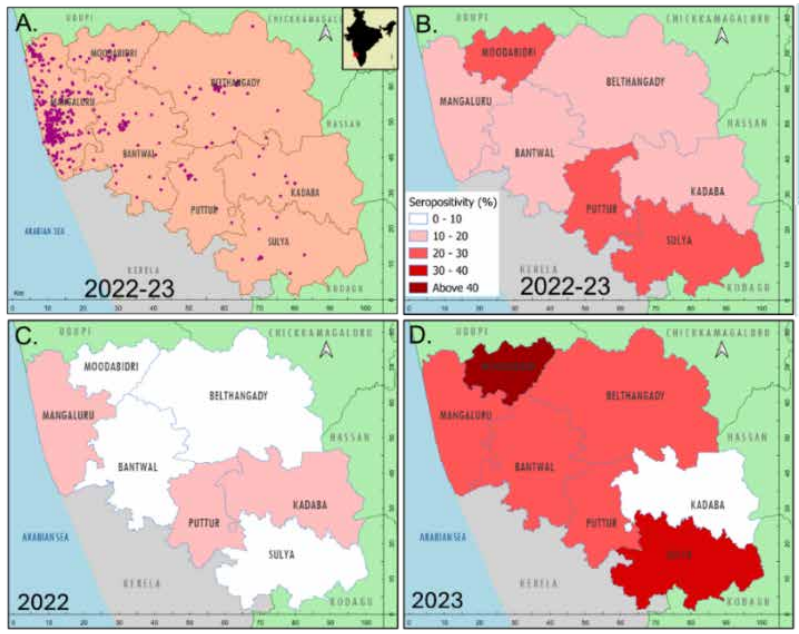



**Fig 23:** A. Leptospirosis Positive case location is depicted (as a Spherical dot). B. Taluk/Tehsil/Block wise percentage seroprevalence for 2022 to 2024, C. for 2022 D. for 2023 in Dakshina Kannada district.

*(V Balamurugan, RK Veena, M Jayashankarand and MR Padma)*

## Environmental and Rodent Surveillance of Leptospirosis in an Endemic Region: Insights from Mangalore Taluk, Karnataka, India

A total of 35 environmental samples, including water, soil, grey water and drainage sources, were collected from affected areas in Mangalore Taluk, along with the trapping of rodents **(Fig 24)**. In addition to environmental sampling, two rodents were captured and screened using the Microscopic Agglutination Test (MAT) and culture isolation. These samples were also subjected to DNA isolation and PCR targeting the *LipL32* gene (for pathogenic *Leptospira*) and 16S rRNA gene (for *Leptospira* genus-specific detection).


**Fig 24**: The map in panel (A) shows the village boundaries of Mangalore Taluk, Dakshina Kannada district, with blue circles indicating the environmental and rodent survey locations. Panel (B) depicts environmental sampling in Karnadu village, Mulki; Panel (C) shows sampling in Thokur village, panel (D) in Hossabettu village, panel (E) in Bunder, panel (F) in Arekere Bail and panel (G) in Baganbilla. Panel (H) displays a rodent captured during the survey in Hossabettu village.

The overall positivity rate for environmental samples was 74.3%, with water samples showing a significantly higher positivity rate (96.2%) compared to soil samples (11.1%). Both rodents tested positive for *Leptospira* DNA and one pathogenic *Leptospira interrogans* isolate was successfully recovered from one of the rodent samples. These findings highlight the potential of environmental reservoirs and rodent carriers in sustaining *Leptospira* transmission in endemic zones.

*(HB Chethan Kumar, V Balamurugan and BR Gulati)*

## Development of an mRNA Vaccine Candidate Against Leptospirosis

Leptospirosis is a major zoonotic disease in tropical regions, caused by *Leptospira* species, with India reporting high prevalence and multiple serovars circulating among livestock. Current vaccines offer only limited, short-term and serovar-specific protection, underscoring the need for a broader and more durable immunization strategy. An mRNA vaccine provides several advantages, including rapid development, precise antigen targeting and long-lasting immunity, making it a promising approach for controlling leptospirosis across diverse epidemiological contexts.

This study reports the ongoing development of an mRNA vaccine candidate against leptospirosis as a collaborative initiative between ICAR-NIVEDI and TIGS, Bengaluru, launched in April 2024. The vaccine targets key antigens, *Lip*L32 and *Lip*L21, which are highly conserved in pathogenic *Leptospira* species. The mRNA encoding these antigens was synthesized, encapsulated in lipid nanoparticles (LNPs) and administered intramuscularly to mice in varying dose groups, including combination formulations.

Significant antibody responses were observed by ELISA in mice receiving 5 µg doses and in those given both antigens, indicating strong immunogenicity. Additionally, recombinant *Lip*L21 and *Lip*L32 proteins were successfully expressed, purified and validated through SDS-PAGE and immunoblotting. These proteins are being employed to standardize ELISA protocols for monitoring immune responses in vaccinated animals. The study presents early evidence supporting the feasibility and promise of an mRNA-based leptospirosis vaccine.

*(V Balamurugan)*

## Slaughterhouse Surveillance for Detecting Zoonotic Spillover of Pathogens

Slaughterhouse environments can serve as sources of zoonotic disease transmission if offal disposal and carcass handling are not properly managed. A surveillance study was undertaken to detect bacterial, viral and parasitic pathogens in such environments. As part of the study, Standard Operating Procedures (SOPs) and a structured questionnaire for environmental sampling and pathogen detection were developed and shared with project partners.

A total of 82 environmental samples—including swabs, drainage water and drinking water—from various sections of the Chengicherla and Amberpet slaughterhouses in Hyderabad were collected during two site visits. Samples were processed for pathogen isolation and identification using cultural, biochemical and molecular methods. From these, 58 isolates of *E. coli* and 10 isolates of *S. aureus* were recovered. Additionally, *Mycobacterium tuberculosis* complex and *Brucella* spp. were detected in 10 samples each. Parasitic eggs of *Haemonchus contortus* were identified in one drainage sample. These initial findings emphasize the need for strengthened surveillance and hygienic practices in slaughterhouses to minimize zoonotic spillover risks. Further studies will provide deeper insights into the prevalence and transmission dynamics of these pathogens.

*(ZB Dubal)*

## Phylogenetic Analysis of *Pasteurella multocida* Strains Based on Repetitive Genes

This study aimed to identify the genetic diversity among *Pasteurella multocida* strains of sheep origin in Karnataka. A total of 352 clinical samples were collected from sheep and goat farms across various regions of the state. Initial identification was performed using conventional methods and species-specific PCR assays. Of the 352 samples, 9% tested positive and 17 isolates of *P. multocida* were recovered.

These isolates underwent phenotypic and genotypic characterization using Repetitive Extragenic Palindromic (REP) and Enterobacterial Repetitive Intergenic Consensus (ERIC)-PCR assays. The REP and ERIC profiles generated multiple amplicons ranging from approximately 100 to 2500 bp. Cluster analysis based on ERIC profiles revealed three distinct clusters, while REP analysis revealed two clusters based on banding patterns **(Fig 25)**.

The findings demonstrate notable genetic diversity among *P. multocida* strains of sheep origin circulating within Karnataka, suggesting ongoing genomic variation even within a defined geographical region.

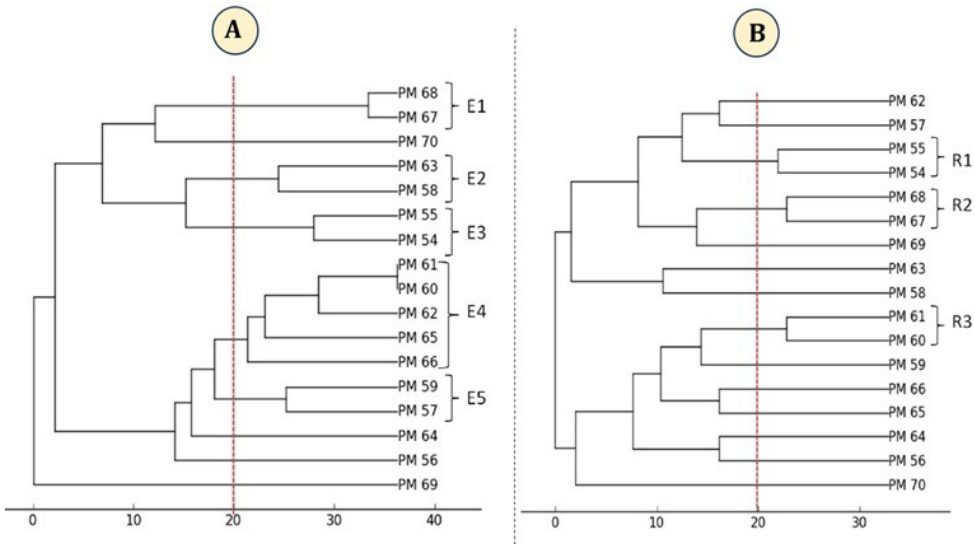



**Fig 25**: Characterization of *P. multocida* strains by repetitive genes-based PCR analysis.
Panel A. Phylogentic tree based on ERIC-PCR profiles Panel B. Phylogentic tree based on REP-PCR profiles

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Screening of *Pasteurella multocida* Strains for Anti-Quorum Sensing Activities

Chronic pasteurellosis in various animal hosts is frequently treated with antibiotics, often leading to multidrug resistance. As an alternative approach, quorum quenching (QQ)—an anti-virulence and anti-biofilm strategy—targets quorum sensing (QS) molecules to suppress pathogenic traits. This study focused on identifying and characterizing QQ properties among *P. multocida* strains isolated from clinical cases in animals.

Anti-quorum sensing activity was assessed using a standard overlay assay. In this method, broth culture of the reference strain *Chromobacterium violaceum* was added to semisolid agar and overlaid on *P. multocida* culture plates. Plates were incubated at 37°C for 24 hours and inhibition of violacein pigmentation (clear zones) around the colonies indicated positive QQ activity. Eleven *P. multocida* strains of sheep origin (associated with pneumonic/ septicaemic pasteurellosis) exhibited QQ activity against *C. violaceum* **(Fig 26)**.

The positive strains were categorized into four QQ activity types based on pigment inhibition zones: low (8%), medium (36%), moderate (50%) and high (16%). The strain *P. multocida* NIVEDIPm9 showed the highest level of pigment inhibition, followed by NIVEDIPm6, NIVEDIPm26,

NIVEDIPm10, NIVEDIPm12, NIVEDIPm17, NIVEDIPm14, NIVEDIPm8, NIVEDIPm11, NIVEDIPm50, NIVEDIPm52 and NIVEDIPm30. Most QQ-positive strains were of capsular type A, except NIVEDIPm17, which belonged to capsular type D.

Biofilm inhibition assays with ethyl acetate crude cell-free extracts demonstrated variable levels of inhibitory activity against *E. coli* (ATCC 25922). NIVEDIPm9 extract showed the highest anti-biofilm activity, followed by NIVEDIPm10. The acyl-homoserine lactone (AHL) degradation activity, specifically for C6-AHL, of NIVEDIPm9 was found to be concentration-dependent.

These findings suggest that certain *P. multocida* strains possess significant anti-QS and anti-biofilm properties, providing a potential basis for non-antibiotic interventions in managing chronic pasteurellosis.

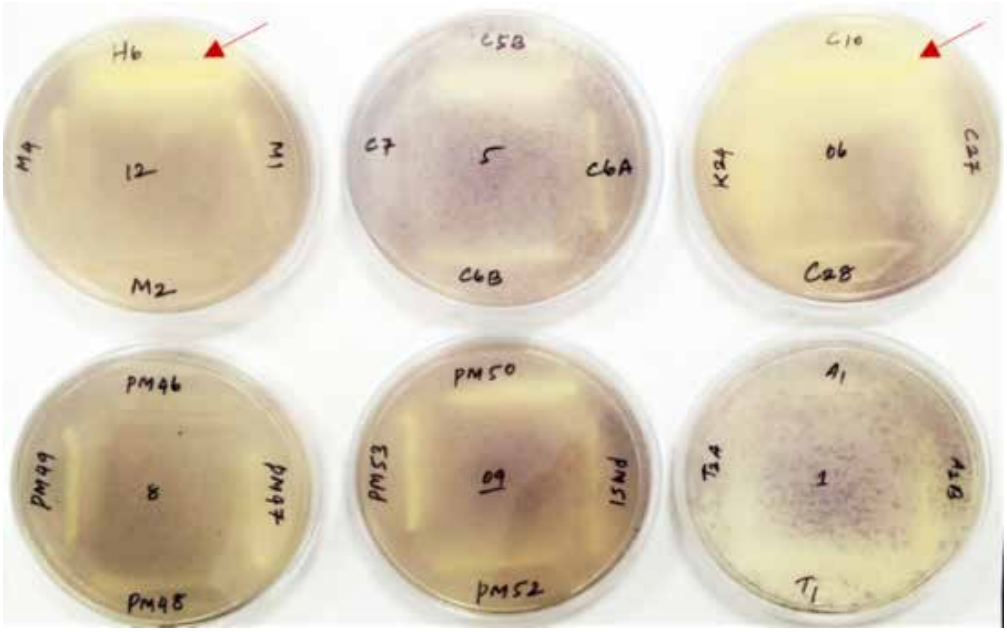



**Fig 26**: Representative petri plates with streaked *P. multocida* strains over laid with pigmentation growth of the *C. violaceum*. A positive result is indicated by inhibition of 'violacein' pigmentation (clear zone, denoted by red colored arrow) of the *C. violaceum* around the colony streak.

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Whole Genome Sequence Analysis of *P. multocida* NIVEDIPm9 Strain of Sheep Origin

The *P. multocida* strain NIVEDIPm9, which exhibited the highest *in vitro* anti-biofilm activity, was subjected to whole genome sequencing and bioinformatic analysis to investigate the presence of MBL fold metallo-hydrolase proteins. Genome sequencing was carried out using Illumina NGS technology and the assembled genome was annotated using standard online tools.

The genome was approximately 2,561,473 base pairs in length with a GC content of 40.17%. A total of 2,596 coding DNA sequences (CDSs) were predicted, along with 6 rRNA and 52 tRNA genes. BLAST analysis of the 16S rRNA sequence confirmed a 99.66% identity with *P. multocida*. A circular genome map was generated and visualized using color-coded maps (**Fig 27**).

BLASTp analysis identified the presence of all major virulence genes, with the exception of *hsf-2*. The strain was classified as sequence type (ST) 288 under the RIRDC scheme and ST 80 under the multi-host MLST scheme and was identified with LPS genotype 6. Notably, MBL fold metallo-hydrolase protein sequences were detected within the genome.

Phylogenetic analysis of metallo-β-lactamase (MBL) proteins was performed using sequences from *P. multocida* NIVEDIPm9 and 15 reference bacterial species. The Maximum

Likelihood method with the JTT matrix-based model (parameter = 47, BIC = 23395.180, AICc = 23086.803) was used for tree construction **(Fig 27)**. The MBL3 (MDA5611061) protein clustered closely with those from *Parvibaculum* sp. and *Bacillus cereus*, while MBL1 (MD5609951) also aligned with proteins from *P. multocida*, *Parvibaculum* sp. and *Bacillus cereus*. The MBL2 (MDA5610199) protein showed similarity with *Labrenzia* sp. and MBL4 (MDA5610329) aligned with *Bacillus*, *Klebsiella*, *Pseudomonas* and *Achromobacter* genera.

This whole genome analysis confirmed the genetic basis of the strong anti-biofilm activity observed in vitro for *P. multocida* NIVEDIPm9, highlighting its potential role in the development of non-antibiotic therapeutic strategies.

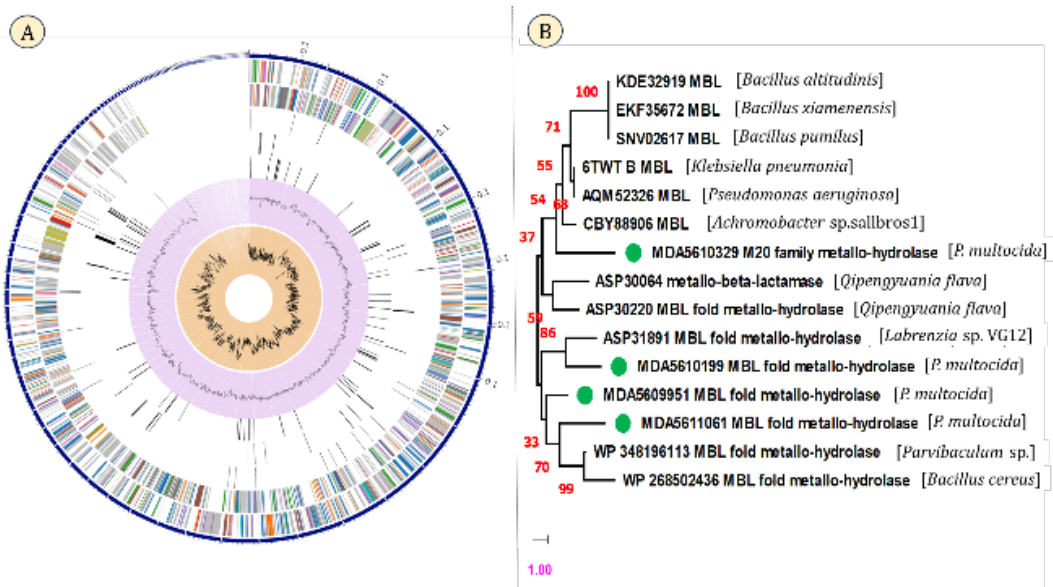



**Fig 27:** Panel A: Circular genome map of *P. multocida* strain NIVEDIPm9. This includes, from outer to inner rings, the contigs, CDS on the forward strand, CDS on the reverse strand, RNA genes, CDS with homology to known antimicrobial resistance genes, CDS with homology to know virulence factors, GC content and GC skew. Panel B: Phylogenetic analysis of P. multocida strain NIVEDIPm9 metallo-β-lactamases (MBL) fold metallo-hydrolase proteins (indicated by 'green' circles).

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Molecular Docking and Heatmap Analysis of *P. multocida* NIVEDIPm9

To further explore the functional potential of the metallo-hydrolase (MBL) proteins detected in the NIVEDIPm9 genome, molecular docking studies were performed to assess their interaction with acyl-homoserine lactone (AHL) ligands. The grid parameters were defined (center: 39.98, 27.17, 12.85; dimensions: 72.92 × 59.00 × 53.64 Å). MBL1 exhibited high binding affinity for 3OH-C10-HSL, C14-HSL, Oxo-C10-AHL and C6-AHL, followed by MBL2 with relatively lower affinities except for 3OH-C10-HSL. MBL3 showed strong interaction with C10-HSL, C12-HSL, 3OH-C10-HSL, Oxo-C10-AHL and C14-HSL. MBL4 had notable affinity for C12-HSL and C6-AHL.

The MBL1, MBL2 and MBL3 proteins had highly binding affinity at 6.2, 5.2 and 6.3 kcal/mol with the 3OH-C10-HSL compound. The MBL1 protein interaction residues were His192, Arg160, Phe11, 96, 163, His57, Trp85 and His132 for the carbon hydrogen bond. MBL2 protein interaction residues Ala54, Asn79, Pro52, Asp306, Arg82, Lys53 (conventional hydrogen bond), Asn79 (unfavourable donor-donor) and Pro52 (alkyl). MBL3 protein interaction residues were Tyr172, Arg176 (conventional hydrogen bond), Lys257, Leu258 and Pro256 (alkyl). MBL4 protein was highly binding affinity at 5.7 kcal/mol with the C12-HSL compound; inter action residues Asn299 (conventional hydrogen bond), Arg373, Ala181,

184 (pi-alkyl) and Ile369, Phe54 and Val330 (alkyl). Histidine kinase (QseC) protein showed significant binding with Oxo-C10-AHL and C8-HSL (binding affinity = 6.5 kcal/mol). Key interacting residues were Gly391, Gln410, Leu400, Val392, Phe448, Tyr367, Leu419.

Additionally, binding affinities of AHL molecules with virulence-associated genes (VAGs) such as *nanH*, *ompA*, *omp87*, *tadD*, *sodA*, *nanB*, *exbB*, *ptfA*, *ompH*, *fur*, *hgbA* and *toxA* were predicted. Heatmap analysis revealed that 3-oxo-C10-AHL and 3OH-C10-AHL exhibited high regulatory potential across most VAGs (binding affinity > -5.5 kcal/mol), particularly stimulating *ompA* and *hgbA*, whereas *sodC* showed no stimulation by any AHL compound **(Fig 28).**

These results highlight the functional versatility of NIVEDIPm9's MBL proteins in interacting with QS molecules and virulence factors, reinforcing its potential role in anti-virulence therapeutic strategies.

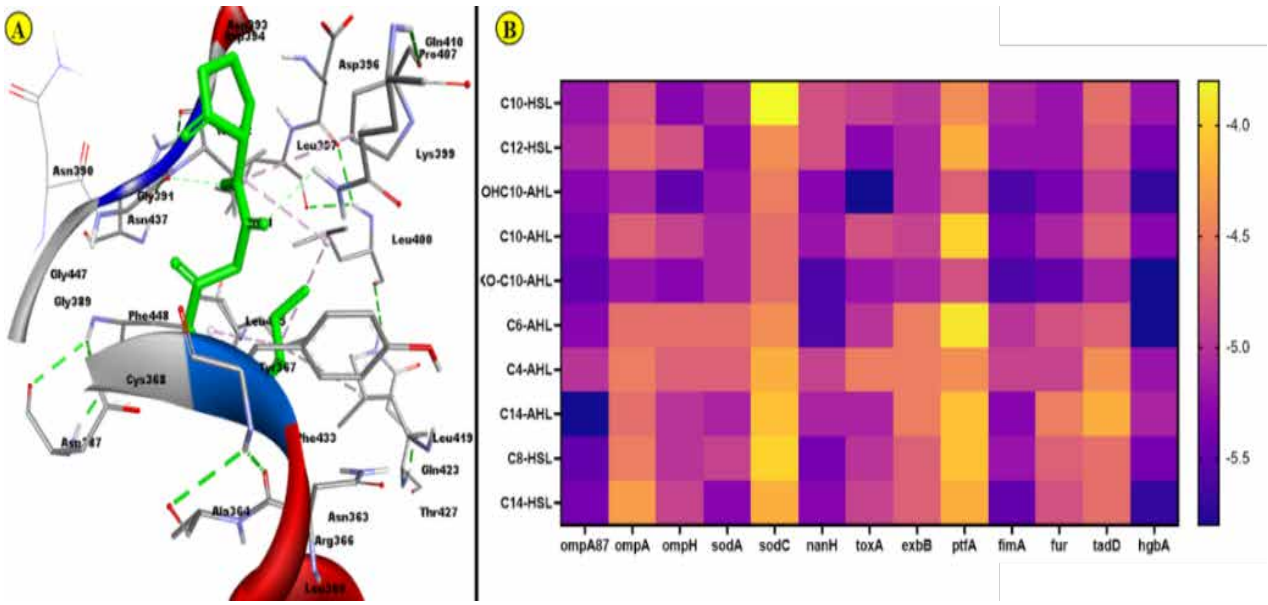



**Fig 28:** Molecular docking (*Panel* A) and Heatmap (*Panel* B) analysis *P. multocida* strain NIVEDIPm9. Panel A. 3D interaction of residues-ligand, Molecular docking study of quorum sensing histidine kinase (QseC) protein of *P. multocida* strain NIVEDIPm9 with Oxo-C10-AHL compound. Panel B. Heat map analysis of VAGs of *P. multocida* with auto inducer compounds.

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Production of Recombinant Exotoxin Antigens of *Bacillus anthracis*

*Bacillus anthracis*, the causative agent of anthrax, secretes three key exotoxins—protective antigen (PA), lethal factor (LF) and edema factor (EF)—which elicit neutralizing antibody responses and serve as promising targets for recombinant subunit vaccine development and immunodiagnostics.

In this study, five recombinant constructs—rPA, rPA20, rPA4, rLFn and rLFn-PA4—representing full-length or domain-specific regions of these exotoxins were designed using the pET28a expression vector and transformed into *Escherichia coli* BL21 (DE3) Codon Plus cells. All constructs were successfully overexpressed and the recombinant proteins were purified using Ni-NTA affinity chromatography.

Hyperimmune sera against rPA were generated in both rabbit and guinea pig models. The rPA antigen was found to be immunoreactive and capable of detecting PA-specific antibodies in random sheep serum samples. Current efforts are focused on the standardization of an indirect ELISA using rPA as the coating antigen and evaluating its potential use in subunit vaccine formulations in animal immunization trials.

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Production of Recombinant Epsilon Toxin of *Clostridium perfringens*

Epsilon toxin (Etx), a major exotoxin secreted by *Clostridium perfringens* Type D strains, is the primary causative agent of enterotoxaemia (ET), a fatal disease in small ruminants characterized by sudden death. Due to its high immunogenicity and pathogenic relevance, Etx is a promising candidate for the development of recombinant subunit vaccines and immunodiagnostic assays.

During the reporting period, the *etx* gene was analyzed using genomic and proteomic tools. Two constructs—encoding the wild-type and a quadruple point mutant of the Etx prototoxin (lacking the signal peptide)—were synthesized and cloned into the prokaryotic expression vector pET28a. These constructs were transformed into *Escherichia coli* BL21 (DE3) Codon Plus cells. Following chemical induction, recombinant Etx prototoxin (rEtx) tagged with an N-terminal His-tag was successfully overexpressed and visualized as a ~36 kDa band on SDS-PAGE **(Fig 29).**

The recombinant Etx protein was purified from both soluble and insoluble cell lysate fractions under native and denaturing conditions using Ni-NTA affinity chromatography on an automated AktaStart system. Hyperimmune sera were raised in rabbit and guinea pig models against rEtx. Preliminary evaluation indicated strong immunoreactivity of the recombinant protein, with detection of Etx-specific antibodies in random sheep serum samples.

Currently, studies are ongoing to assess the immunogenicity and diagnostic potential of the mutant rEtx protein for its potential deployment in ET control strategies.

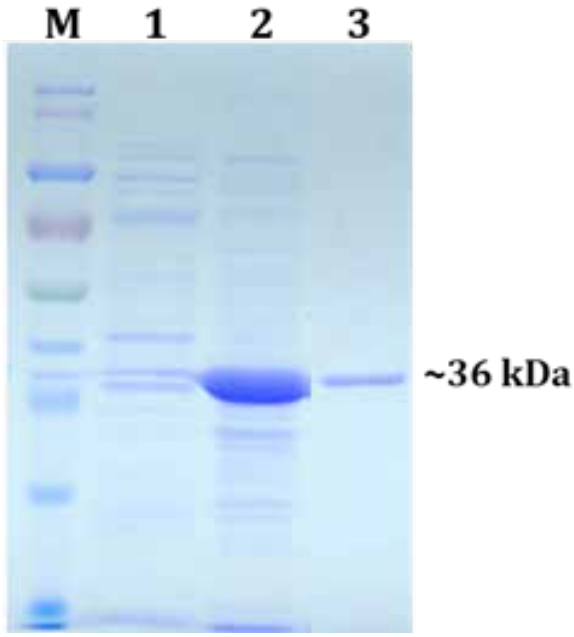



**Fig 29:** SDS-PAGE showing expression and purification of recombinant Etx protein.

[Lane M: Marker, Lane 1: uninduced *E. coli* cell lysate, Lane 2: Induced *E. coli* cell lysate, Lane 3: Purified recombinant Etx protein]

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Production of Recombinant Antigens of CCHFV and GANV

Zoonotic tick-borne viral diseases (TBVDs) such as Crimean-Congo haemorrhagic fever (CCHF), Ganjam virus (GANV) and Kyasanur Forest Disease (KFD) are emerging public health threats in India and globally. During the reporting period, structural and non-structural genes of CCHFV and GANV were analyzed phylogenetically and bioinformatically to assess their diversity, antigenicity, immunogenicity and suitability for heterologous expression.

Based on genetic analysis, the nucleoprotein (NP) genes of CCHFV and GANV were codon-optimized, chemically synthesized and cloned into the prokaryotic expression vector pET28a. Two recombinant clones—pNP-CCHFV and pNP-GANV—were successfully overexpressed in *Escherichia coli* following chemical induction. The expressed recombinant NP proteins (~57 kDa) were purified from the insoluble cell lysate fraction using a denaturation–renaturation method coupled with one-step Ni-NTA affinity chromatography on an Akta Start system.

Bulk-purified recombinant proteins (rNP-CCHFV and rNP-GANV) were used to immunize rabbits and guinea pigs for the generation of specific polyclonal antibodies. Preliminary results showed that rNP-CCHFV effectively detected anti-NP polyclonal sera from immunized rabbits.

Currently, standardization of indirect ELISAs for the detection of CCHFV and GANV antibodies is underway, along with continued production and characterization of polyclonal sera.

*(A Prajapati, MM Chanda and SB Shivachandra)*

## Characterization of Bluetongue Virus Strains/Serotypes and Evaluation as Vaccine Candidates

Bluetongue is a non-contagious, vector-borne viral disease of ruminants that leads to significant economic losses due to mortality and reduced productivity. This study focused on the characterization of circulating Bluetongue virus (BTV) strains across Karnataka and assessed their suitability as vaccine candidates.

A total of 18 BTV isolates were obtained from Tumkur and Koppal districts **(Fig 30)**. Among these, isolates of BTV-4, BTV-12 and BTV-24 were selected for bulk propagation, concentration, inactivation and formulation with adjuvant for vaccine development. The vaccine efficacy was evaluated in sheep through a controlled trial against a commercial vaccine, with antibody titers monitored using i-ELISA and Serum Neutralization Test (SNT).

Further, whole genome sequencing of 55 BTV isolates representing serotypes 3, 4, 5, 9, 12 and 24 was carried out using the Oxford Nanopore MinION platform. An indigenously developed multiplex PCR assay was employed for serotyping and segment-specific primers wer e designed for sequencing.

The analysis identified possible mixed-serotype infections and distinct geographic clustering of isolates. These findings underscore the importance of whole genome sequencing in tracking BTV evolution, monitoring re-assortment events and informing region-specific vaccine strategies.

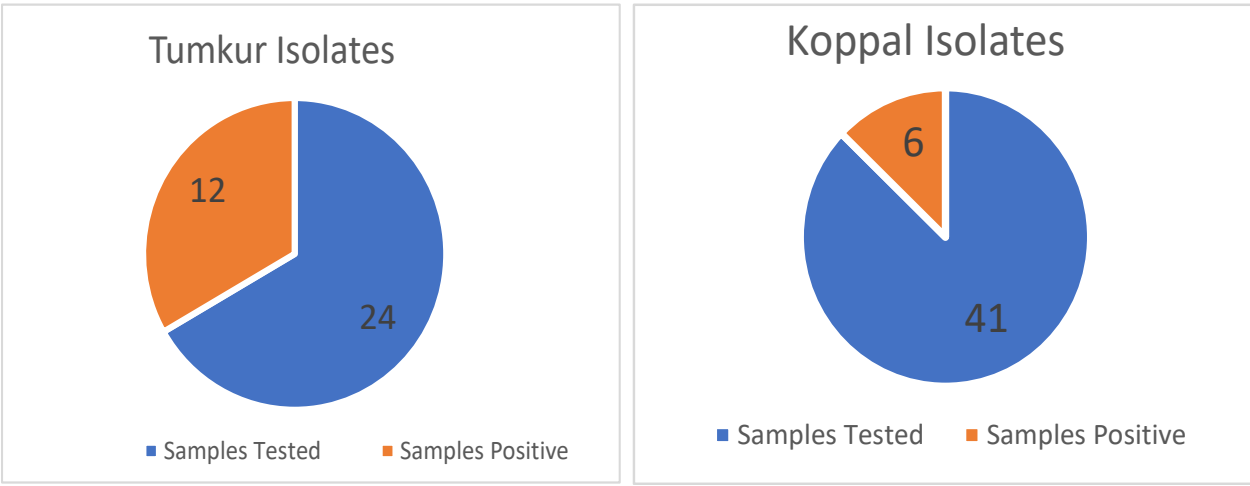



**Fig 30:** Samples processed for BTV isolation and isolates details from Tumkur and Koppal districts in Karnataka

*(D Hemadri and MM Chanda)*

## Development of Recombinant NS1-NS3-Based DIVA-Compliant Competitive ELISA Kit for Bluetongue Surveillance

This study focused on the development of a DIVA-compliant competitive ELISA for bluetongue virus (BTV) based on recombinant non-structural proteins (NS1–NS3). The approach enables differentiation between infected and vaccinated animals, facilitating accurate population-level serosurveillance.

Recombinant NS1 and NS3 proteins were expressed and purified and used to immunize Swiss albino mice. Following immunization, spleen cells were fused with SP2/0 myeloma cells using polyethylene glycol to generate hybridomas. Screening through HAT selection and indirect ELISA yielded three monoclonal antibody (mAb) clones, all of the IgG1 subclass.

Characterization studies showed that two clones, 6F7B5 and 6F7E7, specifically reacted with the NS3-HD region, while the third clone, 2H5F1D3, showed reactivity to the full-length NS1 protein. All three mAbs demonstrated strong diagnostic potential and were selected for incorporation into the competitive ELISA kit.

This recombinant protein-based, DIVA-compliant ELISA assay provides a valuable tool for differentiating naturally infected animals from vaccinated ones, supporting effective surveillance and control programs for bluetongue.

*(D Hemadri and MM Chanda)*

## Pathological and Molecular Epidemiological Study of Sheep and Goat Pox Disease

Sheeppox, caused by the *Sheeppox virus* (SPPV), remains endemic across several regions including India, Central Asia, China, the Middle East and parts of Africa. Owing to its highly contagious nature, the disease warrants rapid and accurate laboratory diagnosis. Molecular tools such as PCR and gene sequencing have proven effective for confirmatory diagnosis, phylogenetic analysis and determining host-specific lineage.

A 12-year epidemiological investigation confirmed the endemic nature and widespread occurrence of sheeppox, with seasonal peaks during winter and summer. Field investigations revealed higher incidence in animals aged 1–2 years, with a greater prevalence observed in females. Clinically, affected animals exhibited characteristic papular to pock skin lesions, especially on hairless areas. Hematological analysis showed a marked increase in total leukocyte count, coupled with a significant decline in haemoglobin, red blood cell count and hematocrit levels.

Gross pathology revealed vesicular to nodular skin lesions, while histopathology showed hyperkeratosis, parakeratosis, acanthosis, hydropic degeneration, necrosis of epithelial cells and distinct intracytoplasmic viral inclusions—hallmarks of sheeppox infection.

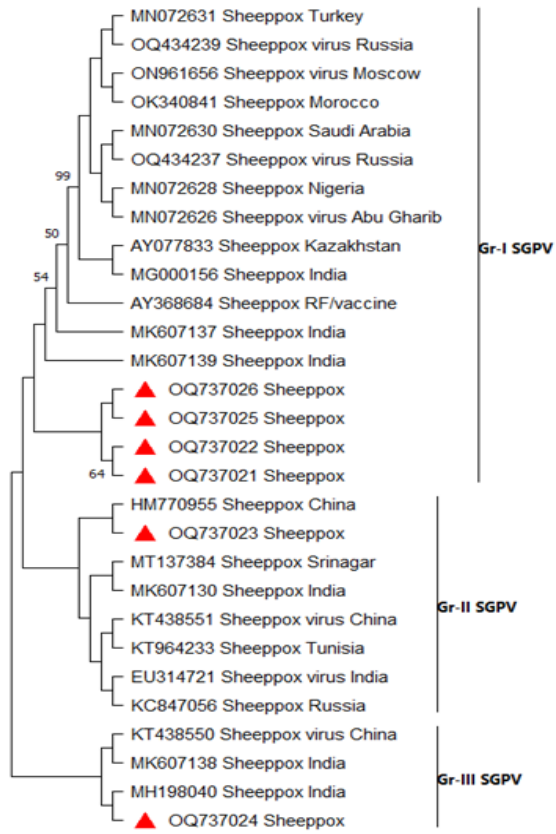



**Fig 31:** Phylogenetic analysis based on a sequence of the full-length P32 gene of SPPV isolates. The present study samples are depicted in red color triangles.

Phylogenetic analysis based on full-length *P32* and *RPO30* gene sequences indicated high genetic similarity with Indian and neighboring country isolates **(Fig 31)**. The analysis also revealed three distinct SPPV subgroups, suggesting lineage specificity and host adaptation.

These findings support the recommendation for a homologous vaccination strategy employing region-specific viral strains to improve protective immunity in at-risk small ruminant populations.

*(GBM Reddy, HB Chethan Kumar, N Shivasharanappa and BR Gulati)*

## Serosurveillance of Sheep and Goat Pox Disease

Sheep and goat pox are economically significant diseases impacting the small ruminant population across India. This study aimed to estimate the seroprevalence of capripoxvirus infection in unvaccinated sheep and goats from five states—Andhra Pradesh, Telangana, Karnataka, West Bengal and Gujarat—through serological screening.

An in-house indirect ELISA (iELISA) was developed and optimized for the detection of capripoxvirus-specific antibodies in sheep and goats. When evaluated against the serum neutralization test (SNT), the iELISA demonstrated high diagnostic performance, with specificity values of 96% (sheep) and 98% (goat) and sensitivity values of 98% and 97%, respectively. No cross-reactivity was observed with antibodies to other transboundary diseases, including Orf, Foot-and-Mouth Disease, Peste des Petits Ruminants (PPR), Haemorrhagic Septicaemia and Brucellosis.

Serological screening of archived field outbreak samples revealed seroprevalence rates of 31.85% in sheep and 47.47% in goats. Across all five states surveyed, the overall seropositivity was 24% in sheep and 19.12% in goats. Higher seroprevalence was observed in females and animals aged 1–2 years. These findings validate the in-house developed iELISA as a safe, sensitive and reliable population-level assay for the serosurveillance and seromonitoring of capripoxvirus infections in small ruminants.

*(GBM Reddy, SB Shivachandra, V Balamurugan and BR Gulati)*

## Evaluation of Anthelmintic Resistance in Small Ruminants

The present study aimed to evaluate the status of anthelmintic resistance in gastrointestinal (GI) parasites of small ruminants in Karnataka, with a focus on *Haemonchus contortus*, *Teladorsagia circumcincta* and *Trichostrongylus colubriformis*. Fresh fecal samples were collected from small ruminants in Bengaluru Rural, Kolar and Hassan districts. Strongyle ova-positive samples were subjected to fecal culture and the third-stage larvae (L3) were harvested, morphologically identified and processed for genomic DNA extraction. Allele-specific PCR targeting the β-tubulin gene was standardized to detect benzimidazole resistance-associated mutations.

In *H. contortus*, out of 120 larval samples analyzed, 66.66% were found to be homozygous susceptible (SS), while 33.33% exhibited heterozygous resistance (RS), with no homozygous resistant (RR) alleles detected. Notably, in Kolar district, all 16 samples showed RS alleles, indicating localized selection pressure. In the case of *T. colubriformis*, among the 52 samples tested, 53.8% carried RS alleles and 46.15% were SS, again with no RR alleles observed. Kolar district showed complete heterozygosity for this species. For *T. circumcincta*, analysis of 80 larvae revealed that 65% were SS, 15% RS and 20% RR. Hassan district showed the highest resistance burden, with eight samples each displaying RR and RS genotypes. Doddaballapur also reported eight RR samples but lacked any RS genotype.

These results highlight significant regional variations in resistance patterns, with Hassan demonstrating a notably higher burden of benzimidazole resistance, particularly in *T. circumcincta*. The findings emphasize the need for targeted, region-specific monitoring and management strategies to mitigate the growing threat of anthelmintic resistance in small ruminant populations.

*(SS Jacob and PP Sengupta)*

## Detection of Acaricide Resistance in *Rhipicephalus microplus* Ticks

Acaricide resistance is an emerging challenge in the management of ectoparasites such as ticks and mites in livestock farms. During the reporting period, a total of 323 ticks were collected from multiple districts across Karnataka—including Bengaluru Rural (Doddaballapura), Bengaluru Urban, Kolar, Hassan, Shimoga and Gadag—and were microscopically identified based on morphological keys, with species including *Rhipicephalus microplus*, *R. haemaphysaloides*, *Hyalomma* spp. and *Haemaphysalis* spp.

An adult immersion test (AIT) was performed using fully engorged female *R. microplus* ticks collected from Doddaballapura to assess deltamethrin efficacy. Groups of twenty ticks were immersed in five different concentrations of deltamethrin (12.5 ppm, 25 ppm, 50 ppm, 100 ppm and 200 ppm), prepared by diluting Butox (1.25%) in distilled water, with a control group treated with distilled water alone. Ticks were monitored for oviposition and mortality for 15 days under controlled laboratory conditions. The results demonstrated a concentration-dependent increase in mortality, with mean adult mortality (MA15) ranging from 10% to 50% and inhibition of oviposition (IO%) varying between 3% and 72%. The calculated $LC_{50}$ value was 179.99 ppm, which is significantly higher than the recommended field dose of 50 ppm, indicating a resistance factor of 13.43 and a Level II resistance status.

To investigate the genetic basis of resistance, molecular detection was conducted by extracting total genomic DNA from individual *R. microplus* ticks and screening for resistance-associated mutations using PCR, PCR-RFLP, sequencing and allele-specific PCR assays. The molecular analysis revealed that 8.3% of ticks were homozygous resistant (RR), 34.7% were heterozygous (RS) and 57.9% were homozygous susceptible (SS). In Doddaballapura, 64% of ticks exhibited heterozygous resistance, while 36% were susceptible. Shimoga showed the highest resistance burden, with 27% RR, 54% RS and only 18% SS ticks.

These findings indicate a rising trend of deltamethrin resistance in *R. microplus*, particularly in the southern districts of Karnataka. The presence of Level II resistance, as evidenced by both phenotypic and genotypic methods, underscores the urgent need for surveillance, rational acaricide usage and integrated tick management strategies to mitigate the further development and spread of resistance.

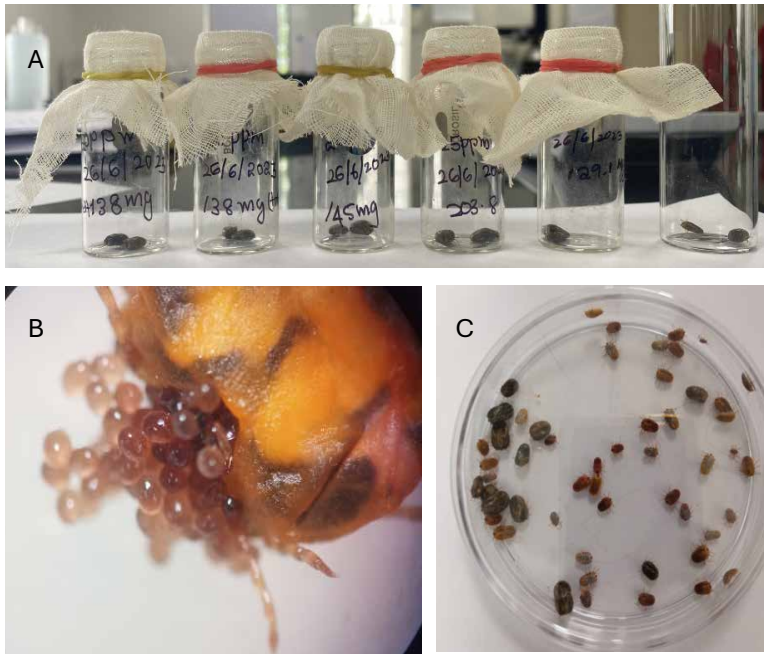



**Fig 32:** A. Field collected ticks being reared in lab B. Reduced oviposition by female tick C. The susceptible ticks knocked out by deltamethrin

*(SS Jacob and PP Sengupta)*

## Testing of Clinical Samples for the Diagnosis of Small Ruminant Diseases

During the reporting period, a total of 1,602 clinical samples—including serum, blood, fecal, nasal, rectal, ocular, conjunctival, tracheal, vaginal swabs and tissue samples—were collected from suspected cases across multiple states (Karnataka, Himachal Pradesh, Punjab, Madhya Pradesh, Delhi, Gujarat, Odisha, Goa and Tamil Nadu) for the diagnosis of viral diseases. These were screened for Peste des Petits Ruminants (PPR) virus using C-ELISA, S-ELISA and RT-PCR and 599 samples were found to be positive for PPRV antigen, antibody, or genome.

In terms of bacterial infections, 368 samples suspected of pasteurellosis were examined using conventional and PCR assays, resulting in 31 (8.42%) testing positive for *Pasteurella multocida*, with 28 isolates recovered. Additionally, among 99 samples tested for *Clostridium perfringens*, only one was found positive. Nineteen blood samples from sheep in Karnataka and Andhra Pradesh, along with four environmental samples from Andhra Pradesh, were screened for *Bacillus anthracis* using protective antigen (PA) and capsule gene-specific PCRs; two (8.7%) blood samples were positive and yielded viable isolates. All 12-foot swab samples tested negative for *Dichelobacter nodosus* by PCR. Out of 11 lung tissue samples from an outbreak in Davanagere, four tested positive for *Mycoplasma ovipneumoniae*, whereas all 70 nasal swabs from Odisha, Himachal Pradesh, Punjab and Karnataka were negative for *Mycoplasma* spp. by genus-specific PCR.

For haemoprotozoan parasites, 126 blood samples from small ruminants in Koppal, Raichur and Davanagere districts of Karnataka were examined via PCR. Anaplasmosis was detected in 20.6% of samples and Theileriosis in 7.1%, with no cases of Babesiosis, Trypanosomosis, or Ehrlichiosis identified. Regional analysis revealed Anaplasmosis prevalence of 15.7% in Koppal and Raichur, 38.46% in Davanagere and 2.4% in Holenarasipura; Theileriosis prevalence was 2.56% in Davanagere, 9.7% in Holenarasipura and 50% in Hessaraghatta. Further screening of 79 samples from Ballari, Hassan and Chikkamagaluru showed 2.53% positivity for *Theileria ovis* and 40.5% for *Theileria luwenshuni*. Phylogenetic analysis indicated that the *T. luwenshuni* isolates were closely related to strains reported from China.

(*Small ruminant disease Epidemiology group*)

## Epidemiological Investigations of Abortions in Sheep and Goats

Abortion outbreaks were investigated in two sheep flocks from Hassan district and one goat farm from Bengaluru Rural district, Karnataka, to identify causative agents and implement suitable control measures. Epidemiological data were collected through farmer questionnaires and biological samples—including serum, vaginal and preputial swabs—were obtained from both aborted and apparently healthy animals. Total DNA extracted from swabs was subjected to genus-specific PCR to detect major abortifacient pathogens of small ruminants, including *Brucella* spp., *Listeria monocytogenes*, *Chlamydia* spp., *Coxiella* spp. and *Toxoplasma* spp. Additionally, serum samples were tested for *Brucella* antibodies using the Rose Bengal Plate Test (RBPT) and indirect ELISA.

In the first sheep flock (n=32), 10 animals (31.25%) aborted over a five-month period, while the second flock (n=30) experienced 4 abortions (13.33%). Serological analysis revealed *Brucella* seropositivity in 65.63% of animals from the first flock and in all aborted ewes from the second flock. Vaginal swabs from these animals were positive for *Brucella* spp. and further characterization using multiplex PCR identified the agent as *Brucella melitensis*. In the goat farm, of 13 aborted animals tested, only one showed *Brucella* antibody positivity, while both breeding males were negative. However, PCR on placental tissue and two out of five vaginal swabs revealed *Chlamydia* spp. as the probable cause, confirmed by sequencing.

These findings underscore the presence of *Brucella melitensis* and *Chlamydia* spp. as significant causes of abortion in small ruminants in the region. Importantly, both pathogens pose serious zoonotic risks, highlighting the urgent need to enhance farmer awareness and adopt stringent biosecurity measures when handling aborted materials.

(*M Nagalingam, R Shome and V Balamurugan*)

## Epidemiological Investigations of PPR in Sheep and Goats

Peste des Petits Ruminants (PPR) is a highly contagious viral disease of sheep and goats, causing significant economic losses in small ruminant farming. This study investigated two PPR outbreaks reported in August 2024 in Karnataka, India—one in a goat flock at Pamenahalli village, Davangere district and the other in Chikkandavadi village, Chitradurga district. The affected flocks comprised 300 goats in Pamenahalli, sourced from Gulbarga and 235 goats in Chikkandavadi, transported from Rajasthan. Despite recent vaccination against PPR, both flocks experienced high morbidity and mortality (Table 3).

Clinically, affected animals exhibited nasal and ocular discharges, frothy salivation, dehydration, high fever, diarrhoea, abortions and sudden death within hours of fever onset **(Fig 33)**. Postmortem examinations revealed severe pneumonia, pneumonic lesions in lungs and intestinal haemorrhages. In Pamenahalli, 30–35 goats died over a span of weeks, with additional deaths occurring on August 7 and 8, 2024. In Chikkandavadi, 14 goats died each day over two consecutive days, with poor ventilation and feeding conditions aggravating the outbreak.

A total of 118 clinical samples were collected—78 from Pamenahalli and 40 from Chikkandavadi. Serum samples were tested for PPRV antibodies by competitive ELISA (c-ELISA), while tissue and swab samples were screened for PPRV antigen using sandwich ELISA (S-ELISA) and RT-PCR. Out of the total, 57 samples tested PPRV positive, including serum (11/25), blood (3/24), nasal swabs (9/22), faecal swabs (6/21), oral swabs (2/4) and tissue samples (26/37). Additionally, group-specific PCR testing for mycoplasma on 25 samples from Davangere and 12 from Chitradurga detected co-infections in 15 and 2 samples, respectively.

The investigation underscored the role of long-distance animal movement from endemic regions in seeding new outbreaks. The findings highlight the urgent need for enforcing quarantine measures, improving biosecurity and strengthening surveillance. Rapid diagnostics and booster vaccination were recommended as immediate interventions to contain disease spread and minimize economic losses.

**Fig 33:** The observed clinical features of affected goats during field investigation.

**Table 3** Details of the descriptive epidemiology of the outbreaks and samples tested and their results

| Place (Village, State) | Population at risk | No. of attacks | No. of Deaths | History of Vaccination | No. Samples tested | No. of Samples Positive | RT-PCR | Virus isolation |
|---|---|---|---|---|---|---|---|---|
| Chikkandavadi Village, Chitradurga district, Karnataka | 235 | 70 | 35 | Vaccinated | Serum: 4<br>Blood: 4<br>Nasal Swab: 5<br>Faecal Swab: 5<br>Oral Swab: 1<br>Tissue: 21 | Serum: 3<br>Blood: 1<br>Nasal Swab: 3<br>Faecal Swab: 2<br>Oral Swab: 0<br>Tissue: 13 | Nasal Swab: 1<br>Faecal Swab: 1<br>Tissue: 5 | Virus was successsfully isolated from intestine sample at Passage level 3 |
| Pamenahalli village, Davangere District, Karnataka | 300 | 72 | 35 | Vaccinated | Serum: 21<br>Blood: 20<br>Nasal Swab: 17<br>Faecal Swab: 16<br>Oral Swab: 3<br>Swab: 5<br>Tissue: 16 | Serum: 8<br>Blood: 2<br>Nasal Swab: 6<br>Faecal Swab: 4<br>Oral Swab: 2<br>Swab: 2<br>Tissue: 9 | Nasal Swab: 1<br>Faecal Swab: 1<br>Oral Swab: 2<br>Swab: 2<br>Tissue: 2 | - |

*(V Balamurugan, SB Shivachandra, M Nagalingam, R Sridevi and SS Jacob)*

## Outbreak Investigation of Suspected Bluetongue in Tumkur, Karnataka

As part of its mandate for bluetongue disease (BT), ICAR-NIVEDI undertakes epidemiological investigations, sample collection and processing, virus isolation, serotyping, nucleotide sequencing and economic impact assessments in selected northern states. During the reporting period, a suspected BT outbreak was investigated in Sira Taluka of Tumkur district, Karnataka. A total of 28 flocks were visited and 51 blood and serum samples were collected. Blood samples were processed for virus isolation in BHK-21 cells, while serum samples were tested for bluetongue virus (BTV) antibodies using indirect ELISA.

Serological analysis revealed that animals over 3 years of age exhibited the highest ELISA positivity rate (66.7%), whereas young animals (0–6 months) showed a 30.0% positivity rate, indicating early exposure **(Table 4)**. The age-wise distribution suggests cumulative exposure to BTV with increasing age.

Serotyping of isolates indicated that BTV-6 was the most prevalent serotype, detected in 12 of 25 positive samples (48%), suggesting its dominance in the affected population. Additionally, 17 of the 25 positive samples showed multiple serotypes, highlighting the common occurrence of co-infections in the region.

**Table 4** Age wise distribution of bluetongue ELISA positivity

| Age Group | Total Samples | ELISA Positive | Positivity Rate |
|---|---|---|---|
| 0-6 months | 10 | 3 | 30.0% |
| 7-12 months | 10 | 3 | 30.0% |
| 1-2 years | 14 | 4 | 28.6% |
| 2-3 years | 8 | 2 | 25.0% |
| 3+ years | 9 | 6 | 66.7% |

*(MM Chanda and CS Sathish Gowda)*

# EPIDEMIOLOGY OF SWINE DISEASES

The Pig Disease Epidemiology Group at ICAR-NIVEDI focuses on comprehensive surveillance and monitoring of pig diseases, with an emphasis on identifying and analyzing risk factors at the animal, farm, and environmental levels. The group studies disease distribution, transmission dynamics, and determinants through field investigations, outbreak analyses, and epidemiological modeling. Additionally, efforts are directed toward the development and validation of diagnostic assays for early detection and control.

The group's objective is to support the design and implementation of science-based interventions aimed at preventing disease introduction and spread. This includes guidance on farm-level biosecurity, vaccination strategies, herd health management, and adoption of improved farming practices. The overarching goal is to safeguard swine health, enhance the productivity and sustainability of the pork industry, and strengthen the livelihoods of pig farmers and the rural economy

## Surveillance and Monitoring of Classical Swine Fever During Implementation of the Control Programme (CSF-CP)

Classical Swine Fever (CSF), or hog cholera, is a highly contagious viral disease affecting domestic and wild pigs. Under the nationwide CSF Control Programme (CSF-CP) initiated by the Government of India, ICAR-NIVEDI contributed to surveillance efforts across multiple states.

During Round I of vaccination, 32,074 pig serum samples were tested from 1,589 epidemiological units across 23 states. Among the 17,008 pre-vaccination samples and 10,785 post-vaccination samples, 4,649 (27.33%) and 7,715 (71.59%) tested positive for CSFV antibodies, respectively, indicating a substantial post-vaccination seroconversion **(Fig 34)**.

In Round II, 13,049 pig serum samples were tested from 558 epi-units across six states, comprising 6,832 pre- and 6,217 post-vaccination samples. Seropositivity was observed in 4,119 pre-vaccination samples (60.28%) and 4,185 post-vaccination samples (67.31%) **(Fig 34)**.

Further, 447 serum samples—220 pre- and 227 post-vaccinated pigs—were evaluated by Fluorescent Antibody Virus Neutralization Test (FAVNT), of which 125 (56.81%) pre- and 194 (85.46%) post-vaccination samples were positive.

In addition to serological monitoring, molecular surveillance was carried out using 612 pig clinical samples (tissues, blood, serum and swabs), with 220 samples (35.94%) testing positive for CSFV by RT-PCR. A total of 53 virus isolates were recovered for further characterization.

Screening for other pig viral diseases was also undertaken. All 127 samples tested for Porcine Reproductive and Respiratory Syndrome (PRRS) virus from four states were negative. Among 14 fecal samples tested for Porcine Circovirus type 2 (PCV2) and Porcine Sapelovirus (PSV), five (35.71%) were positive. In addition, a total of 224 bovine serum samples were screened to assess any potential spillover or cross-species infection. All bovine samples tested negative for CSFV, confirming that cattle did not serve as incidental hosts in the surveyed regions.

These findings confirm a significant seroconversion following vaccination and underline the importance of continued nationwide surveillance to assess vaccine efficacy and monitor virus circulation.

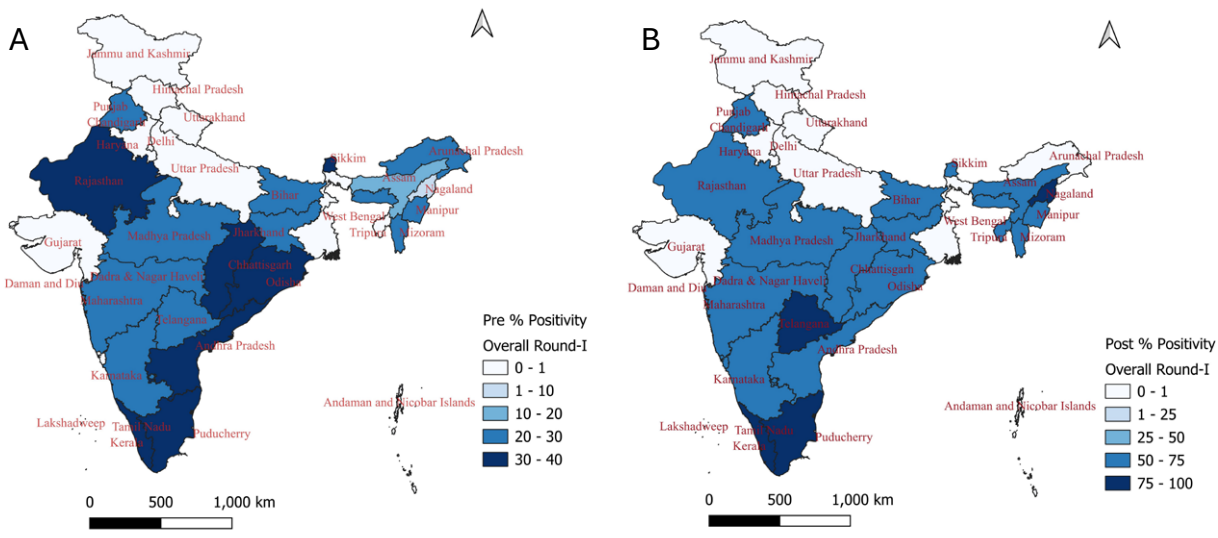



**Fig 34** *:* Pre (A) and post (B) vaccination seromonitoring of CSF in different states in round 1

*(SS Patil, KP Suresh, J Hiremath, HB Chethan Kumar, N Shivasharanappa, R Sridevi, G Narayanan and CS Sathish Gowda)*

## Identification of African Swine Fever (ASF) Risk Factors in Idukki District, Kerala

Understanding the epidemiology of African Swine Fever (ASF) is critical for formulating effective control and prevention strategies. A retrospective case-control study was conducted in the Idukki district of Kerala to identify key risk factors associated with ASF outbreaks. Data were collected using a structured and validated questionnaire covering aspects such as live pig transport, swill feeding practices, proximity to water bodies, roads, slaughterhouses and meat shops, interactions with wild pigs and on-farm biosecurity practices **(Fig 35)**.

The analysis revealed several significant risk factors. Farms affected by ASF were more likely to report frequent sightings of wild pigs in nearby areas (75.0% vs. 15.4%, $p < 0.001$) and entry of wild pigs into farm premises (50.0% vs. 7.7%, $p < 0.001$). Swill feeding emerged as a major contributor to outbreak risk—93.8% of case farms used slaughter waste as pig feed ($p < 0.001$) and 75.0% sourced swill from multiple locations ($p < 0.001$). The pattern and extent of swill feeding were also significantly different between case and control farms (12.5% vs. 69.2%, $p = 0.002$). Poor swill collection practices and use of pork-containing waste were strongly linked to outbreaks ($p < 0.001$). Additionally, lack of vaccination and limited farmer training on pig health were associated with increased outbreak risk ($p < 0.05$).

These findings highlight the urgent need for targeted interventions in ASF control, including the enforcement of swill feeding regulations, strengthening of on-farm biosecurity and enhancement of farmer awareness and training. This study provides critical, evidence-based insights that can inform state and national ASF prevention strategies in India.

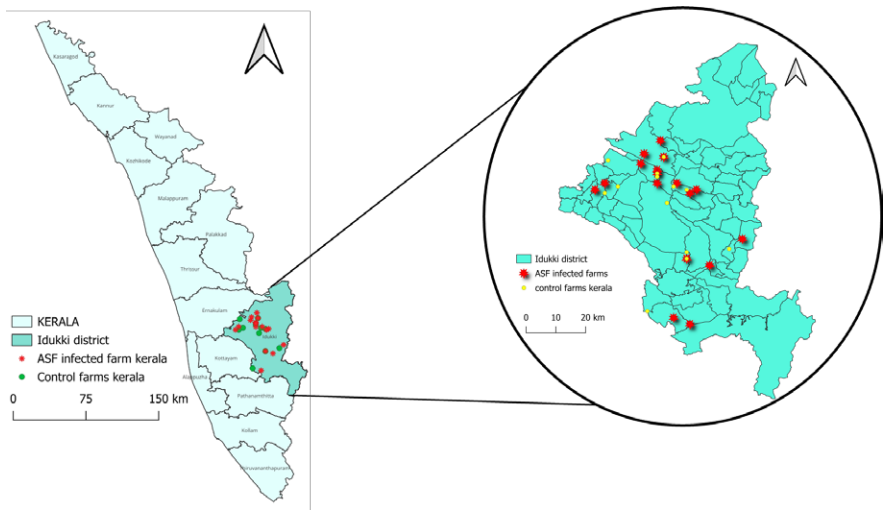



**Fig 35:** Map showing the location of case and control farms surveyed for identification of ASF risk factors

*(J Hiremath, HB Chethan Kumar, SS Jacob, N Shivashararanappa, CS Sathish Gowda, KP Suresh and SS Patil)*

## Investigation of Porcine Teschovirus Outbreak and Genetic Characterization Reveal the Circulation of PTV-12 in Karnataka

Porcine Teschovirus (PTV) is an emerging viral pathogen of swine, associated with neurological and systemic manifestations. During the reporting period, an outbreak suspected to be of PTV was investigated in Karnataka to characterize its clinical features, pathological changes and genetic makeup **(Fig 36)**. Clinically, the disease in affected pigs progressed from early signs of ataxia and hypermetria to severe neurological symptoms such as tremors, paresis, hemiparesis, paralysis and ultimately respiratory distress and death. Necropsy revealed distinct pathological lesions, including meningeal hemorrhages, neuronal degeneration and infiltration of lymphocytes and neutrophils in multiple organs.

Faecal samples collected from clinically affected pigs were used for virus isolation in PK-15 cell lines, leading to the successful recovery of three PTV isolates. Molecular characterization of the isolates was performed through VP1 gene sequencing, a key genomic region used for serotyping. Phylogenetic analysis of the VP1 gene confirmed the presence and circulation of Porcine Teschovirus 12 (PTV-12) as the causative agent of the outbreak.

This investigation highlights the clinical significance of PTV-12 in Indian pig populations and emphasizes the importance of active surveillance, virus isolation and molecular characterization of porcine enteric viruses to inform disease control and management strategies.


**Fig 36:** Clinical changes in pigs affected by PTV. (A) Paresis (B) Hemiparesis

*(J Hiremath, HB Chethan Kumar, SS Jacob, N Shivashararanappa, CS Sathish Gowda, KP Suresh and SS Patil)*

## Investigation of Porcine Abortion Outbreaks in Mandya District, Karnataka Revealed Coinfection of *Brucella* and *Leptospira* spp.

In July 2024, a detailed investigation was undertaken to examine ongoing abortion outbreaks at a pig farm in Mandya district, Karnataka, where repeated culling and restocking over the past year had failed to halt disease occurrence. The outbreak predominantly affected primiparous pigs, with abortion morbidity rates recorded at 52% before culling and 36% post-restocking **(Fig 37)**.

Comprehensive sampling was carried out, including placenta, aborted fetuses, blood, urine, rodent carriers and environmental specimens. Laboratory testing confirmed the presence of *Brucella* spp. and *Leptospira* spp. as causative agents, while tests for *Porcine circovirus* (PCV), *Porcine reproductive and respiratory syndrome virus* (PRRSV), *Porcine parvovirus* (PPV) and *African swine fever* (ASF) were negative. Epidemiological tracing identified breeding boars—sourced from a farm with a prior history of reproductive issues—as the likely origin of infection. Additionally, *Leptospira* was detected in both clinical and environmental samples, indicating significant environmental contamination.

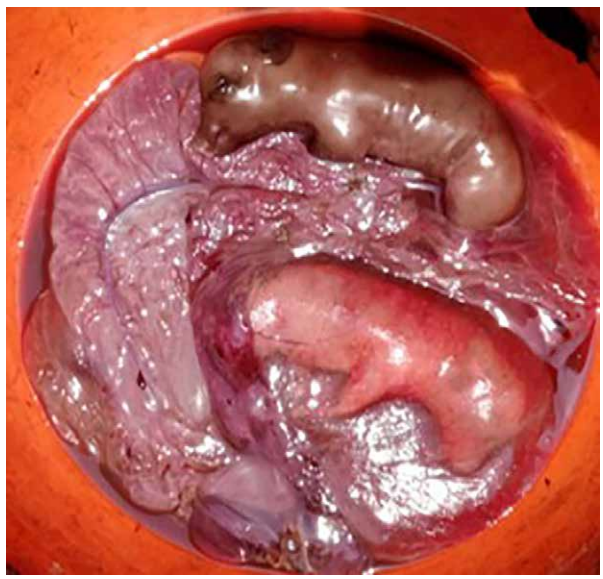


**Fig 37:** Clinical manifestation of porcine abortion and aborted foetus with placental covering.

The findings point to a dual infection with *Brucella* and *Leptospira* as the cause of persistent abortions on the farm. Immediate control measures, including rodent management, improved drainage systems and appropriate disposal of biological waste, were recommended to reduce infection pressure and prevent recurrence. Strengthened biosecurity and scrutiny of breeding stock sources were emphasized to control the spread of reproductive pathogens in swine herds.

*(J Hiremath, HB Chethan Kumar, S. Jacob, N Shivashararanappa, CS Sathish Gowda, KP Suresh and SS Patil)*

## Development of a Recombinant Protein-Based Indirect ELISA for Serological Detection of African Swine Fever in India

African Swine Fever (ASF) is an emerging transboundary disease of pigs, causing significant economic losses and threatening the pig farming sector in India. Currently, there is a lack of indigenous serological diagnostic tools for ASF surveillance and control in the country. To address this critical gap, a recombinant protein-based indirect ELISA was developed for the serological detection of ASF virus (ASFV) antibodies.

The target ASFV genes encoding structural proteins p22 and p54 were cloned into the pET28 expression vector and transformed into *Escherichia coli* for recombinant protein production. Expression of recombinant p22 and p54 proteins was confirmed by SDS-PAGE and further validated using western blot analysis with field sera collected from ASF-positive pigs. The antigenic reactivity of the recombinant proteins demonstrated their suitability for ELISA-based antibody detection.

This newly developed iELISA is likely to provide a promising tool for large-scale ASF sero-surveillance in India and will support national efforts for early detection, monitoring and management of ASF outbreaks.

*(J Hiremath)*

## Expression and Purification of Japanese Encephalitis Virus Recombinant Proteins

Japanese encephalitis (JE) is a mosquito-borne zoonotic viral disease of significant public health concern, predominantly affecting children under 15 years of age. Pigs serve as amplifier hosts, playing a crucial role in the transmission cycle by facilitating virus spread to humans via mosquitoes. Therefore, detection of seropositive pigs is essential to identify high-risk zones and periods of transmission. To facilitate sero-diagnosis and surveillance of JE in pigs, the development of both recombinant antigen-based and whole virus antigen-based in-house ELISAs was undertaken.

For the development of recombinant antigens, three immunologically relevant regions—NS3 C-terminal, NS5 N-terminal and the Domain III of the envelope protein (EDIII)—were cloned into pET28a and pET32a vectors and expressed in *Escherichia coli* BL21 cells under denaturing conditions. The recombinant proteins were purified using Ni-NTA affinity chromatography with imidazole gradient elution **(Fig 38)**.

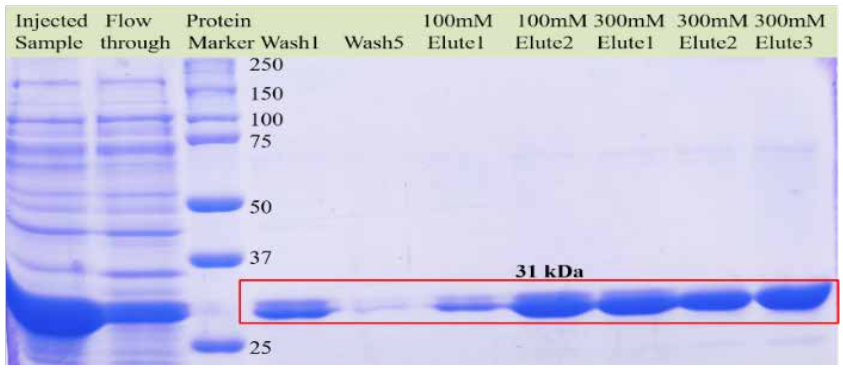



**Fig 38:** SDS-PAGE of purified JEV rEDIII protein

The purified EDIII protein (~31 kDa) was dialyzed using a decreasing urea gradient in PBS. The protein yield ranged from 350 µg/ml to 782 µg/ml across different batches, as estimated by the Bradford assay.

These purified recombinant proteins are being utilized for the development and validation of serological assays to enhance Japanese encephalitis surveillance efforts in swine populations.

*(HB Chethan Kumar, J Hiremath, GBM Reddy, SS Jacob, SB Shivachandra, V Balamurugan and SS Patil)*

## Development of ELISA and Serodetection of Porcine Cysticercosis

Cysticercosis, caused by the metacestode stage of *Taenia solium*, is a neglected tropical disease with the potential for eradication in endemic regions. As a zoonotic parasite, early detection of infection in pigs is crucial to preventing transmission to humans. However, antemortem diagnosis remains challenging due to the absence of indigenous serodiagnostic kits. To address this gap, the present study was undertaken to develop and validate an indirect ELISA for the serodiagnosis of porcine cysticercosis.

*Cysticercus cellulosae* cysts were collected from pig slaughterhouses and total RNA was extracted. Complementary DNA was synthesized and the GP50 gene of *T. solium* was amplified using custom-designed primers. The recombinant GP50 gene was cloned and expressed in a prokaryotic expression system, followed by standardization of purification protocols to obtain high-yield recombinant GP50 protein. The indirect ELISA was developed using this purified recombinant protein and characterized via western blotting, achieving a diagnostic sensitivity of 96.2% and specificity of 98% at a cut-off value of 53% percent positivity.

The developed assay underwent rigorous intra- and inter-institutional validation. Internal validation was conducted at three laboratories within ICAR-NIVEDI, while external validation was performed at CADRAD, ICAR-IVRI (Izatnagar), the Centre for Advanced Faculty Training (Parasitology), Veterinary College, Bengaluru and the Institute of Animal Health & Veterinary Biologicals, Hebbal, Bengaluru.

Subsequently, a total of 2,304 pig serum samples from seven Indian states were screened using the recombinant GP50 ELISA **(Table 5)**. The highest seropositivity rates were observed in Sikkim (7.5%) and Punjab (7.3%), while Karnataka reported the lowest at 3.5%, indicating significant regional variation in exposure.

This study demonstrates the successful development and validation of a sensitive and specific recombinant ELISA for porcine cysticercosis and underscores its utility for nationwide surveillance and targeted control efforts to reduce the zoonotic risk to human populations.

**Table 5** State-wise seropositivity of porcine cysticercosis

| State | Total Screened | Total Positives | Seropositivity (%) |
|---|---|---|---|
| Karnataka | 426 | 15 | 3.5 |
| Punjab | 523 | 38 | 7.3 |
| Chhattisgarh | 208 | 11 | 5.3 |
| Mizoram | 360 | 25 | 6.9 |
| Kerala | 307 | 29 | 4.1 |
| Sikkim | 360 | 27 | 7.5 |
| Tripura | 120 | 8 | 6.67 |
| **Total** | **2304** | **153** | **6.6** |

*(SS Jacob, PP Sengupta and SS Patil)*

## Pig Disease Diagnosis and Sero-Surveillance

To monitor the spread and prevalence of African Swine Fever (ASF) in India, integrated molecular and serological surveillance was conducted across multiple states. A total of 92 pig tissue samples were collected from Karnataka (n=69), Kerala (n=6), Nagaland (n=9), Goa (n=7) and Tamil Nadu (n=1) and screened using PCR for ASFV detection. Out of these, 76 samples tested positive, confirming the presence of ASFV in all five surveyed states. Additionally, 555 serum samples from six states were analyzed for ASFV antibodies using a commercial indirect ELISA, revealing 58 seropositive cases indicative of ongoing or past ASFV exposure in the pig population.

In view of the zoonotic importance of *Taenia solium*, serological surveillance for porcine cysticercosis was undertaken. A total of 260 pig serum samples from Punjab (n=45) and Karnataka (n=215) were tested using an indirect ELISA based on recombinant GP50 antigen. The assay identified 20 seropositive samples, corresponding to seropositivity rates of 8.8% in Punjab and 7.44% in Karnataka. These results suggest active transmission cycles and underscore the potential risk of neurocysticercosis in humans due to consumption of infected pork and poor sanitation.

To assess the role of pigs as amplifying hosts in the epidemiology of Japanese Encephalitis (JE), extensive sero-surveillance was carried out in both endemic and non-endemic areas of Karnataka. As part of the Classical Swine Fever Control Programme (CSF-CP), 598 pig serum samples were collected from 46 locations—equally distributed between JE-endemic and non-endemic districts. Indirect ELISA testing revealed an overall seropositivity of 57%, with significantly higher prevalence in endemic districts (62.87%) compared to non-endemic districts (51.17%) ($p<0.01$), suggesting persistent transmission in high-risk areas.

To complement these findings, 452 pig serum samples from nine states were screened for anti-JEV antibodies using the virus neutralization test (VNT), a confirmatory assay. The overall JEV seropositivity was 40%, with significant variation across states. While Tamil Nadu reported no positive samples, Tripura exhibited the highest seropositivity at 89% **(Table 6)**. These data provide critical insights into the regional epidemiology of JEV in pigs and support the utility of pig-based surveillance as an early warning system for potential human outbreaks.

**Table 6** JE sero-positivity in pigs of different states

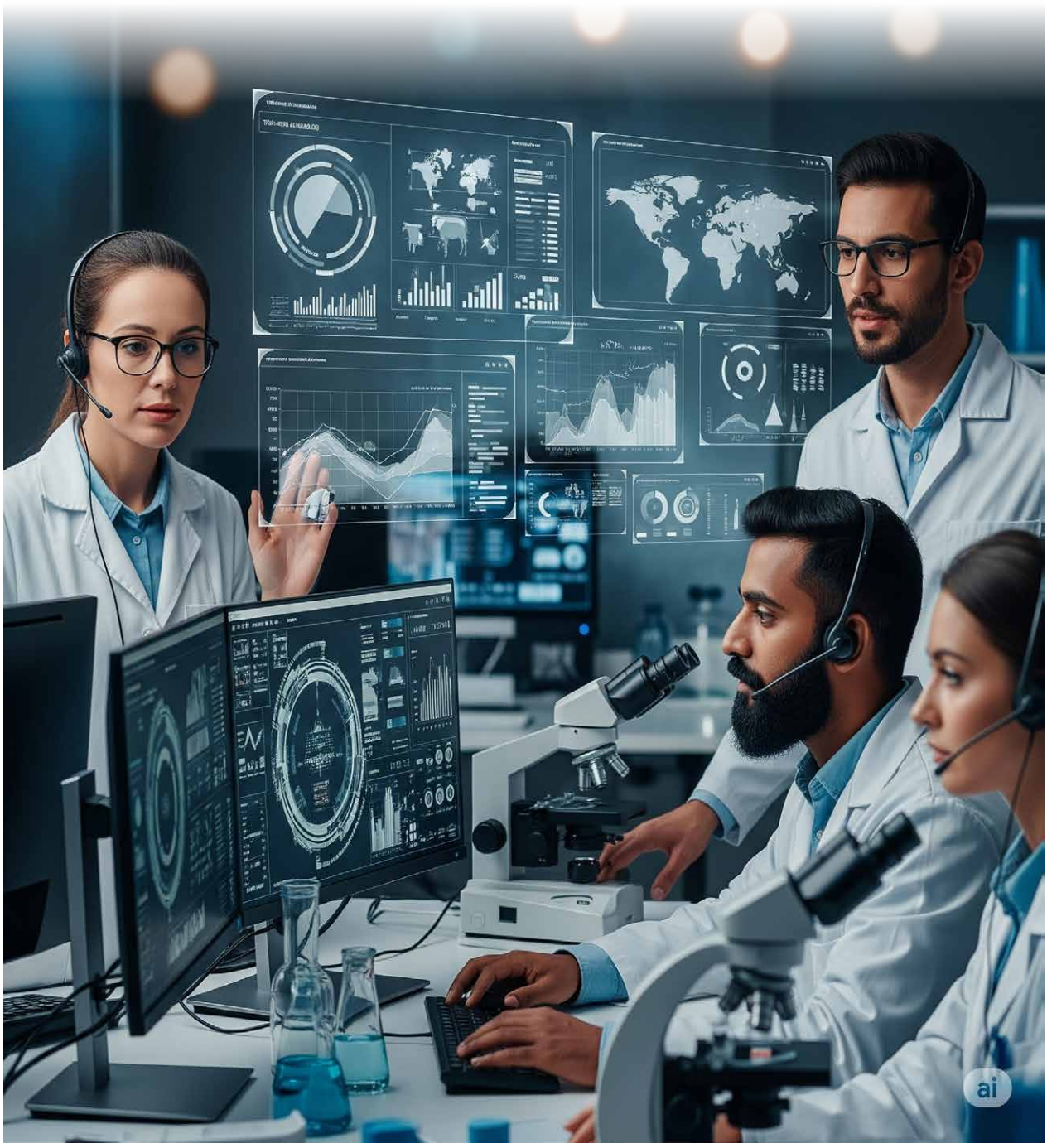
| Sl.No | State | No. Tested | No. Positive (%) |
|---|---|---|---|
| 1 | Andhra Pradesh | 21 | 8 (38) |
| 2 | Assam | 98 | 45 (46) |
| 3 | Chhattisgarh | 131 | 39 (30) |
| 4 | Karnataka | 10 | 2 (20) |
| 5 | Kerala | 17 | 3 (18) |
| 6 | Madhya Pradesh | 82 | 40 (49) |
| 7 | Odisha | 48 | 19 (40) |
| 8 | Tamil Nadu | 18 | 0 (0) |
| 9 | Tripura | 27 | 24 (89) |
| | **Total** | **452** | **180 (40)** |

*(J Hiremath, SS Patil, SS Jacob, HB Chethan Kumar, GBM Reddy, D Hemadri and KP Suresh)*

# ANIMAL DISEASE INFORMATICS & SOCIO-ECONOMICS

The Animal Disease Informatics and Socio-Economics Group at ICAR-NIVEDI focuses on systematic collection, integration, and analysis of livestock disease data with respect to risk, time, and location to inform timely and targeted disease control strategies.

The group manages the AI-enabled National Animal Disease Referral Expert System (NADRES), which integrates disease outbreak data with climatic variables to forecast 15 priority livestock diseases and disseminate early warnings to farmers and stakeholders. In parallel, the group also assesses the economic burden of endemic and emerging diseases and quantifies the cost-benefit of vaccination and control programs to support evidence-based policy decisions.



## Scientifically-Driven Forecasting and Forewarning Systems for Proactive Management of Livestock Infectious Diseases (NADRES V2)

To strengthen proactive disease control and inform evidence-based policymaking, the National Animal Disease Referral Expert System Version 2 (NADRES v2) was developed as an advanced early warning platform that leverages Artificial Intelligence (AI) and Machine Learning (ML) algorithms. The system provides livestock disease risk forecasts up to two months in advance across India by integrating near real-time outbreak data with a broad suite of environmental, climatic and demographic predictors.

In 2024, NADRES v2 incorporated data from 341 district-level and 49 village-level reported outbreaks, enabling risk prediction for 15 major livestock diseases across the country. Twenty ML models were trained and evaluated using 13 performance metrics and the predictor dataset was expanded to 52 parameters, incorporating critical climatic event flags such as extreme temperatures, forest fires and anomalous rainfall. This enhancement allowed for more robust environmental variability assessments.

Each month, approximately 4.88 million data points were processed to generate 9,770 district-level outbreak predictions across 755 districts. To ensure timely communication, ICAR-NIVEDI, in collaboration with the National Informatics Centre (NIC), disseminated 2.11 crore SMS alerts through the FRUITS (Farmer Registration and Unified Beneficiary Information System) platform (Table 7. Additionally, a secure, DLT-enabled alert system was deployed via Fast2SMS in 14 states, delivering 75,641 real-time advisories.

Risk maps **(Fig 39)** and monthly bulletins were regularly updated and shared through the NADRES v2 portal (https://nivedi.res.in/Nadres_v2/), supporting regional disease control planning and preparedness. By the end of the year, the platform's user base had grown to 27.01 lakh, underscoring its growing relevance and outreach in India's livestock health surveillance ecosystem.

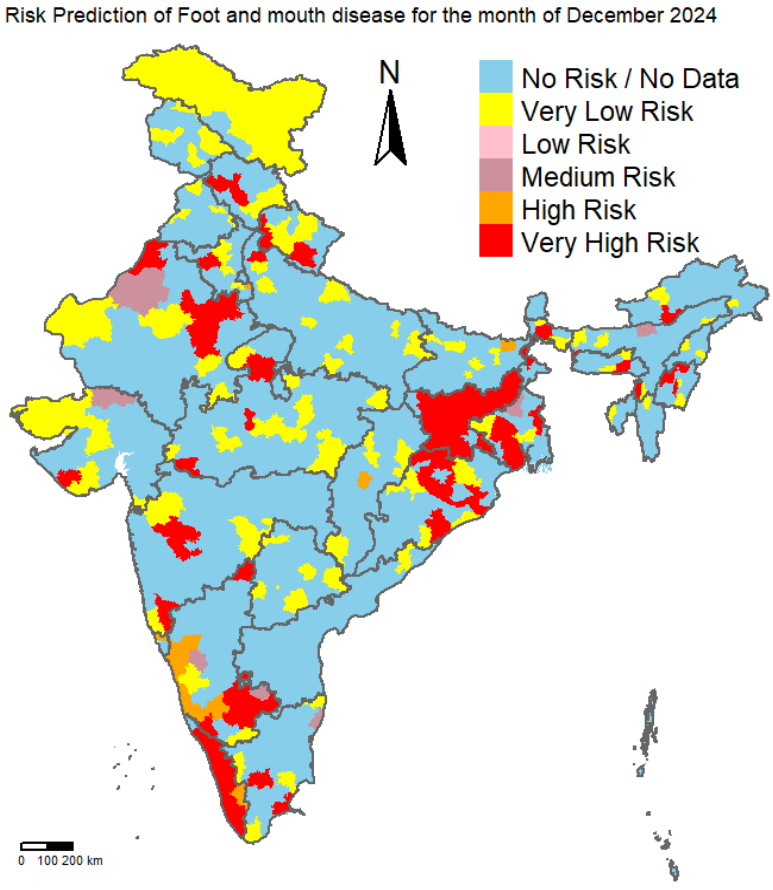



**Fig 39:** Livestock disease forewarning map of FMD for the month of December 2024

**Table 7** Details of SMS alerts sent on the risk of the occurrence of diseases during 2024

| Disease | Total number of SMS |
|---|---|
| Anthrax | 3698556 |
| Babesiosis | 33084 |
| Black Quarter | 5687432 |
| Foot & Mouth Disease | 9445170 |
| Haemorrhagic Septicaemia | 1816170 |
| Lumpy Skin Disease | 171079 |
| Theileriosis | 160889 |
| Trypanosomiasis | 157575 |
| Total | 2,11,69,955 |

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

## Modeling Climate Variability Across Agro-Climatic Zones of India for Livestock Disease Risk Assessment

Climate variability plays a critical role in influencing the occurrence and distribution of livestock diseases. To assess its impact, spatial and temporal modeling of environmental parameters was undertaken using geostatistical and AI-assisted methods. Kriging, a spatial interpolation technique, was applied to map key environmental variables such as the Normalized Difference Vegetation Index (NDVI), land surface temperature, rainfall, wind speed and specific humidity across different agro-climatic zones of India **(Fig 40).**

In southern India, Bland-Altman analysis and Temperature-Humidity Index (THI) modeling were used to examine the climate sensitivity of diseases like Lumpy Skin Disease, Foot and Mouth Disease, Foot Rot and Bluetongue. Kriging-based analysis of forest fire incidence from 2005 to 2022 identified recurring hotspots and their spatial overlap with zones suitable for disease emergence. Similarly, spatial mapping of extreme weather events from 2001 to 2022 provided insights into environmental stressors contributing to disease vulnerability.

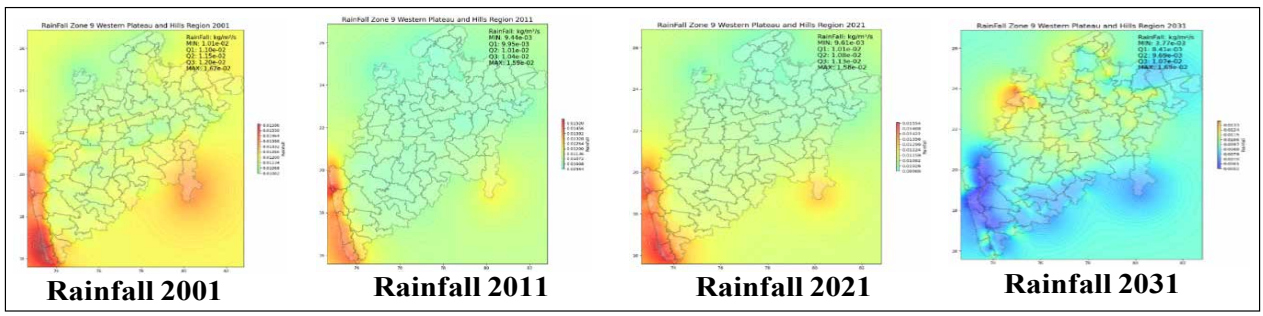



**Fig 40:** Spatial interpolation Modelling (Kriging) on Rainfall for Zone 9 Western Plateau and Hills Region 2001-2021(Observed) and 2031(Predicted)

Ground-truthing was performed through a comprehensive field survey involving 615 farmers across 61 villages in Karnataka, capturing community perceptions on climate change and its perceived impact on livestock health. Furthermore, an AI-supported survey on tick-

borne diseases in Tamil Nadu collected 1,244 samples from 156 villages, identifying four major tick genera and correlating their distribution with local environmental conditions.

The findings highlight significant spatial and climatic influences on livestock disease emergence, supporting the development of climate-resilient disease management strategies.

*(KP Suresh and P Krishnamoorthy)*

## National Sampling Plan for Serosurveillance and Monitoring of Foot-and-Mouth Disease (FMD) and Brucellosis

Foot-and-Mouth Disease (FMD) and Brucellosis continue to pose major threats to India's livestock health, productivity and trade. To support disease control efforts under the National Animal Disease Control Programme (NADCP), a comprehensive national sampling plan was developed in 2024 for systematic serosurveillance and monitoring of these two priority diseases **(Fig 41)**. The initiative aimed to generate robust prevalence estimates, evaluate vaccination effectiveness and provide scientific evidence to inform strategic interventions.

The sampling framework was designed using a stratified, representative approach to cover villages and blocks across all states, enabling unbiased data collection while avoiding complex technical terminology to ensure clarity for implementation at field level. In total, the sampling plan included over 119,000 samples for FMD surveillance, around 79,000 for FMD post-vaccination monitoring and over 111,000 samples for Brucellosis surveillance and seromonitoring. All sampling sites were georeferenced and digitally mapped to support logistical planning and real-time tracking of field activities.

To enhance efficiency and transparency, a dedicated web-based portal (LH-DCP) was developed using secure technologies (PHP, MySQL with TLS/SSL) and integrated with analytical tools (Python, R, SAS) for seamless data capture, storage and analysis. The majority of planned sampling activities were successfully completed, generating actionable insights on disease distribution and vaccination outcomes. This national initiative marks a significant step toward strengthening India's animal disease surveillance system and supporting evidence-based policy formulation.

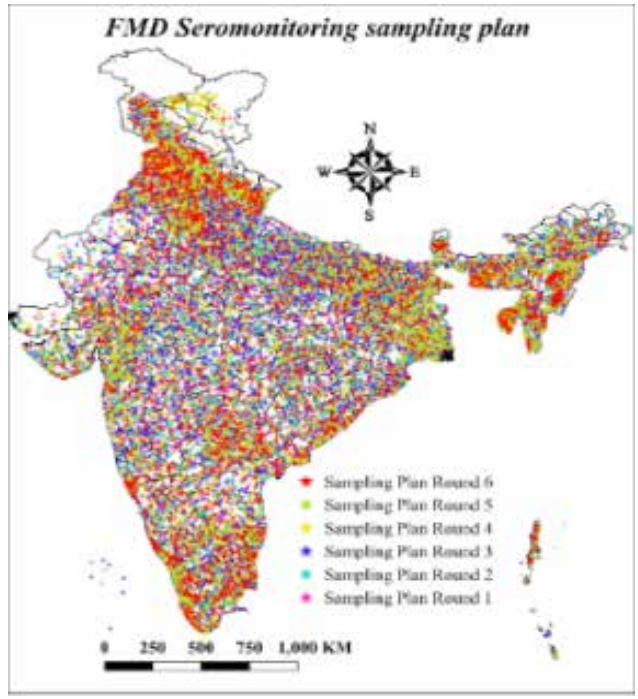



**Fig 41:** FMD Seromonitoring sampling plans

*(KP Suresh and SS Patil)*

## One Health Surveillance Strengthened with AI-Driven Zoonotic Risk Models and National Sampling Plan

To enhance India's preparedness against zoonotic and transboundary animal diseases, an integrated One Health surveillance framework was developed using advanced statistical and computational methodologies. A Bayesian and Maximum Likelihood Estimation (MLE)-based approach was employed to estimate prevalence for 14 prioritized zoonoses—including Brucellosis (14%), Scrub Typhus (12%), Japanese Encephalitis (18%) and African Swine Fever (10%). Based on these estimates, a species-stratified sampling plan was devised covering 46,376 animals across 1,934 villages, aiming to capture 20% cluster-level prevalence with epidemiological rigor.

To study disease transmission, compartmental SEIRSIR models incorporating vital dynamics were developed, alongside GARMA and periodic regression models to estimate time-dependent reproduction numbers ($R_0$) and forecast trends for ASF, Anthrax, LSD, PPR, FMD and Avian Influenza **(Fig 42)**. Ensemble machine learning models were used to generate geospatial risk maps, highlighting high-risk zones and environmental drivers for key zoonotic diseases such as ASF, Anthrax and Avian Influenza.

A centralized, web-based, multi-sectoral data integration platform was deployed to enable real-time sharing of veterinary, medical and wildlife health data. Molecular epidemiology investigations included evolutionary analysis of ASFV, development of epitope-based vaccine design tools and application of machine learning algorithms for risk modeling of Classical Swine Fever and other priority pathogens.

This initiative underscores the operational feasibility and strategic importance of AI-powered, cross-sectoral surveillance for strengthening early warning systems, supporting evidence-based policies and advancing the One Health agenda in India.

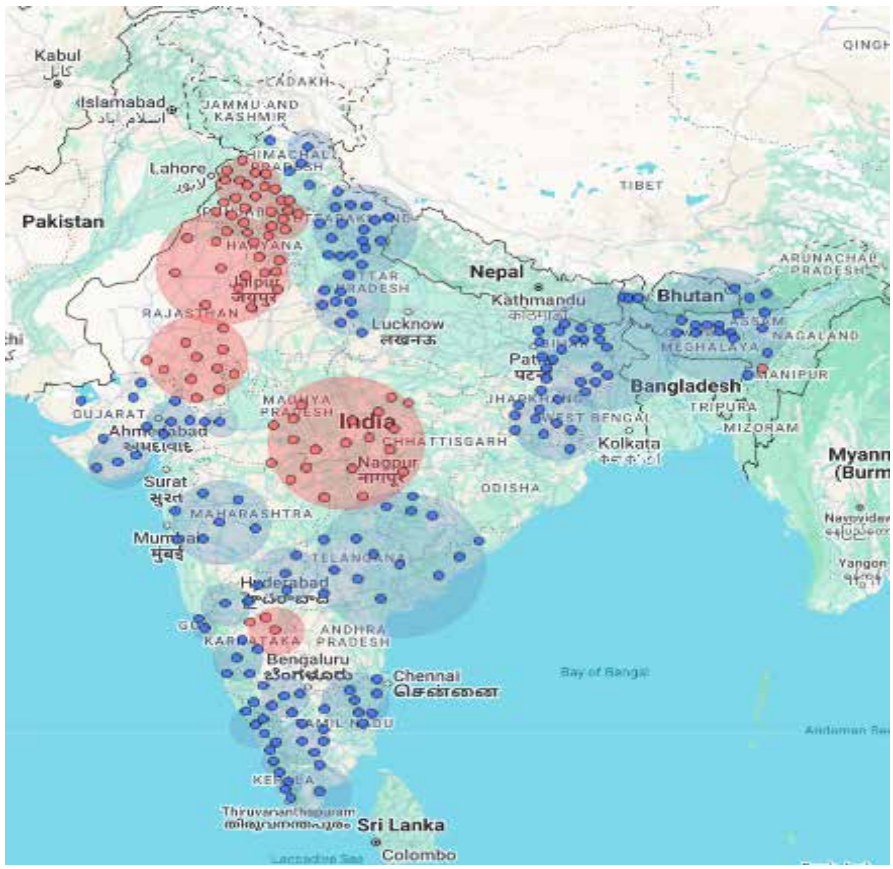



**Fig 42:** LSD Cluster Map Using SaTScan using Poisson Model in India (2019-2024)

*(KP Suresh, SS Patil, D Hemadri and V Balamurugan)*

## Risk Estimation and Prediction of Anthrax Using Artificial Intelligence Systems (OHAI)

Anthrax remains a critical zoonotic threat in several regions of India, necessitating data-driven strategies for its prediction and control. Leveraging a One Health approach, this study integrated socio-economic, ecological and molecular data to estimate and forecast anthrax risk using advanced artificial intelligence systems. Field investigations were carried out in 70 anthrax-affected villages across Tumkur, Bellary, Davanagere, Mysuru and Vijayanagar districts, engaging 552 farmers to understand behavioural risk factors, exposure routes and preventive practices **(Fig 43).**

Historical environmental data (2001–2023), including soil characteristics, land surface temperature, vegetation indices and proximity to water sources, were analyzed to identify key ecological drivers. AI-based models, including Random Forest and Classification Tree Analysis, identified south-eastern Karnataka—particularly Bellary, Davanagere and Chikkaballapura—as high-risk zones for anthrax occurrence. Predictive simulation models such as Epiflows (used for district-level spread in Tumkur and Koppal), Markov chains (state-level progression) and PERT analysis (village-level risk) were applied to trace potential transmission routes and estimate real-time outbreak probabilities **(Fig 44).**

At the molecular level, host genomic analysis revealed critical single nucleotide polymorphisms (SNPs) in the ANTXR2 gene—specifically Arg465Trp and Ala33Ser—associated with increased anthrax susceptibility. Pan-genomic analysis of 112 global *Bacillus anthracis* isolates highlighted evolutionary variations in virulence plasmids pXO1 and pXO2, while transcriptomic data identified differentially expressed genes, offering novel targets for diagnostics and therapeutic development.

To complement technical interventions, community awareness was strengthened through bilingual educational materials and video documentaries tailored to at-risk populations. This integrated, AI-augmented model demonstrates a robust and scalable framework for anthrax surveillance, early warning and targeted mitigation under the One Health paradigm.

**Fig 43:** Risk assessment survey of anthrax in Karnataka by NIVEDI team

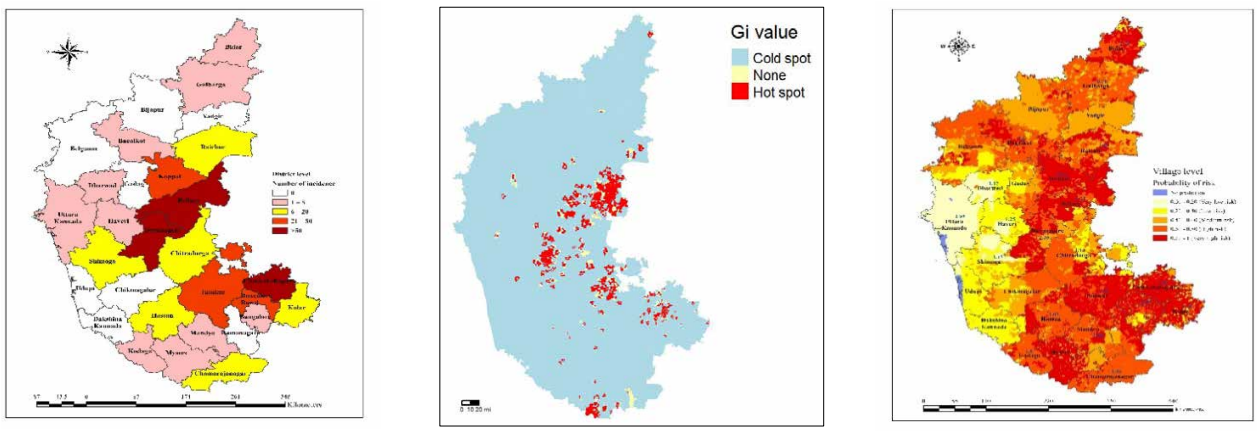



**Fig 44:** Disease map, Hotspot and Risk map of Anthrax in Karnataka

*(KP Suresh, D Hemadri and SS Patil)*

## Mathematical Modelling and Genomics Reveal Japanese Encephalitis Hotspots

Japanese encephalitis (JE) remains a critical public health challenge in India, particularly in endemic states such as Karnataka and West Bengal. This study employed an integrated approach combining mathematical modelling and genomic surveillance to better understand the transmission dynamics and evolutionary patterns of the Japanese encephalitis virus (JEV). Genomic analysis of the E-gene from 105 JEV isolates representing five genotypes (G1–G5) revealed distinct evolutionary trajectories, with Genotype 1 exhibiting rapid evolution and Genotype 3 displaying structural conservation, as determined using BEAST and DNAsp tools. These findings suggest differential genotype-specific adaptation and potential implications for vaccine efficacy and surveillance.

To characterize transmission dynamics, a host-vector interaction model was developed, confirming pigs as principal amplifying hosts and humans as dead-end hosts, consistent with known JE biology. Time-varying reproduction numbers, estimated across five outbreak waves in Karnataka, showed a downward trend, indicating reduced transmission intensity over time. Forecasting using Generalized Auto-Regressive Moving Average (GARMA) models provided valuable early warning insights for outbreak preparedness.

Spatio-temporal analysis of JE cases over a 10-year period (2014–2023 in Karnataka and 2019–2023 in West Bengal) identified persistent hotspots in Raichur, Bellary and Haveri (Karnataka) and Jalpaiguri, Birbhum and Bankura (West Bengal), underscoring the need for region-specific control strategies **(Fig 45)**. Additionally, host immune response markers—ISG15 and CPSF6—were identified as potential biomarkers for JE infection, providing promising targets for diagnostics and therapeutic development. This study demonstrates the power of integrating genomics and predictive modelling to inform evidence-based, localized intervention strategies for Japanese encephalitis control under a One Health framework.

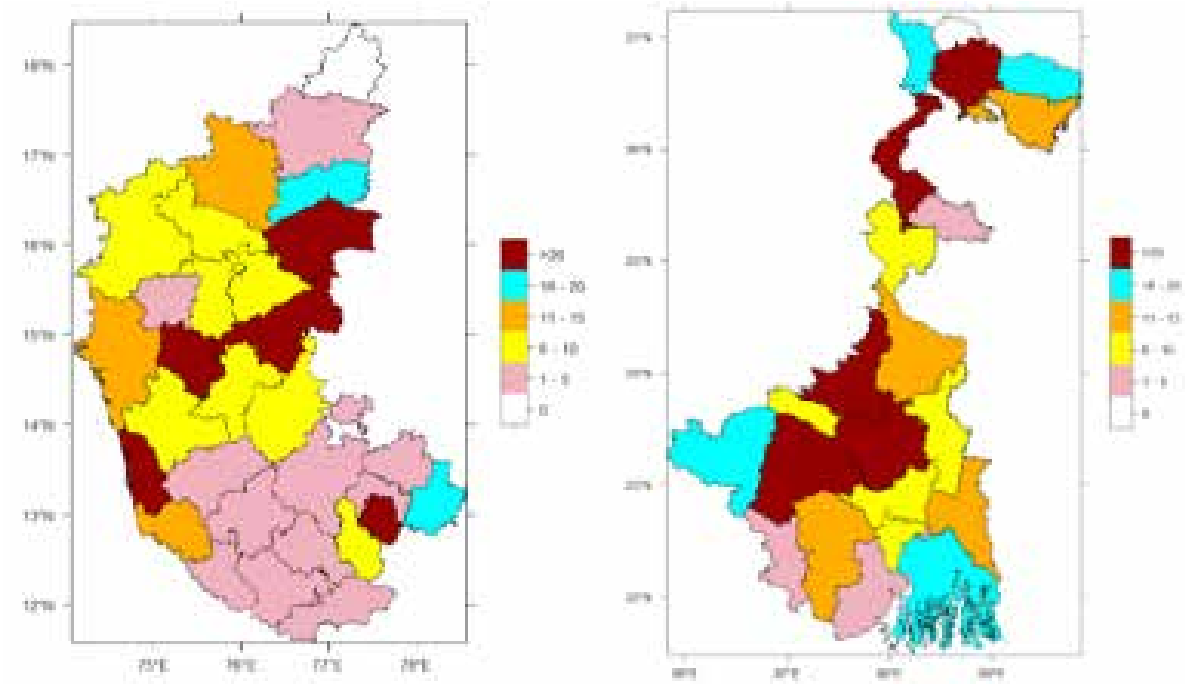


**Fig 45:** Spatial distribution maps of JE in Karnataka and West Bengal states

*(KP Suresh, P Krishnamoorthy and PP Sengupta)*

## Assessment of the Farm-Level Economic Impact of Lumpy Skin Disease (LSD)

During the reporting period, a comprehensive study was undertaken to assess the epidemiological characteristics and farm-level economic impact of clinically diagnosed Lumpy Skin Disease (LSD) in bovines across five states—Tamil Nadu, Karnataka, Madhya Pradesh, Odisha and Assam. Disaggregated data from each surveyed state revealed considerable variation in LSD incidence and associated losses **(Fig 46).**

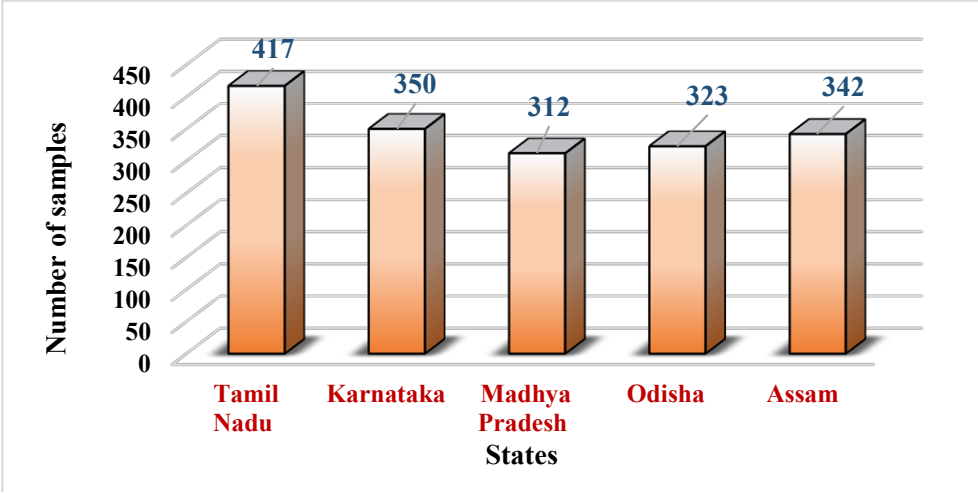



**Fig 46:** Sample Surveyed in different states

Among indigenous cattle, the incidence of LSD ranged from 11.9% in Madhya Pradesh to 49.8% in Karnataka, while in crossbred cattle, it varied between 14.3% in Madhya Pradesh and 28.5% in Assam. Mortality among indigenous cattle ranged from 0.9% (Tamil Nadu) to 16.3% (Karnataka) and in crossbred cattle, from 2.5% (Madhya Pradesh) to 11.1% (Assam).

The economic losses incurred per affected animal were substantial. Milk yield reduction in indigenous cattle ranged from INR 0 to 5,594 (highest in Tamil Nadu) and in crossbred cattle from INR 0 to 9,595 (highest in Odisha). Mortality losses per animal ranged from INR 2,498 to 89,997 in indigenous breeds and INR 2,498 to 83,000 in crossbreds (**Table 8**).

**Table 8** The estimated losses per animal (INR) due to LSD

| State | Species | Total Milk Loss | Mortality Loss |
|---|---|---|---|
| Tamil Nadu | Indigenous | 796.8 -5594.2 | 4996.6-59992.4 |
| | Crossbred | 796.8-8399.6 | 2498.3-59992.4 |
| Karnataka | Indigenous | 1045.8-4946.8 | 4996.6-89996.9 |
| | Crossbred | 896.4-9196.4 | 2498.3-59992.4 |
| Madhya Pradesh | Indigenous | 282.2-1792.8 | 22493.0-44994.3 |
| | Crossbred | 282.2-2797.1 | 14998.1-59992.4 |
| Odisha | Indigenous | 0.0-1195.2 | 9993.2-84999.47 |
| | Crossbred | 0.0-9594.8 | 7992.9-83000.0 |
| Assam | Indigenous | 0.0-1792.8 | 2498.3-57494.1 |
| | Crossbred | 0.0-2000.3 | 5992.6-51999.5 |

Treatment costs also varied widely; allopathic treatment ranged between INR 70 and 11,661 per animal, while Ayurvedic treatment costs ranged between INR 5.8 and 2,855 per animal. Additionally, significant variation was observed in the opportunity cost of labour for managing LSD-affected animals across states.

Overall, LSD outbreaks have imposed a substantial economic burden on livestock farmers due to decreased milk production, mortality, treatment expenses and increased labour costs, highlighting the urgent need for strengthened disease control and vaccination strategies.

*(G Govindaraj, CS Sathish Gowda and G Narayanan)*

## Socio-Economic Upliftment of Scheduled Caste Beneficiaries Through Goat Distribution

To promote inclusive development and livelihood security among Scheduled Caste (SC) families, ICAR-NIVEDI implemented a goat distribution initiative in selected villages under the DAPSC scheme. The program introduced Osmanabadi goats—a hardy and prolific breed—enabling beneficiaries to establish structured breeding and fattening systems suited to local conditions. Over a three-year period, the intervention demonstrated measurable socio-economic and livestock productivity improvements, despite initial challenges related to animal health and management.

A detailed socio-economic impact assessment was conducted among the beneficiaries. The baseline profile revealed that the majority of respondents belonged to the middle-aged category (median age 45 years), with secondary-level education. Notably, 59% of participants were landless and about 40% reported an annual income below ₹40,000, while 49% earned up to ₹79,999. The data reflect the high economic vulnerability of the target group.

Regarding goat enterprise development, the initial flock size in 2021 was 120, which reduced to 88 by year-end due to high mortality. However, in 2022, the program distributed 180 additional goats, expanding the flock to 300 by year-end. By the end of 2023, the total flock size had grown to 337, factoring in new births, purchases and mortality. The establishment of a sustainable breeding and fattening system was observed in the project villages, largely attributed to the adaptability and productivity of the Osmanabadi breed.

***Socio-Cultural and Economic Impact:*** The program's socio-cultural influence was notable, with 44% of respondents reporting a high level of social impact (>3.8, Mean + 0.5 SD). While female beneficiaries were enrolled in the program, ownership and decision-making concerning goat management predominantly rested with men—53% of flocks were owned by men, who also played the primary role in purchase and sale decisions (59%).

Economically, the program showed a substantial impact, with 67.63% improvement in indicators such as income, savings and asset creation. Around 44% of beneficiaries fell into the medium category of economic upliftment (SD = 10.1). On average, respondents reported a 27% increase in income from goat sales, reflecting improved livelihood options and market access.

***Adoption of Scientific Management Practices:*** Adoption levels of recommended goat-rearing practices were also assessed. Housing practices were adopted by 76% of respondents, followed by 69% in health management. However, only 46% of beneficiaries adopted improved nutritional management practices, suggesting the need for intensified capacity-building initiatives focused on balanced feeding and mineral supplementation.

Overall, the intervention not only contributed to increased goat productivity and income but also enhanced the socio-economic resilience and social mobility of SC families in the project area. The results reinforce the potential of livestock-based interventions as a tool for targeted rural development and inclusive growth.

*(G Narayanan, CS Sathish Gowda and R Sridevi)*


**Hands-on Training on GIS Application for Zoonotic Disease Surveillance and Mapping**

# 04

# Capacity Development, Education and Trainings

## Entrepreneurship development

### Promotion of Agri-Startups through NaaViC Grant-in-Aid Support

NaaViC continued its commitment to nurturing agri-startups under its flagship programs NEO and NEST, now in their sixth year of implementation. A new initiative, NUZEN, was launched to support aspiring student innovators, offering grant-in-aid support of up to ₹4 lakhs. During the reporting period, the 3rd RIC meeting was held to evaluate the 3rd to 7th cohort startups and recommend the release of the second tranche of funding. Physical verification of 8th cohort startups was conducted, along with progress evaluations for cohorts 1 to 7. The 4th RIC meeting assessed the performance of the 1st cohort and recommended the release of the third tranche for four startups. Additionally, the RC meeting recommended grant-in-aid worth ₹44 lakhs for six startups from the 8th cohort, supported by the Ministry of Agriculture & Farmers Welfare, GoI.

The 9th cohort call for proposals was also launched, inviting agri-startups to seek financial support ranging from ₹5 to ₹25 lakhs for prototyping and commercialization. This round received 274 applications (NEO: 140; NEST: 134), of which 62 were shortlisted and 39 entrepreneurs were selected for a one-month Agripreneurship Orientation Program.

### Promotion of Agri-Entrepreneurship through NaaViC Flagship Programs

NaaViC, ICAR-NIVEDI, actively promoted entrepreneurship under its flagship initiatives NEXUS and NOVICE, offering year-round orientation programs and workshops. A new incubation support program, NOVABEE, was introduced to encourage microenterprises and small businesses in agriculture and allied sectors. To strengthen the entrepreneurial ecosystem, NaaViC signed six MoUs with various institutions and conducted 3 workshops, 15 sensitization programs and 6 orientation programs, training over 1,500 youth and startups.

A pioneering State-Level Incubator Conclave was hosted, bringing together 33 incubators from Karnataka, with participation from the Bangalore Chamber of Industry and Commerce (BCIC) and the Department of Electronics, IT, BT and S&T, Government of Karnataka.

Four Entrepreneurship Development Programs (EDP) were organized in collaboration with partner institutions, benefiting over 130 participants with knowledge on agri-business opportunities. NaaViC also showcased its initiatives and supported startups at major events, including the National Horticulture Fair, Krishi Mela, Agri Future Forward, Ingenium 2024 and the National Agri Startup Expo, engaging over 2,000 young entrepreneurs and 200 farmers.


Outreach through social media extended to over 30,000 people across India. Overall, NaaViC successfully incubated 44 startups, supported by the Ministry of Agriculture & Farmers Welfare, GoI, resulting in the creation of over 80 direct and 2,500 indirect employment opportunities for Indian youth.

| Entrepreneurship development programmes (EDP) by Naavic | | | | |
|---|---|---|---|---|
| **Sl No.** | **Name of Seminar /Workshop /EDP/Training** | **Venue** | **Duration (Days)** | **Date** |
| 1 | Workshop on "Design Thinking, Critical Thinking and Innovation Thinking" | Channabasavesh-wara Institute of Technology, Gubbi | 3 | 03-05 January 2024 |
| 2 | Orientation program on "Entrepreneurship op-portunities in Agriculture & Allied sectors" | ICAR-NIVEDI | 1 | 12 Januryy 2024 |
| 3 | Orientation Program on Startup opportunities in the Agribusiness sector | Vellamad College, Madurai | 1 | 27 March 2024 |
| 4 | World Intellectual Property Day-Intellectual Property (IP) and the sustainable Development Goals (SDGs) | ICAR-NIVEDI | 1 | 30 April 2024 |
| 5 | State Level Incubators Conclave | Karnataka Science and Technology Academy (KSTA), Bengaluru | 1 | 17 May 2024 |
| 6 | Orientation program on NUZEN | IVRI, Bengaluru | 1 | 06 August 2024 |
| 7 | Orientation program about the NUZEN program | Veterinary College, Hassan | 1 | 20 August 2024 |
| 8 | Orientation program about NUZEN program | ICAR-NIVEDI | 1 | 21 August 2024 |
| 9 | Workshop on "Waste to Wealth" | ICAR-NIVEDI | 1 | 01 December 2024 |
| 10 | One Month training on Agripreneurship Orienta-tion Program<br>[For the 9th cohort startups] | ICAR-NIVEDI | 31 | 27 October to 27 November 2024 |
| **Entrepreneurship Development Programs (EDP) in collaboration with different Institutes** | | | | |
| 1 | EDP on Entrepreneurship in Sheep and Goat Farming | Veterinary College, KVAFSU, Hebbal, Bengaluru | 3 | 28 February 2024 to 01 March 2024 |
| 2 | EDP on Entrepreneurship in Sheep, Goat, Pig Farming | Veterinary College, Hassan. | 3 | 18-20 March 2024 |
| 3 | EDP on Entrepreneurship in Pig Farming | Veterinary College, Hebbal, Bengaluru | 3 | 25-27 March 2024 |
| **Meetings** | | | | |
| 1 | 4th RIC meeting for 1st Cohort Entrepreneurs | ICAR-NIVEDI | 1 | 05 January 2024 |
| 2 | 2nd RIC meeting for 8th Cohort Entrepreneurs | ICAR-NIVEDI | 2 | 12-13 February 2024 |
| 3 | RC meet for 8th Cohort Entrepreneurs | ICAR-NIVEDI | 1 | 09 March 2024 |
| 4 | ICAR-NAIF-ABI Advisory Committee Meeting | ICAR-NIVEDI | 1 | 21 March 2024 |
| 5 | 3rd RIC meeting for 3rd Cohort Entrepreneurs | ICAR-NIVEDI | 1 | 20 June 2024 |

| | | | | |
|---|---|---|---|---|
| 6 | 3rd RIC meeting for 4th Cohort Entrepreneurs | ICAR-NIVEDI | 1 | 20 June 2024 |
| 7 | 3rd RIC meeting for 5th Cohort E Entrepreneurs | ICAR-NIVEDI | 1 | 21 June 2024 |
| 8 | Annual ABI Review Meeting (Virtual) | ICAR, IPTM unit, New Delhi | 1 | 02 August, 2024 |
| 9 | 3rd RIC meeting for 6th Cohort Entrepreneurs | ICAR-NIVEDI | 1 | 21 August 2024 |
| 10 | 3rd RIC meeting for 7th Cohort Entrepreneurs | ICAR-NIVEDI | 1 | 22 August 2024 |
| 11 | 1st RIC meeting for 9th Cohort Entrepreneurs | ICAR-NIVEDI | 2 | 11-12 September 2024 |

## Human Resource Development

The institute has established collaborative linkages with various national and international organizations, academic institutions and NGOs to support research, capacity building and outreach initiatives. During the reporting period, a series of need-based training programmes were organized for scientists, academicians, field veterinarians and public health professionals. These trainings focused on enhancing skills in modern laboratory techniques, epidemiological investigations, livestock disease forecasting, diagnostics, research methodologies and the use of specialized tools such as NADRES and EpiInfo software for epidemiological and GIS data analysis. Additionally, sessions on assessing the economic impact of livestock diseases and sensitization programmes on disease prevention and control were conducted. The programmes benefited veterinary officers from state departments of animal husbandry, medical and IDSP officers, assistant professors from State Agricultural Universities and students from life science disciplines, thereby strengthening national capacity for effective livestock disease management and surveillance.

**Workshop/Training/Awareness, Sensitization and Other Programs Organized**

| Sl. No. | Name of the Program | Duration (Days) | Date | No. of participants |
|---|---|---|---|---|
| **Workshops** | | | | |
| 1 | Technical Orientation Workshop on Action Plan for Surveillance and Monitoring of PPR in India under PPR-Eradication Programme, LH&DCP Scheme, DAHD, GoI as Programme Coordinator | 1 | 24 October 2024 | 100 |
| 2 | One-day workshop on “Advancing Research Collaborations to Tackle Antimicrobial Resistance (AMR) at the Livestock, Environment and Human Interface” | 1 | 25 November 2024 | 75 |

| Sl. No. | Name of the Program | Duration (Days) | Date | No. of participants |
|---|---|---|---|---|
| **Trainings** | | | | |
| 1 | Training programmes to SC farmers on Poultry farming and management practices | 1 | 2, 19, 20 February , 25 July and 22 August | 180 |
| 2 | ICAR sponsored ten days short course on Advances in GIS applications in epidemiological analysis of livestock diseases in India | 10 | 7-16 February 2024 | 25 |
| 3 | Field Veterinary Epidemiology Training for Veterinarians of Kerala State | 5 | 26 February – 1 March 2024 | 20 |
| 4 | Hands-on Training on Geospatial Epidemiology for Zoonotic Disease Surveillance and Mapping | 5 | 4-8 March 2024 | 32 |
| 5 | Organized ISO9001:2015 Surveillance audit | 1 | 21 May 2024 | 20 |
| 6 | Hands-on training on laboratory diagnosis of leptospirosis. | 5 | 5-9 August 2024 | 35 |
| 7 | Hands on Training on Laboratory diagnosis of Leptospirosis | 2 | 7-9 October 2024 | 2 |
| **Awareness/Sensitization Programs** | | | | |
| 1 | ICAR-NIVEDI sponsored an awareness programme for SC farmers to protect their rights in areas PPVFR Act, of farm innovations, breeding and protection of varieties | 1 | 01 March 2024 | 55 |
| 2 | Sensitization program to school children on major zoonotic diseases Mathkur and Ivarakandapura, Jadigenahalli, Hesarghatta, Bengaluru | 1 | 5-6 July 2024 | 200 |
| 3 | ITMU –Awareness programme on PPV& FRA, 2001 to SC farmers | 1 | 22 August 2024 | 30 |
| 4 | Awareness program cum free health checkup for slaughterhouse workers organised by ICAR-NMRI, AIIMS, Bibinagar and ICAR-NIVED at Chengicherla slaughterhouse, Hyderabad | 1 | 5 September 2024 | 120 |
| 5 | Outreach Awareness program on Rabies for school children in Doddatumkur, Gejjegadahalli and Kakolu, Bengaluru | 1 | 18-26 September 2024 | 120 |
| 6 | Anti-rabies vaccination drive for dogs/cats at Veterinary Clinical Complex, Yelahanka | 30 | 26 September to 28 October 2024 | 200 |
| 7 | World Antimicrobial Awareness Week (WAAV) - 2024 | 7 | 18-24 November 2024 | 200 |

## Short Course on Advances in GIS Applications in Epidemiological Analysis of Livestock Diseases

ICAR-NIVEDI organized a ten-day ICAR-sponsored short course on "Advances in GIS Applications in Epidemiological Analysis of Livestock Diseases in India" from 7th to 16th February 2024. The program was attended by 25 participants from nine states, who received hands-on training in GIS-based mapping of livestock disease outbreaks and epidemiological analysis using open-source tools such as EpiInfo and QGIS. The course enhanced participants' capacity to apply spatial tools in disease surveillance and control planning.


## Field Veterinary Epidemiology Training for Kerala State Veterinarians

ICAR-NIVEDI organized a five-day training program on "Field Veterinary Epidemiology" from 26th February to 1st March 2024, specifically for veterinarians from Kerala State, sponsored by the Kerala State Animal Husbandry Department, Government of Kerala. The training focused on systematic approaches to outbreak investigations and introduced participants to key epidemiological tools, including QGIS and EpiInfo, to enhance field-level disease surveillance and analysis capabilities.

## Hands-on Training on GIS Applications for Zoonotic Disease Surveillance

ICAR-NIVEDI, under the National One Health Programme for Prevention & Control of Zoonoses (NOHPPCZ) of the National Centre for Disease Control (NCDC), organized a five-day Hands-on Training on Geospatial Epidemiology for Zoonotic Disease Surveillance and Mapping from 4th to 8th March 2024. A total of 32 participants from eight states participated in the program. The training aimed to provide foundational knowledge in Geographic Information Systems (GIS), including

practical sessions on using open-source software QGIS for disease mapping, visualization of surveillance data and creating buffer zones to support disease containment and response activities.


## State-Level Incubator Conclave Organized by NaaViC, ICAR-NIVEDI

NaaViC Agri Business Incubation Centre, ICAR-NIVEDI, Bengaluru organized a State-Level Incubator Conclave uniting 33 incubators operating across Karnataka at the Karnataka Science and Technology Academy (KSTA), Bengaluru, on 17th May 2024. The conclave brought together incubators implementing flagship programs of both the Central and State Governments. Industry partners were represented by BCIC, along with K-Tech from the Government of Karnataka.

NaaViC, recognized for its leadership in Animal Husbandry and Veterinary Services incubation, has been instrumental in executing the RKVY-RAFTAAR program under the Ministry of Agriculture & Farmers Welfare (MoA&FW), Government of India, in collaboration with ICAR-NAIF-ABI.

## NCDC-Sponsored Training on Laboratory Diagnosis of Leptospirosis Conducted at ICAR-NIVEDI

ICAR-NIVEDI organized a five-day training program on “Laboratory Diagnosis of Leptospirosis” under the National One Health Programme for Prevention and Control of Zoonoses (NOHPPCZ), supported by the National Centre for Disease Control (NCDC), Ministry of Health and Family Welfare, from 5th to 9th August 2024.

The training aimed to build diagnostic capacity among veterinarians, public health professionals and laboratory personnel engaged in zoonotic disease surveillance and control. A total of 35 participants from 10 states representing veterinary departments, state diagnostic laboratories and academic institutions took part in the program.

Participants were trained in modern diagnostic techniques for leptospirosis, including sample collection, culture methods, PCR, ELISA and microscopic agglutination test (MAT). The sessions

also covered biosafety practices, interpretation of test results and integration of laboratory findings into field epidemiology.

The training featured hands-on laboratory sessions, expert lectures and interactive discussions, with a focus on fostering collaboration between veterinary and medical professionals under the One Health framework. The program contributed to strengthening the national diagnostic network and improving outbreak response mechanisms for leptospirosis—a priority zoonotic disease in India.


## Specialized Training on Laboratory Diagnosis of Leptospirosis for Indian Immunologicals Limited

A focused three-day training program on "Laboratory Diagnosis of Leptospirosis with Special Reference to Microscopic Agglutination Test (MAT)" was conducted at ICAR-NIVEDI from 7th to 9th October 2024 for Indian Immunologicals Limited (IIL), Hyderabad.

The training was tailored for two R&D professionals from IIL who were provided with hands-on experience in conducting MAT, the gold standard serological test for leptospirosis. Additionally, the participants were trained in the isolation, cultivation and maintenance of various *Leptospira* serovars, along with best practices in biosafety and culture handling.

This capacity-building initiative reflects ICAR-NIVEDI's continued support to industry partners in strengthening zoonotic disease diagnostics and enhancing One Health preparedness through technology transfer and professional training.

## ICAR-NIVEDI and FAO (India) Collaborate for ISAVET Training of Trainers (ToT)

ICAR-NIVEDI, in partnership with the Food and Agriculture Organization (FAO) India Office, organized a two-day Training of Trainers (ToT) program under the In-Service Applied Veterinary Epidemiology Training (ISAVET) initiative on 21–22 November 2024.

The program convened 18 national experts specializing in veterinary epidemiology and public health from reputed institutions such as GADVASU, KVASU, DAHD, FAO and ICAR-NIVEDI. The training aimed to strengthen the national veterinary workforce by refining the ISAVET curriculum to better equip field veterinarians with practical skills in disease surveillance, outbreak investigation and emergency response.

The interactive sessions focused on curriculum enhancement, training methodologies and One Health integration to build a resilient field epidemiology network across India. This initiative marks a key step towards institutionalizing applied veterinary epidemiology training and improving the country's preparedness for emerging and transboundary animal diseases.

## Experts Unite Against AMR: NIVEDI Workshop Emphasizes Cross-Sector Collaboration

ICAR-NIVEDI, Bengaluru, organized a one-day workshop on "Advancing Research Collaborations to Tackle Antimicrobial Resistance (AMR) at the Livestock, Environment and Human Interface" on 25th November 2024. The event, chaired by Dr. Suresh S. Honnappagol, former Vice Chancellor, KVAFSU, Bidar and co-chaired by Dr. Sindura Ganapati, Visiting PSA Fellow, Dr. L.S. Shashidhara, Director, NCBS, Bengaluru, Dr. Baldev R. Gulati, Director, ICAR-NIVEDI and Dr. Prabhdeep Kaur, Chair, ISAAC Centre for Public Health, IISc, highlighted the urgent need for multidisciplinary collaboration to combat AMR. Dr. Honnappagol emphasized that AMR is a shared challenge across the livestock and health sectors and no single sector can be solely responsible for its rise in India. He stressed that the fight against AMR cannot be won in isolation but requires collective efforts from all stakeholders.

The workshop featured presentations followed by a panel discussion with experts from IISc, NCBS, TIGS, Veterinary College Hassan, IAH&VB, NDRI SRS, NBAIR, GBRC Gujarat, NCL Pune, the Institute of Public Health, Bengaluru Science & Technology (BeST) Cluster, Molecular Solutions Care Health, Thermo Fisher Scientific, CII and JSS Academy, Mysore. Discussions underscored the importance of integrated AMR surveillance and the necessity for collaborative action across the health, livestock and environmental sectors.

## Invited Expert Lectures/ Talks/ Presentations

- Dr. V. Balamurugan delivered an expert lecture on " Public Health Initiatives towards the Goal of a Developed India in the National Public Health India Conference (NPHICON-2024) held at National Centre for Disease Control, Delhi during 23-25 February 2024.
- Dr. V. Balamurugan delivered an expert lecture on the Status of PPR in Sheep and Goats in Karnataka State in the Government of India Sponsored ASCAD programme held at Bengaluru Karnataka on 19 March 2024.
- Dr. Shivasharanappa N delivered an expert lecture on "Microbes, Infections and Antibiotics" during the awareness program held at PM Shri. KV CRPF Yelahanka, Bengaluru during 10 January 2024
- Dr. Shivasharanappa N delivered an expert lecture on "Zoo/wildlife disease surveillance" to IFS Officers during the compulsory training on "Captive Management of Wild Animals & Zoo Management for Zoo Managers," held at Mysuru Zoo during 9-13 September 2024
- Dr. Shivasharanappa N delivered an expert lecture on "Spatial analysis of AMR surveillance in India" during the ten day ICAR short course on GIS applications held at ICAR NIVEDI on 8 February 2024

## Memorandum of Understandings (MoUs)

### MoU with Manipal Academy of Higher Education, Manipal

A Memorandum of Understanding (MoU) was executed between ICAR-NIVEDI and Manipal Academy of Higher Education (MAHE), Manipal, Karnataka on 6th January 2024. MAHE will recognize ICAR-NIVEDI as an Institute for conducting research related to the thesis requirement of the research students for PG/ PhD/ MPH in One Health. Scientists of ICAR-NIVEDI will be guiding the students of MAHE in their research. Research instrumentation facility and library facilities available with both the institutes will be made available to the faculty and research scholars.


### MoU with GITAM University, Visakhapatnam

MoU was made with GITAM Deemed to be University, Visakhapatnam andhra Pradesh on 6 February 2024 for facilitating the student's training and post-graduate research in ICAR-NIVEDI and future collaborations in the various research activities.

## ICAR-NRC Mithun signed MOU as NADEN Centre

Dr Girish Patil, ICAR National Research Centre on Mithun visited NIVEDI, Bengaluru on 18 March 2024 and discussed the collaborations with NIVEDI scientists in surveillance and monitoring of livestock diseases in Mithun population in North east region. An MoU was signed for establishing Network for Advancement in Dairy Education and Nutrition NADEN centre in NRC Mithun.

## MoU with GBRC, Gandhinagar

ICAR-NIVEDI has made a MoU with Gujarat Biotechnology Research Centre (GBRC), Gandhinagar, Gujarat on 31 May 2024. GBRC is involved in innovative research leading to product/ prototype/ process development with application in healthcare, agriculture, environment and marine sectors. Operational details of research effort and collaboration were made in common research programmes and/or projects restricted to specific mandated domain within the approved disciplines/ divisions. Information/biological samples/materials will be shared between two institutes under collaborative research mode. Research instrumentation facility and library facilities available with both of the institutes will be made available to the faculty and research scholars.

## NIVEDI Signs MoU with National Centre for Biological Sciences (NCBS)

On the sidelines of the NADEN annual review meeting on 8th July 2024, ICAR-NIVEDI and the National Centre for Biological Sciences (NCBS), Bengaluru, signed a Memorandum of Understanding (MoU) to strengthen collaborative research. The agreement was formalized in the presence of Dr. Raghavendra Bhatta, DDG (Animal Sciences), ICAR. This MoU paves the way for enhanced cooperation and joint research initiatives, particularly in the study of zoonotic diseases and their impact on both animal and human health. The collaboration aims to leverage expertise, technology and data-sharing to advance scientific understanding and improve disease management strategies.

## Post-Graduate Teaching and Research

### Academic Activities of IVRI-Deemed University Bengaluru Hub Initiated at ICAR-NIVEDI

As a recognized Centre under the Bengaluru Hub of the Indian Veterinary Research Institute – Deemed University (IVRI-DU), ICAR-NIVEDI has commenced postgraduate academic activities, offering both offline and online instruction for enrolled students.

For the academic year 2023–24, a total of seven students have been admitted: five for the M.V.Sc. programme and two for the Ph.D. programme. Among the M.V.Sc. students, three are pursuing Veterinary Microbiology and two are specializing in Veterinary Public Health & Epidemiology. Both Ph.D. candidates are enrolled in the Veterinary Public Health & Epidemiology discipline.

All enrolled students have been provided on-campus hostel accommodation and the institute has ensured access to essential amenities, including purified drinking water, geysers, smart classrooms and sports facilities, to support a conducive learning and living environment.

### Students undertaken PG Research in ICAR-NIVEDI

| Sr. No. | Name of Student | University Registered | Name of Supervisor | Awarded Degree |
|---|---|---|---|---|
| 1 | Mrs R Veena | The University of Trans-Disciplinary Health Sciences and Technology, Bengaluru | Dr Mudassar Chanda | Ph.D. |
| 2 | Mr. S Akash | UAS Bangalore | Dr. G. Govindaraj | MBA (ABM) |
| 3 | Ms. Sindhoora Lakshmi | REVA University, Bengaluru | Dr. P. Krishnamoorthy | M.Sc. |
| 4 | Mr. Sushant Wankhade | REVA University, Bengaluru | Dr. R. Sridevi | M.Sc. |
| 5 | Ms. G Shubhada Rao | REVA University, Bengaluru | Dr. M. Nagalingam | M.Sc. |
| 6 | Ms. Isha Nilesh Wankhade | REVA University, Bengaluru | Dr. P.P. Sengupta | M.Sc. |
| 7 | Ms. Sharanya | REVA University, Bengaluru | Dr. P.P. Sengupta | M.Sc. |
| 8 | Ms. Namagundla Vyshnavi | School of Basic & Applied Sciences, Dayanand Sagar University, Bengaluru | Dr. M. Nagalingam | M.Sc. |
| 9 | Mr. MV Bhuvan Bharadwaj | REVA University, Bengaluru | Dr. Jagadish Hiremath | M.Sc. |
| 10 | Mr. Abishek | Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar | Dr. Rajeswari Shome | M.V.Sc. |
| 11 | Ms. Srujana | Dayananda Sagar University, Bengaluru | Dr. R. Sridevi | M.Sc. |

# 05

# Participation in Training/ Workshop/Conference/Meeting

## Conferences/Symposium/Conclaves

- Dr Md. Mudassar Chanda and Dr. M. Nagalingam attended Winter Symposium & South Zone MicroCon 2024 held at CMC, Vellore, during 1-3 February 2024.
- Dr. V. Balamurugan attended International Symposium on Animal Viruses, Vaccines and Immunity (AVVI 2024) held at Institute of Veterinary Science and Animal Husbandry Siksha 'O' Anusandhan Campus, Bhubaneswar, during 9-11 February 2024.
- Dr attended WVPA (India)-2024 conference on Avian Health challenges and opportunities organized by The World Veterinary Poultry Association (WVPA) India held at ICAR-NIANP Bengaluru, during 15-16 February 2024.
- Dr. V. Balamurugan attended National Public Health India Conference (NPHICON-2024) held at NCDC campus, Delhi, during, 23-25 February 2024.
- Dr. M. Nagalingam and Dr. Shivasharanappa N attended International Conference of Indian Society for Sheep and Goat Production and Utilization (ISSGPUCON-2024) on Recent Trends and Future Perspective to Improve the Performance, Health and Welfare of Small Ruminants Under Changing Climate Scenario held at Rajiv Gandhi Institute of Veterinary Education and Research (RIVER), Kurumbapet, Puducherry, during 24-26 April 2024.
- Dr. Md. Mudassar Chanda attended Webinar on occasion of World Veterinary day organized by EMRI Green Health Services, during 26 April 2024.
- Dr. V. Balamurugan attended National Conference on "IAVMICON-2024, XXXVI Annual Convention of IAVMI" on "XXXVI National Conference of "Indian Association of Veterinary Microbiologists Immunologists and Specialists in Infectious Diseases" "Impact of Animal Health on One Health and National Prosperity" held at Department of Veterinary Microbiology, CAVS, Navania, Udaipur during, 6-7 June 2024.
- Dr. Md. Mudassar Chanda attended Symposium on "Bacterial Zoonoses: Disease Modelling" held at Christian Medical College, Vellore (CMC Vellore) during 6 July 2024.
- Dr. P. Krishnamoorthy attended International Conference on Impact of climate change on biodiversity: a global perspective held at Madras Veterinary College, Chennai, during, 11-13 July 2024.

- Dr.G.Govindaraj attended 32nd international conference of agricultural Economics organized by International Association of Agricultural Economics (IAAE) held at New Delhi, during 2-7 August 2024.
- Dr. V. Balamurugan attended VIBCON – 2024, XXIX Annual Convention of ISVIB and National Conference on Challenges in Animal Health and Production Amidst Climate Change: Innovative, Sustainable Solutions and Their Translations held at Tamil Nadu Veterinary and Animal Sciences University, Chennai, during 26-28 September 2024.
- Dr. Sathish B Shivachandra attended ICSSR International Conference held at Assam University, Silchar, Assam, during, 30 September to 01 October 2024.
- Dr. M. Nagalingam attended 16th International Colloquium on Paratuberculosis held at Vrindavan, Uttar Pradesh, during 21-25 October 2024.
- Dr. V. Balamurugan attended VIROCON 2024: International Conference on Emerging Viruses: Pandemic & Biosecurity Perspectives held at Defence Research & Development Establishment (DRDE), Gwalior, Madhya Pradesh, during 11-13 November 2024.
- Dr. V. Balamurugan, Dr. Z. B. Dubal and Dr. P. Krishnamoorthy attended XX Annual conference of IAVPHS and national symposium on "Integrating One Health: Bridging the gap at the Human-Animal-Environment Interfaces" held at Krantisinh Nana Patil College of Veterinary Science, Shirwal, during 14-15 November 2024.
- The Scientists of ICAR-NIVEDI attended One-day workshop on "Advancing Research Collaborations to Tackle AMR at the Livestock, Environment and Human Interface" held at ICAR-NIVEDI, Bengaluru, on 25 November 2024.
- Dr. P. Krishnamoorthy attended 33rd National Congress of Veterinary Parasitology held at College of Veterinary Science, Hyderabad, during 17-19 December 2024.

## Workshops

- Dr. Rajeswari Shome attended workshop on One Health Concepts: Best Practices for Disposal of Carcasses held at India Habitat Centre, New Delhi, on 20 January 2024.
- Dr. ZB. Dubal, Dr. Jagadish Hiremath, Dr. Md. Mudassar Chanda, Dr. R. Sridevi, Dr. N. Shivasharanappa, Dr. Siju Susan Jacob, Dr. H. B. Chethan Kumar attended Stakeholder consultation workshop for establishing an in-service field epidemiology training program for veterinarians in India, organized by FAO-ECTAD, India in collaboration with ICAR-NIVEDI, during 27-28 February 2024.
- Dr Md. Mudassar Chanda, attended Workshop on Protocol Development for Risk Mapping and Hotspots of Priority Zoonotic Diseases held at National Institute for One Health PM-ABHIM Initiative ICMR-NIV Pune, during 8-9 March 2024.
- Dr. V. Balamurugan attended Episystem workshop for PPR eradication in the Lake Chad Basin and the Regional Advisory Group for Central Africa, held at Yaounde, Cameroon, during 3-4 April 2024.
- Dr Md. Mudassar Chanda attended 4th Stakeholder Engagement Workshop for Sector Connect: Fellowship in One Health, held at NCDC, Delhi, on 14 May 2024.
- Dr. N. Shivasharanappa attended Launch workshop on the all India Network Project on Antimicrobial Resistance (AINP-AMR) in fisheries and Livestock, held at NASC complex, New Delhi, on 22 May 2024.
- Dr. Rajeswari Shome attended IAWV-State level workshop held at Vignana Bhavana, University of Mysore, during 30-31 May 2024.
- Dr. N. Shivasharanappa attended Workshop on One Health and Agroecology: Building synergies held at Indira Paryavaran Bhavan, MoEF&CC, New Delhi, on 3 June 2024.

- Dr. P. Krishnamoorthy attended World Accreditation Day workshop on "Accreditation: Empowering tomorrow and shaping the future" held at NABL, Bengaluru on 10 June 2024.
- Dr. Md. Mudassar Chanda and Dr. Chethan Kumar H.B attended Avian Influenza outbreak and Response Simulation Exercise held at Bhopal, during 19-20 June 2024.
- Dr. Z. B. Dubal attended Mentor's Orientation workshop by Sector Connect team held at IISc, Bengaluru, on 5 August 2024.
- Dr. Z.B. Dubal and Dr. N. Shivasharanappa attended Sector Connect Field Epidemiology Programme in One Health (FEP OH) Bengaluru, held at IISc, Bengaluru, during 6-8 August 2024 and 25-27 September 2024.
- Dr. B.R. Gulati, Dr. V. Balamurugan, Dr. S.S. Patil and Dr. M.M. Chanda attended Animal infectious diseases on prioritization workshop organized by FAO, USAID, DAHD, held at New Delhi, during 27-30 August 2024.
- Dr. N. Shivasharanappa, attended Workshop on Climate Resilient Dairy held at CII, Indiranagar, Bangalore, on 13 September 2024.
- Dr P. Krishnamoorthy and Dr. M. Nagalingam attended International workshop on "Bovine Sample Collection and Processing for Mycobacterial Isolation" organized by TANUVAS, ICMR-NIRT, CisGEN-IITM Research Park, Penn State University held at Chennai, India, during 24-26 September 2024.
- Dr.G.Govindaraj attended Livestock Master Plan Development and livestock sector modelling held at ILRI, Nairobi, during 18-21 November 2024.
- Dr.R.Sridevi attended (Virtual) Strategy workshop on "Microplastics Pollution: Strategies for Remediation in Sustainable Environmental Management" organized by NAAS, New Delhi on 3 December 2024.

## Meetings

- Dr Md. Mudassar Chanda attended (Virtual), meeting on "Strategies for glanders surveillance, disease investigation & containment zones" organized by ICAR-NRCE, Hisar, during 13 May 2024.
- Dr. Sathish B Shivachandra attended (Virtual) NAAS Foundation Day- General body Meeting and Foundation Day lecture (Virtual), held at NAAS, New Delhi, during 4-5 June, 2024.
- Dr. V. Balamurugan attended 7$^{th}$ PPR Advisory Committee Meeting and the GREN vaccination thematic group meeting held at Rome, Italy, during 25-28 June 2024.
- Dr. V. Balamurugan attended Epidemiology and Laboratory Network Consultation Meeting and training on the South Asian Cross-border Harmonization Meeting, Epidemiology and Laboratory Network Consultation Meeting and Training on the use of the PPR Monitoring and Assessment Tool (PMAT) held at Dhaka, Bangladesh, during 7-11 July 2024.
- Dr. B.R. Gulati (In-person) and Dr. V. Balamurugan (Virtual) attended 4$^{th}$ Regional Meeting for WOAH Reference Centres in Asia and the Pacific held at Tokyo, Japan, during 16-18 July, 2024.
- Dr.R.Sridevi attended Expert Meeting on Revision of National Action Plan for Avian Influenza 2015, held at CEAH, Bengaluru, during 17-18 October 2024.
- Dr.R.Sridevi attended (Virtual) ONLINE meeting on iGOT for all the ICAR institutes HRD nodal officers, ICAR-HRM unit orgainzed by ICAR-HRM unit, on 12 December 2024.

## Trainings

- Dr Md. Mudassar Chanda attended Field Epidemiology program in One Health orgaised by National Centre for Disease Control, New Delhi, during 13-14 February 2024.
- Dr. M. Nagalingam attended Orientation program for the in-charge of ICAR-ITMUs in the "Srijan: Empowering ZTMCs/ITMUs of ICAR Institutes" held at NASC, New Delhi, during 13-15 February 2024.
- Dr. Siju Susan Jacob attended CAFT Training: Interdisciplinary approaches for the control of vector and vector borne parasitic diseases with a special reference to climate change, organized by Centre for advanced faculty training in veterinary Parasitology, Veterinary college, Hebbal, Bengaluru, during 23 February to 14 March 2024.
- Dr. Manjunatha Reddy GB attended (Virtual) RNAome: Profiling and characterization of non-coding RNAs, organized by ICAR-IASRI, New Delhi, during 14-20 March 2024.
- Dr. Shivasharanappa N attended Training program on "Genomic Surveillance of AMR" held at GBRC, Gandhinagar, during 27-31 May 2024.
- Z. B. Dubal attended (Virtual) Online Training programme on Bioinformatics Advances in Genomic Data Analysis organized by ICAR-IASRI, New Delhi, during 24-28 June 2024.
- Dr. Shivasharanappa N attended AMR Exhibition in Bengaluru Science and Technology Cluster (BeST) -OneHealth festival organised by BeST cluster held at VITM, Bengaluru on 5 July 2024.
- Dr Md. Mudassar Chanda attended Field Epidemiology Program in One Health organised by NCDC and DAHD during 10-12 July 2024.
- Dr.R.Sridevi attended (Virtual) Online Metagenomics data analysis organised by ICAR-IASRI, New Delhi, during 22-24 July 2024.
- Dr. P. Krishnamoorthy and Dr. M. Nagalingam attended Training on "Mycobacterial conventional and molecular diagnostic techniques" held at Christian Medical College, Vellore, during 26-30 August 2024.
- Dr. P. Krishnamoorthy attended Training cum awareness programme on "J-Gate@CeRA southern regional training for Nodal Officers of CeRA" held at Kerala Agricultural University, Thrissur, on 16 October 2024.
- Dr. Manjunatha Reddy GB attended (Virtual) IP Awareness/Training program under National Intellectual Property Awareness Mission, organised by IPO, India, on 18 October 2024.
- Dr.R.Sridevi attended (Virtual) Online Training programme on Bioinformatics in R organised by ICAR-IISR, Kozhikode, during 4-8 November 2024.
- Dr.R.Sridevi attended (Virtual) Launching ceremony of Network Programmes on ICAR-AINPs (AINP-CEDA), held at ICAR-IVRI, Bareilly, on 7 November 2024.
- Dr. ZB. Dubal, Dr. Jagadish Hiremath, Dr. Md. Mudassar Chanda, Dr. R. Sridevi, Dr. N. Shivasharanappa, Dr. Siju Susan Jacob and Dr. H. B. Chethan Kumar attended Orientation and TOT for Master Trainers of ISAVET held at ICAR-NIVEDI, Bengaluru, during 21-22 November 2024.
- Dr. Siju Susan Jacob attended Training on Application of CRISPR-Cas mediated genome editing for vaccines and diagnostics organised by ICAR,IVRI, Hebbal, Bengaluru, during 2-6 December 2024.
- Dr.R.Sridevi attended completed Decision making and Yoga Break at Workplace online modules on iGot KARMAYOGI platform on 16 December 2024

## Episystem workshop for PPR eradication in the Lake Chad Basin, Cameroon

Dr V. Balamurugan, Principal Scientist participated in the Episystem workshop for PPR eradication in the Lake Chad Basin and Regional Advisory Group for Central Africa organized by the Food and Agriculture Organization (FAO) of the United Nations and World Organization for Animal Health (WOAH) at Yaounde, Cameroon during 3-4th April 2024. The workshop gave good exposure and opportunity to interact with renowned international scientists in the field of PPR / PPR virus research. Further, it helped to understand and learn the episystem-based epidemiology approach for control and eradication programme strategies. Additionally, following the direction and guidance of experts from the WOAH and the FAO, activities under the National Strategic Plan for PPR Eradication, to eradicate the disease from India by 2030 as proposed by DAHD, Government of India as planned.

## 7th PPR Advisory Committee Meeting at FAO, Rome

Dr V. Balamurugan Participated in the 7th PPR Advisory Committee Meeting and the GREN vaccination thematic group meeting organised by Food and Agriculture Organization (FAO) and World Organization for Animal Health (WOAH) at FAO Headquarters in Rome, Italy held during 25-28th June 2024. In this meeting, various strategies to control and eradicate the PPR in various countries of the world were discussed.

## World Bank and DAHD workshop on Avian Influenza outbreak response

Dr M.M. Chanda and Dr Chethan Kumar H.B, Scientists attended the Avian Influenza outbreak and Response Simulation Exercise organized by the World Bank and Department of Animal Husbandry and Dairying during 19-20th June 2024 at Bhopal, Madhya Pradesh. During the exercise, expert from State Disease Diagnostic laboratories, wildlife officials, public health officials and ICAR scientists were divided into different functional groups and simulated avian influenza outbreaks scenarios were created. The goal of the exercise was to assess the existing capacity, identify the

gaps and needs for better preparedness and outbreak response for Avian Influenza in India. In addition, there were expert talks on surveillance and current global and regional status of Avian Influenza.


## Dr. BR Gulati Attends WOAH Regional Seminar in Tokyo

Dr. BR Gulati, Director, ICAR-NIVEDI, participated in the Regional Seminar for WOAH National Focal Points for Veterinary Laboratories, organized by the World Organization for Animal Health (WOAH) in Tokyo, Japan, from 16-18th July 2024.

The seminar provided valuable insights into biosafety, biosecurity, emerging diseases and One Health collaboration, highlighting the critical role of laboratory networks in disease surveillance, capacity building and technological advancements. The event also fostered international collaboration, reinforcing efforts to strengthen veterinary laboratory governance and global health security.

# 06

# Outreach, Extension and Institutional Activities

## Secretary, DAHD Interacted with NIVEDI Scientists

Hon'ble Smt. Alka Upadhyaya, Secretary, Department of Animal Husbandry and Dairying (DAHD, GoI), along with other senior officials interacted with NIVEDI scientists on 5th April 2024. Dr. Baldev R Gulati, Director of ICAR-NIVEDI, showcased the institute's profile and presented the plans for establishing the National Animal Disease Information and Control Centre (NADICC) as part of the National Digital Livestock Mission. This centre will develop a comprehensive digital platform for real-time reporting and analysis of livestock diseases. He expressed gratitude towards Secretary, DAHD and the Animal Husbandry Commissioner for their pivotal roles in securing WOAH Reference Laboratory status for two of NIVEDI's laboratories. Dr. Abhijit Mitra, Animal Husbandry Commissioner, praised the institute's efforts in managing national animal disease control programs, specifically targeting diseases like Brucellosis, PPR and CSF. Mrs. Varsha Joshi, Additional Secretary (CDD/IT), emphasized the importance of using AI and machine learning in disease management. Mrs. Sarita Chauhan, Joint Secretary (LH), highlighted the need to integrate zoonotic disease studies and public awareness into all projects, while Shri G.N Singh, Joint Secretary (Admin/Trade/ GC/IC), called for increased exports of livestock products. Secretary Mrs. Upadhyaya, commended the institute's advancements in livestock disease epidemiology and its proactive approach in disease forecasting and forewarning. She also advocated for a collaborative national project to tackle Antimicrobial Resistance (AMR) and Antimicrobial Usage (AMU).

## Interaction of Director, ICAR-ATARI, Guwahati with NIVEDI Scientists

Dr G. Kadirvel, Director, ATARI, Guwahati visited ICAR-NIVEDI and interacted with the scientists on research collaborations and effective implementation of schemes in North east region of India on 24th January 2024

## Republic Day Celebration

ICAR-NIVEDI celebrated 75th Republic Day on 26th January 2024 with full of pride and patriotism. Dr. B.R. Gulati, Director, unfurled the national flag in the presence of staff and employees. On the occasion, he urged the entire staff to work for betterment of livestock and farming community of the country. He emphasized the application of modern tools in disease diagnosis, surveillance and epidemiology for betterment of livestock farmers in India.

## Distribution of Cow Mats and Milk Cans to Farmers

Under DAPSC scheme, national farmer's day was organized by conducting one-day training programme and a total of 120 farmers belonging to scheduled caste from Chinthamani and Doddaballapura taluks have attended the training programme. On 26th January 2024, the farmers were provided with one milk can and one cow mat to achieve clean milk production with enhanced biosecurity measures in their dairy farm.

## NIVEDI Seminar Club Organized Lectures by Experts

The NIVEDI Seminar Club hosted series of talks as part of the Continuing Epidemiology Education (CEE). Dr Georgina Limon-Vega, Scientist, Epidemiology from Pirbright institute, UK visited ICAR-NIVEDI on 9th February 2024. She delivered a talk on "Understanding drivers for transmission and spread of transboundary diseases" and interacted with scientists about epidemiological risk factors of sheep pox, CCHF, other diseases and possible collaboration with Pirbright Institute, UK in the area of livestock viral diseases.

Professor Peter Hudson, Former Director, Huck Institutes of the Life Sciences delivered a talk on the topic "Primary pandemic proposal studying Hendra virus spill over" on 5th March 2024.

Dr Prabhdeep Kaur, Professor, Isaac Centre for Public Health, Indian Institute of Science, Bengaluru, spoke on the topic of "Event-based surveillance, a unified community-based approach for human and animal health" on 27th March 2024.


## Skill Development Programme on Poultry Farm Management

Under Development Action Plan for Schedule Caste (DAPSC) project, ICAR-NIVEDI organized on 2nd, 19th and 20th February 2024 three one day training cum workshops in collaboration with CPDO & TI, Hessaraghatta, Bengaluru. Each batch of training consists of 30 landless farmers, both female and male belongs to scheduled caste community of Hovinahalli, Venukalgudd, Eswaragere, Devarakotta, Vedhavathi Nagar, Hariyabbe villages in Hiriyur taluk, Chiradurga District. Along with training, an exposure visits to IIHR nurseries, vegetable garden and orchards were also arranged to motivate rural farmers to do kitchen gardening for their family's nutritional security. On successful completion of each training programme, 4500 chicks of Kaveri, Aseel and Kalinga Brown breeds of chicks, 8 weeks old age were distributed to the beneficiaries.

## Nandidurga Goat Distributed for Doubling Farm Women Income

Nandidurga is white coloured goat and mainly reared in Chitradurga district of Karnataka for meat purpose. Under DAPSC scheme ICAR-NIVEDI introduced among Scheduled Caste rural women for developing among them the entrepreneurship in Bengaluru Rural District. NIVEDI has chosen Nandidurga because it has higher fecundity and twinning is very common (50- 60%) and at times triplets, quadruplets and occasionally pentaplets. Adult weight varies from 26 to 56kg in males and 24 to 41kg in females depending upon the management by farmers. In this programme, a total of 35 beneficiaries were given with 2 female +1 male goat unit to each, which covered 31 women beneficiaries, having 11 widows on 22nd February 2024.

## Special Veterinary Health Camp and Training Programme for Farmers Organized

During the Special livestock health camp programme organized on 27th February 2024 at Arasampati village, Pochampally taluk, Krishnagiri district, the animals were given deworming drug, distributed mineral mixture for cattle and salt licks for calves, etc. The brucellosis vaccines in female calves of 4-8 months of age, LSD vaccination in cattle, Rabies vaccination in dogs and Ranikhet disease vaccinations in poultry were done in the camp. Seventy six SC farmers and a total of 385 livestock species of animals and 24 dogs were provided health care during the camp. The castration in dogs was also undertaken in this camp. The dung samples were tested for detection of parasitic eggs and the milk samples were tested for mastitis using the CMT test. The cattle were examined for pregnancy and infertility by using ultrasound sonography during the Infertility camp. The training programme on Scientific rearing of farm animals in Tamil Nadu was organized for the benefit of the Thirty SC farmers in the village.

## Consultation on Field Epidemiology Training Programme for Veterinarians in India

Stakeholder Consultation Workshop for Establishing an In-service Field Epidemiology Training Program for Veterinarians (FETPV) in India was organised at ICARNIVEDI on 28th February 2024. During the workshop Dr Peter Black and Dr Tang Hao from ECTAD (RAP), Dr. R.K. Singh and Team from ECTAD India, Dr.B.R. Gulati, Director and Scientists of NIVEDI, experts from GADVASU, KVASU and WII deliberated on preparing the Road Map to rollout FETPV in India.

## International Women's Day Celebration

The ICAR-NIVEDI, Bengaluru celebrated the "International Women's Day" on 22nd March, 2024. Overall, 100 lady staff of NIVEDI participated and various events such as invited lectures by experts Dr Rinku Mathappan, Dr Padmakshi P and Mrs Payal Patel on various health aspects for women were conducted. On this occasion, free eye check-up, body mass index assessment and dietary advisory, testing of GRB, HBA1c, lipid profile and uric acid testing for women were organized.

## World Intellectual Property Day Celebrated

ICAR-NIVEDI celebrated World Intellectual Property Day on 30th April 2024. On this occasion, a session on the theme "Intellectual Property (IP) and the Sustainable Development Goals (SDGs): Building our common future with innovation and creativity" was held with the participation of scientists, research scholars, technical and administrative staff. It emphasized the importance that intellectual property rights, such as patents, copyrights, designs, trademarks, plant varieties and technological licensing, play in stimulating innovation and creativity. The speaker, Ms. Soumyashree, Associate partner and Branch Head, Altacit Global, Bengaluru, highlighted the importance of patenting as a tool for protecting innovations and discussed strategies for monetizing intellectual property to support sustainable development efforts. Additionally, the speaker mentioned various forms and processes related to IP management or regulation.

## International Yoga Day Celebrated

ICAR-NIVEDI celebrated the International Yoga Day on 21st June 2024 and the Yoga session was held for the NIVEDI staff members on this occasion.

# ICAR-NIVEDI Celebrates its Foundation Day with Focus on Innovation and Collaboration

On 1st July 2024, ICAR-NIVEDI celebrated its Foundation Day with great enthusiasm, highlighting its commitment to innovation, research excellence and collaborative efforts in livestock health. The event commenced with the hoisting of the institute's flag by esteemed guests, followed by a series of discussions on NIVEDI's achievements and future directions.

Dr. Baldev R. Gulati, Director, ICAR-NIVEDI, provided an overview of the institute's origin, mandate and contributions, emphasizing its role in developing diagnostics for livestock diseases, including zoonoses and its efforts in forecasting and forewarning 15 economically important livestock diseases. He also highlighted the institute's work in economic burden estimation and capacity-building programs for veterinarians and stakeholders.

The event was addressed by several dignitaries gracing the occasion. Dr. Manjunath S. Palegar, Director, AH & VS, Karnataka, acknowledged NIVEDI's support in outbreak investigations, timely disease diagnosis and capacitybuilding programs for field veterinarians. Dr. Artabandhu Sahoo, Director,Dept. of ICAR-NIANP, commended the institute's disease forecasting and diagnostic advancements, stressing the importance of animal nutrition in disease prevention and calling for collaborative research in areas of mutual interest. Dr. Tusar Kanti Behera, Director, ICAR-IIHR, highlighted the role of Krishi Vigyan Kendras (KVKs) in disseminating animal disease information and emphasized the potential collaboration between ICARNIVEDI and IIHR to enhance farmers' income. He also praised NIVEDI's BSL-2+ facility and recent NABL accreditations, expressing interest in leveraging genome editing, artificial intelligence and quarantine measures for disease prevention and control.

As part of the celebrations, the dignitaries released a surveillance plan for classical swine fever, reinforcing the institute's commitment to strengthening disease surveillance and control. Recognizing outstanding research contributions, awards were presented to scientists and staff of ICAR-NIVEDI. Dr. G.B.M. Reddy received the Best Research Paper Award, Dr. Sathish B. Shivachandra was honoured for securing the highest external funding for research projects and Dr. V. Balamurugan received the Special Contribution Award. Additionally, administrative, contractual and housekeeping staff were recognized for their valuable contributions to the institute's operations. Winners of various sports events organized as part of the celebrations were also awarded.

The Chief Guest, Dr. Ashok Kumar, ADG (Animal Health), ICAR, underscored the significance of One Health and praised NIVEDI's contributions to veterinary research. He urged the institute to undertake projects on antimicrobial usage (AMU) and expand its capacity-building initiatives in veterinary epidemiology for stakeholders.

A Farmers-Scientists Interactive Meet (Kisan Goshthi) was also organized as part of the event, where over 100 livestock farmers from SC communities received training on advancements in livestock health and management. Inputs for livestock rearing were also provided and progressive livestock farmers of the region were felicitated on the occasion

## ICAR-NIVEDI Observes World Zoonoses Day and World Rabies Day with Awareness and Vaccination Drives

ICAR-NIVEDI marked World Zoonoses Day on 6th July 2024 with a series of outreach programs aimed at raising awareness about zoonotic diseases and their prevention. On World Rabies Day 2024, celebrated under the theme "Breaking Rabies Boundaries," ICAR-NIVEDI, in collaboration with Veterinary College, Hebbal, organized a free anti-rabies vaccination drive at the Veterinary Clinical Complex, Yelahanka. Over 200 pets were vaccinated, reinforcing efforts to eliminate dog-mediated human rabies by 2030. These initiatives highlight ICAR-NIVEDI's commitment to public health, fostering awareness, disease prevention and collaborative action in combating zoonotic diseases. Over 300 students and teachers participated, learning about rabies, vector-borne diseases, leptospirosis and tuberculosis, with a focus on hygiene, sanitation and disease prevention.

## ICAR-NIVEDI Marks Independence Day with Patriotic Fervor

ICAR-NIVEDI celebrated India's 77th Independence Day on 15th August 2024 with great enthusiasm. Dr. P. P. Sengupta, In-charge Director, hoisted the national flag and paid tribute to the sacrifices of freedom fighters. Dr. D. Hemadri, Assistant Director General (ADG), ICAR Headquarters, graced the occasion as the chief guest. The event concluded with a collective pledge towards excellence in animal health and public service.

## ICAR-NIVEDI Launches 'Plant4Mother' Tree Plantation Drive

ICAR-NIVEDI launched a tree plantation program on 29th August 2024 under the '*Plant4Mother*' campaign, promoting environmental conservation and climate resilience. The event featured the plantation of three tree varieties: Rosy Trumpet Tree (*Tabebuia rosea*), Sampige (*Michelia champaca*) and Kadu Badami (*Terminalia catappa*). The program was inaugurated by Dr. Baldev R. Gulati, Director, ICAR-NIVEDI, who planted the first tree and emphasized the environmental and community benefits of such initiatives. Scientists, staff and students of NIVEDI participated by planting one sapling each, pledging to nurture them as part of the "*Plant4Mother*" campaign. The Plantation Drive was organized in collaboration with the Centre for Environment Education (CEE) and EPAM, reflecting a joint commitment to biodiversity enhancement and environmental awareness.

## Awareness Programme on Zoonotic Spillover Risk Conducted in Hyderabad

A study on zoonotic spillover risks in high animal-human interaction settings was conducted at Chengicherla and Amberpet slaughterhouses in Hyderabad. As part of this initiative, an awareness programme and free health check-up for slaughterhouse workers was organized at Chengicherla slaughterhouse by ICAR-NMRI, AIIMS Bibinagar and ICAR-NIVEDI during 6-7 September 2024. The programme aimed to educate workers on the importance of hygienic meat production and the risks of zoonotic disease transmission. Additionally, training on environmental sample collection and analysis was provided to study partners to strengthen disease surveillance and preventive measures.

## ICAR-NIVEDI Promotes Hindi Usage During Hindi Saptah Celebrations

ICAR-NIVEDI observed *Hindi Saptah* from 14-23rd September 2024 for the promotion of Hindi in scientific and administrative work. The event was inaugurated on 14th September by Dr. Baldev R. Gulati, Director, ICAR-NIVEDI, in the presence of scientists, officers, staff members and research scholars. Staff members enthusiastically participated in various competitions, including Extempore Speech, Essay Writing, Technical Terminology Contest, Quiz, Hindi Poetry Recitation, Singing and Slogan Writing on "NIVEDI". A Hindi Essay Writing Competition was also conducted for employees' children up to Class 12/PUC. Additionally, a Hindi Promotion Competition was held to encourage the use of Hindi in office administration and official work.


## ICAR-NIVEDI Observes '*Swachhata Hi Seva*' Under Swachh Bharat Abhiyan

ICAR-NIVEDI actively participated in the '*Swachhata Hi Seva*' campaign from 17th September to 2nd October 2024, organizing various outreach programs to promote cleanliness and public health awareness. The initiative included educating schoolchildren on cleanliness and zoonotic disease prevention, as well as human chains and street plays to encourage communities to adopt the principles of reduce, reuse and recycle. The seventeen-day campaign culminated in a 'Mega Cleanliness Drive', bringing together citizens to clean offices, religious sites and public spaces. The event underscored the power of collective action, fostering longterm community engagement in sustainable practices.


## DDG (Animal Science) Launches New Initiatives and Reviews Research Progress

Dr. Raghavendra Bhatta, Deputy Director General (Animal Science), ICAR, New Delhi, visited ICAR-NIVEDI on 4th October 2024 to launch new initiatives aimed at enhancing livestock health and disease surveillance. Accompanied by Dr. Divakar Hemadri, ADG (Animal Health), ICAR, he was briefed on NIVEDI's recent collaborations with international agencies, including FAO, WOAH, BMGF and the World Bank, to strengthen disease surveillance and control programs.

As part of the visit, Dr. Bhatta participated in the culmination of the "*Ek Ped Maa Ke Naam*" plantation drive, where 1,500 forestry saplings were planted across the NIVEDI campus. He emphasized the importance of such initiatives in promoting environmental sustainability and fostering a green, healthy ecosystem within the institute. During the visit, Dr. Bhatta launched a pilot project in Karnataka for an SMS-based early warning system designed to alert

veterinarians about potential livestock disease outbreaks in their respective districts. This system will provide two months' advance notice, enabling veterinarians to take timely preventive measures. Another key highlight was the release of the book "Nanotechnology in Agriculture and Medicine", authored by Dr. S. S. Patil and others, which explores the transformative role of nanotechnology in agriculture and veterinary science. Additionally, the Sampling Plan for the 6th Round of Foot and Mouth Disease (FMD) monitoring was unveiled, marking a significant step in India's ongoing efforts to control and eradicate FMD. Dr. Bhatta commended NIVEDI's research advancements, particularly its success in securing substantial funding from both national and international sources. He highlighted the institute's growing impact in livestock disease surveillance, epidemiology and predictive modelling, reinforcing its role as a key player in veterinary research and disease management.


## Animal Husbandry Commissioner Inaugurates WOAH Reference Laboratory for PPR

ICAR-NIVEDI achieved a significant milestone in Peste des Petits Ruminants (PPR) eradication with the formal inauguration of its WOAH Reference Laboratory on 17th October 2024. The state-of-the-art facility was inaugurated by Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD, Government of India, in the presence of Dr. Divakar Hemadri, ADG (Animal Health), ICAR and Dr. A. Sanyal, Director, ICAR-NIHSAD. Accredited with ISO 17025:2017, the laboratory will enhance disease surveillance, diagnostics and capacity building for PPR control in India.

Dr Mitra highlighted that as one of only four WOAH Reference Laboratories worldwide, it reinforces India's leadership in global PPR eradication efforts. Dr. Baldev R. Gulati, Director, ICAR-NIVEDI, acknowledged the support of DAHD in making this milestone possible. The newly inaugurated laboratory will play a pivotal role in veterinary epidemiology, disease control and international collaborations, significantly contributing to India's animal health initiatives and strengthening its global standing in PPR eradication.

## ICAR-NIVEDI Celebrates Kannada Rajyotsava with Cultural Splendour

ICAR-NIVEDI marked the 69th Kannada Rajyotsava on 10th December 2024 with great enthusiasm, celebrating Karnataka's rich cultural heritage. The event was graced by Sri Hrudaya Shiva, a renowned writer and director in the Kannada film industry and Dr. Vijay Kumar K.T., Assistant Professor at GKVK, Bengaluru, as chief guests. The celebrations began with a vibrant performance of *Dollu Kunita* and *Tamate*, symbolizing Karnataka's deep-rooted traditions. The flag hoisting ceremony was led by the chief guests along with Dr. Baldev R. Gulati, Director, ICAR-NIVEDI. In their addresses, the dignitaries encouraged the staff to take pride in Karnataka's art, culture and heritage, emphasizing the importance of preserving and promoting the Kannada language and traditions. The event concluded with cultural performances by NIVEDI staff, including singing, dance and drama, showcasing their talent and enthusiasm in honouring the spirit of Kannada Rajyotsava.

## Swachhata Pakhwada: ICAR-NIVEDI Leads Cleanliness and Sustainability Initiatives

ICAR-NIVEDI observed *Swachhata Pakhwada* from 16-31st December 2024, undertaking impactful initiatives to promote cleanliness, digital transformation and environmental sustainability. A major highlight of the campaign was the digitization of over 3,000 files, significantly reducing paper usage and enhancing transparency in administrative processes. Hundreds of residents, farmers and students actively participated in awareness programs, *Shramdaan* activities and cultural events, fostering a sense of community responsibility. Key achievements included the implementation of rainwater harvesting systems and wastewater recycling for agricultural use, responsible management of biohazardous and organic waste and the beautification of waste management facilities.

# 07

# Ongoing Research Projects

| Project Title | Start Date | End Date | Project Team |
|---|---|---|---|
| **Epidemiology of Bovine Diseases** | | | |
| All India Network program AMR in Animals and Fisheries **(AINP-AMR) (ICAR)** | November 2018 | continuing | N Shivasharanappa*, R Shome, P Krishnamoorthy, ZB Dubal |
| Sero-monitoring of Brucellosis control programme under NADCP for control of FMD and Brucellosis- ELISA kit supply and capacity building. **(NADCP,LH&DCP, DAHD-GoI)** | 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-ADMac Phase II)** | March 2021 | March 2025 | 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-GoI)** | May 2019 | March 2026 | V Balamurugan*, HB Chethan Kumar, M Nagalingam, SS Jacob, KP Suresh, J Hiremath, GB Manjunatha Reddy, MM Chanda, G Govindaraj |
| Development of population assay for detection of LSD in cattle and buffaloes **(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-GoI)** | April 2023 | March 2026 | GB Manjunatha Reddy *, N Shivasharanappa, HB Chethan Kumar |
| 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, GoI)** | 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 |

| Project Title | Start Date | End Date | Project Team |
|---|---|---|---|
| Detection of subclinical mastitis and disease management program at farm level for dairy farmers **(BIRAC-BIPP)** | June 2023 | February 2025 | R Shome* |
| Epidemiology of economically important bovine diseases **(Institute)** | April 2023 | March 2026 | R Shome*, PP Sengupta, 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 |
| IndoZooRisk: Using OneHeealth approaches to understand and co-develop interventions for zoonotic diseases affecting forest communities in India. **(UKCEH)** | August 2023 | July 2025 | M. M. Chanda*, B R. Gulati |
| Identifying the association between climatic variables, CCHF, KFD and their vectors for the development of risk maps under present and future climate change scenarios using GIS (Geographical Information System), remote sensing and novel modelling approaches **(ICMR)** | January 2024 | December 2026 | M. M. Chanda*, H. B Chethan Kumar, S B. Shivachandra |
| Development of mRNA Vaccine Candidate Against Leptospirosis**.(Institute)** | April 2024 | March 2026 | V Balamurugan*, P Krishnamoorthy |
| Active Surveillance of the important haemoprotozoan parasites in large ruminants in Karnataka and Chhattisgarh**(Institute)** | July 2024 | June 2026 | PP Sengupta*, SS Jacob, P Krishnamoorthy |
| Estimates of Risk and Assessment of Burden of Zoonotic TB in India (ERAzTB) Pennsylvania State University USA | May 2024 | May 2026 | B R. Gulati *, M Nagalingam, P Krishnamoorthy, R Shome, V Balamurugan |
| Building a surveillance model for detecting zoonotic spill over in increased animal-human interaction setting using a one health approach: A study at selected slaughter houses**.(ICMR)** | August 2024 | July 2026 | BR. Gulati*, KP Suresh, R Shome, ZB Dubal, N Shivasharanappa, SS Jacob |
| Environmental Surveillance and Early Warning System for Animal Pathogen Surveillance(**BMGF)** | August 2024 | August 2026 | GB Manjunatha Reddy*, MM Chanda, BR Gulati, |
| Development of CRISPR Cas platform Assays for Rapid detection and Differentiation of Capripox Viruses **(ICAR)** | August 2024 | August 2026 | GB Manjunatha Reddy*, N Shivasharanappa, M Nagalingam |
| All India Network Program on One Health Approach to Zoonotic Diseases **(AINP-OH) (AINP, ICAR-IVRI)** | October 2024 | March 2026 | R Shome *, V Balamurugan, GB Manjunatha Reddy, M Nagalingam, HB Chethan Kumar |
| **Epidemiology of Small Ruminant Diseases** | | | |
| Network unit of NCVTC under veterinary microbe component **(ICAR)** | July 2021 | Continuing | R Sridevi*, GB Manjunatha Reddy, M Nagalingam |
| Characterization of bluetongue virus strains/ serotypes and assessment of their suitability as vaccine candidates to the current field scenario **(NLM, DAHD-GoI)** | March 2022 | March 2025 | MM Chanda * |

| Project Title | Start Date | End Date | Project Team |
|---|---|---|---|
| Action plan for surveillance and monitoring of PPR in India under PPR-EP **(CADCP, LH&DCP, DAHD-GoI)** | September 2022 | March 2026 | V Balamurugan*, KP Suresh, G Govindaraj, D Hemadri, N Shivasharanappa, SS Jacob, HB Chethan Kumar, M Nagalingam, G Narayanan |
| Epidemiology of respiratory infections in small ruminants with reference to Mycoplasmosis and Ovine Pulmonary adenocarcinoma (JSRV) ( **Institute**) | May 2023 | April 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 | MM Chanda * |
| Development of recombinant antigen based Novel Epi diagnostics and subunit vaccines for Anthrax in small ruminants (**NLM, GoI**) | April 2023 | March 2025 | SB Shivachandra*, MM Chanda |
| 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 |
| Development of Recombinant Antigens Based Immuno-diagnostics for Sero-surveillance of Zoonotic tick-borne Diseases (CCHF, GAN and KFD) Among Livestock Under One Health Approach | January 2024 | January 2027 | SB Shivachandra *, MM Chanda |
| Epidemiology of infectious diseases of small ruminants **( Institute**) | April 2023 | March 2025 | V Balamurugan*, MM Chanda, GB Manjunatha Reddy, SB Shivachandra, N Shivasharanappa, R Sridevi, M Nagalingam |
| AINP-CEDA on Mycoplasma and Theileriosis Research Component **(AINP-CEDA)** | October 2024 | March 2026 | R Sridevi*, SS Jacob, PP Sengupta, P Krishnamoorthy |
| AINP-CEDA on Bluetongue Research Component **(AINP-CEDA)** | October 2024 | March 2026 | MM Chanda*, CS Sathish Gowda |
| **Epidemiology of Swine Diseases** | | | |
| Action plan for surveillance and monitoring of classical swine fever during implementation of control programme (CSF-CP) **(CADCP,LH&DCP, DAHD-GoI)** | September 2022 | March 2026 | SS Patil*, KP Suresh, J Hiremath, N Shivasharanappa, R Sridevi, G Narayanan, HB Chethan Kumar |
| Epidemiology of major pig diseases in India **(Institute)** | April 2023 | March 2026 | J Hiremath*, SS Patil, N Shivasharanappa, HB Chethan Kumar, CS Sathish Gowda, KP Suresh, SS Jacob |
| Development of recombinant antigen-based ELISA for sero-surveillance of porcine cysticercosis **(CRP&VD)** | December 2022 | November 2025 | SS Jacob*, PP Sengupta |
| Development and validation of efficient multiplexed diagnostic platforms for early detection of African Swine Fever Virus.**(DBT, GoI)** | June 2024 | June 2027 | J Hiremath*, Sonu Gandhi |

| Project Title | Start Date | End Date | Project Team |
|---|---|---|---|
| **Animal Disease Informatics and Socio-economics** | | | |
| National initiative on climate resilient agriculture (NICRA) **(ICAR)** | February 2015 | March 2026 | 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 2025 | KP Suresh*, SS Patil, G Narayanan |
| Sampling plan generation for carrying out sero-surveillance and sero-monitoring and data analytics for FMD and Brucellosis. **( NADCP,LH&DCP, DAHD-GoI)** | January 2021 | March 2026 | KP Suresh*, SS Patil |
| 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 | March 2025 | KP Suresh*, SS Patil, V Balamurugan |
| Risk estimation & prediction and Risk mapping communication of Anthrax using artificial intelligence systems **(DTRA, USA)** | February 2023 | February 2028 | KP Suresh*, SS Patil BR Gulati |
| Socio-economic impact of important livestock diseases in India **(Institute)** | April 2023 | March 2026 | G Govindaraj *, G Narayanan, CS Sathish Gowda |
| Integrating data-driven disease surveillance and predictive analytics for live-stock diseases (NADRES V2) **(Institute)** | April 2023 | March 2026 | KP Suresh *, SS Patil, P Krishnamoorthy, SS Jacob, R Shome |
| Assessing Japanese Encephalitis Vaccination Impact: A Mathematical Modeling and Risk Mapping Perspective **(IIT-Bombay)** | April 2024 | October 2025 | KP Suresh*, PP Sengupta, G Narayanan |
| **Service Projects** | | | |
| Enhancing the livelihoods of Scheduled Tribes farmers and farm women through improved livestock production technologies **(Institute)** | August 2024 | Continuing | CS Sathish Gowda*, G Narayanan, R Sridevi |
| Institute Technology Management Unit (ITMU) **(NAIF)** | April 2024 | Continuing | M Nagalingam*, R Sridevi |
| Socio economic upliftment of the Scheduled caste livestock farmers and farm women in rural area through improved livestock production technologies **(Institute)** | September 2020 | Continuing | G Narayanan*, CS Sathish Gowda, R Sridevi, HB Chethan Kumar |
| **NAAVIC** | | | |
| R-ABI RAFTAAR funded MoAFW, GOI **(DAHD – GoI)** | April 2019 | March 2025 | SB Shivachandra* |
| ICAR-Agri-Business Incubator (ABI) – ICAR funded NAIF-IP-and TM Division, ICAR, GOI **(ICAR)** | January 2020 | Continuing | SB Shivachandra* |

*Principal Investigator

# 08

# Technology Development and Commercialization

## Copyrights:

### Copyrights registered

1. Suresh K.P, Divakar H, S.S Patil, P. Krishnamoorthy, S.J Siju. *National Animal Disease Referral Expert System (NADRES V2).* (Application No. 6651/2022-CO/SW; Date of filing 28.03.2022; Date of registration 12.03.2024; RoC No. SW-18400/2024).

2. S.B Shivachandra, R. Yogisharadhya, G.B.R. Manjunatha, A. Prajapati, M.M. Chanda. *NaaViC Bengaluru logo.* (Application No. 7774/2024-CO/A; Date of filing 12.03.2024; Date of registration 11.06.2024; RoC No A-153925/2024).

3. S.B Shivachandra, R. Yogisharadhya, G.B.R Manjunatha, A. Prajapati, M.M Chanda. *NaaViC logo.* (Application No. 7775/2024-CO/A; Date of filing 12.03.2024; Date of registration 04.12.2024; RoC No A-156335/2024).

4. S.B Shivachandra, R. Yogisharadhya, G.B.R Manjunatha, A. Prajapati, M.M Chanda. *NEXUS logo.* (Application No. 7775/2024-CO/A; Date of filing 14.03.2024; Date of registration 04.12.2024; RoC No A-156318/2024).

### Technologies certified

Some of the technologies of ICAR- NIVEDI got certified from the SMD and those are

1. Indirect ELISA kit for diagnosis of brucellosis in sheep and goat
2. Protein G based Indirect ELISA kit for sero-diagnosis of bovine brucellosis
3. Surravey-Kit for detection of antibody against *Trypanosoma evansi* in bovines
4. PPR ABrAC-ELISA Kit (PPR Ag Chek Kit) for the detection of PPR Virus antigens in the clinical specimens of sheep and goats
5. Indirect ELISA for the detection of antibodies against CSFV in Pigs.

Among these technologies “Protein G based Indirect ELISA kit for sero-diagnosis of bovine brucellosis” was selected as best technology from Animal Science Division for awarding certificate during ICAR Foundation Day.

## Release of Diagnostic Kits

ICAR-NIVEDI continues to innovate in diagnostic kit development, strengthening disease surveillance and control. This year, Lumpy Screen rELISA and LumpySure wELISA Kits were officially released on 8th July 2024 by Dr. Raghavendra Bhatta, DDG (Animal Science), ICAR, New Delhi

# 09

# Publications

## Research Publications

1. Anand, T. S., Ahmad, T., Kumar, D., Devadason, I. P., Mendiratta, S. K., Verma, A. K., Biswas, A. K., Talukder, S. Dubal, Z. B., Das, A., Deshpande, A. D., Aruna, T. S., Yasotha, T., and Sen, A. R. 2024. Development of drying methodology for intact whole buffalo liver, its characterization, shelf life and evaluation of palatability as pet treat. Journal of Food Processing and Preservation. pp:13 https://doi.org/10.1155/2024/7842389
2. Anandakumar, J., Suresh, K. P., Patil, A. V., Jagadeesh, C. A., Bylaiah, S., Patil, S. S. and Hemadri, D. 2024. Comprehensive spatial-temporal and risk factor insights for optimizing livestock anthrax vaccination strategies in Karnataka, India. Vaccines, 12(9), 1081. https://doi.org/10.3390/vaccines12091081
3. Archana, C. A., Sekar, Y. S., Suresh, K. P., Subramaniam, S., Sagar, N., Rani, S. and Patil, S. S. 2024. Investigating the influence of ANTXR2 gene mutations on protective antigen binding for heightened anthrax resistance. Genes, 15(4), 426. https://doi.org/10.3390/genes15040426
4. Asaaga, F. A., Shakeer, I., Sriram, A., Chhotaria, K., Dutta, S., Narayanaswamy, D., Amankwaa, G., Chanda, M. M., Hoti, S. L., Young, J. C., and Purse, B. V. 2024. Ties that bind: Understanding One Health networks and participation for zoonoses prevention and control in India. One Health Outlook, 6(1), 24.
5. Ashwini, M., Suresh, K. P., Patil, S., Hemadri, D., Gulati, B. R., Barman, N. and Nayak, A. 2024. Comprehensive assessment of lumpy skin disease prevalence across Asia and African countries: A systematic review and meta-analysis. The Indian Journal of Animal Sciences, 94(8), 659-664. https://doi.org/10.56093/ijans.v94i8.148945
6. Balamurugan, V., Ojha, R., Kumar, K. V., Asha, A., Ashraf, S., Dsouza, A. H., Pal, A., Bokade, P. P., Harshitha, S. K., Deshpande, R., Swathi, M., Suresh, K. P., Govindaraj, G., Hasnadka, S. P., ChandraSekar, S., Hemadri, D., Guha, A., Felix, N., Parida, S. and Gulati, B. R. 2024. Post-vaccination sero-monitoring of peste des petits ruminants in sheep and goats in Karnataka: Progress towards PPR eradication in India. Viruses, 16, 333. https://doi.org/10.3390/v16030333
7. Balamurugan, V., Ojha, R., Kumar, K. V., Asha, A., Ashraf, S., Dsouza, A. H., Suresh, K. P., and Gulati, B. R. 2024. Post-vaccination sero-monitoring of peste des petits ruminants in sheep and goats in Karnataka: Progress towards PPR eradication in India. Viruses, 16(3), 333. https://doi.org/10.3390/v16030333
8. Bharathi, I. U., Rani, S., Patil, S. S., Pandey, R. K., Ramesh, V., B, M. and Suresh, K. P. 2024. Gene expression meta-analysis identifies novel pathways of the avian influenza virus disease. Journal of Biomolecular Structure and Dynamics, 1–11. https://doi.org/10.1080/07391102.2024.2431662

9. Chaithra, N., Jayashree, A., Sahana, C., Shreevatsa, B., Rajendrasozhan, S., Dharmashekar, C., Suresh, K. P. and Shivamallu, C. 2024. Progression-free survival estimation of docetaxel-based second-line treatment for advanced non-small cell lung cancer: A pooled analysis from 18 randomized control trials. Frontiers in Oncology, 14, 1298786. https://doi.org/10.3389/fonc.2024.1298786

10. Chamuah, J. K., Jacob, S. S., Ezung, L., Awomi, L., Aier, I., Kumar, H., Goswami, P., Lalzampuia, H., Khate, K., Vupru, K., and Singh, M. 2024. First report of Ikeda genotype of *Theileria orientalis* in Mithun *(Bos frontalis)* from northeastern hilly region of India. Parasitology Research, 123(1), 36.

11. Chanda, M. M., Campbell, L., Walke, H., Salzer, J. S., Hemadri, D., Patil, S. S., Purse, B. V., and Shivachandra, S. B. 2024. A thirty-year time series analysis identifies coherence between oscillations in anthrax outbreaks and El Niño in Karnataka, India. Scientific Reports, 14(1), 19928. https://doi.org/10.1038/s41598-024-19928-5

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16. Dudhe, N., Bhilegaonkar, K., Abass, G., Rawat, S., Singh, V., Rajak, K. K., Vinodhkumar, O. R., Malik, Y. P. S., and Dubal, Z. B. (2025). Genotypic diversity of human and porcine group A rotaviruses in Uttar Pradesh, India. Gene Protein Dis. https://doi.org/10.36922/gpd.6237

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18. Jacob, S. S., Sengupta, P. P., Kumar, H. B. C., Maharana, S. M., Goudar, A., Chandu, A. G. S., Rakshitha, T. S., Shivakumar, V., Gulati, B. R. and Reddy, G. B. M. 2024. Unveiling genotypic diversity of *Theileria orientalis* in lethal outbreaks among bovines in Karnataka, India. Parasitology Research, 123(5), 202. https://doi.org/10.1007/s00436-024-07376-z

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microscopic agglutination test (MAT) in and around Navsari, South Gujarat, India. International Journal of Veterinary Science and Animal Husbandry, 9(2), 510-514.

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## b. Abstracts/ lead papers in conference/symposium/ workshop

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2. Arun, Y.P.,, Bokade, P. P., Bharath, V., Kumar, K. V., Vikram, R., Kumar, H. B., Chethan, Patil, S. G., and Balamurugan, V. 2024. First Evidence on Seroprevalence and Serovar Distribution of Leptospirosis in Mithun (Bos frontalis) from Nagaland, India. In XX Annual Conference of the Indian Association of Veterinary Public Health Specialists (IAVPHS) and National Symposium on Integrating One Health: Bridging the Gap at Human-Animal-Environmental Interfaces, Veterinary College, Shirwal, Dist. Satara (MAFSU, Nagpur), November 14-15, 2024, pp. 86-87.

3. Balamurugan, V. 2024. Bridging boundaries: A comprehensive public health strategy for leptospirosis - Diagnosis and one health integration in zoonosis management. In XX Annual Conference of the Indian Association of Veterinary Public Health Specialists (IAVPHS) and National Symposium on Integrating One Health: Bridging the Gap at Human-Animal-Environmental Interfaces. Krantisinh Nana Patil College of Veterinary Science, Shirwal, Maharashtra, November 14-15, 2024, pp. 131-136.

4. Balamurugan, V. 2024. Experiences in Accreditation and Designation of WOAH Reference Laboratory for Leptospirosis. In VIBCON – 2024, XXIX Annual Convention of ISVIB and National Conference on Challenges in Animal Health and Production Amidst Climate Change: Innovative, Sustainable Solutions and Their Translations, TANUVAS, Chennai, September 26-28, 2024, pp. 124.

5. Balamurugan, V. 2024. Status of PPR in Sheep and Goats in Karnataka State. Towards Eradication of Peste des Petits Ruminants. Lecture delivered to Veterinary Officers of Animal Husbandry and Veterinary Services Department under the Government of India Sponsored ASCAD programme, Karnataka Veterinary Council Auditorium, Hebbal, Bengaluru, March 2024

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7. Balamurugan, V., Kumar, K. V., Ojha, R., Swathi, M., Asha, A., Dsouza, A. H., Priya, S., Bokade, P. P., Pal, A., Harshitha, S. K., Deshpande, R., Ashraf, S., Suresh, K. P., Govindaraj, G., Sekar, S. C., Hemadri, D. and Gulati, B. R. 2024. Pre-vaccination seroprevalence of Peste des Petits Ruminants (PPR) virus antibodies in sheep and goats across India: A baseline study for the national PPR eradication program. In National Conference on IAVMICON-2024, XXXVI Annual Convention of IAVMI, Impact of Animal Health on One Health and National Prosperity, Udaipur, Rajasthan, June 6-7, 2024, pp. 102.

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9. Bokade, P. P., Apsana, R., Arun, Y. P., Bharath, V., Vinod Kumar, K., Hemadri, D., and Balamurugan, V. 2024. Sero-epidemiology of leptospirosis in buffaloes: Insights from enzootic states of Andhra Pradesh and Odisha, India. In XX Annual Conference of the Indian Association of Veterinary Public Health Specialists (IAVPHS) and National Symposium on Integrating One Health: Bridging the Gap at Human-Animal-Environmental Interfaces. Veterinary College, Shirwal, Maharashtra, November 14-15, 2024, pp. 98-99.

10. Dubal, Z.B, 2024. Emergence of Antimicrobial Resistance. DST-SERB sponsored High-End Workshop (KARYASHALA) on "Advances in Pathological Techniques in Diagnosis of Emerging and Re-emerging Diseases of Animals and Poultry" organized by Division of Pathology, IVRI, July 15-24, 2024.

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12. Dubal, Z.B, 2024. Step 1: Prepare to Investigate and Step 2: Confirm Outbreak of Outbreak Investigation. Lecture delivered during "Field Veterinary Epidemiology" training, ICAR-NIVEDI, Bengaluru and February 26 - March 1, 2024.

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20. Hemanth, R. A., Namrutha, M. R., Bindu, S., Prajapati, A., Yogisharadhya, R., Mohanty, N. N., Chanda, M. M. and Shivachandra, S. B. 2024. Gene cloning and expression of recombinant lethal factor (LFn)-amino terminal domain antigen of Bacillus anthracis. In XXVIII Annual Convention of ISVIB and National Conference-VIBCON-2024, (TANUVAS), Chennai, September, 26-28, 2024.

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24. Jagath, C. C., Gowda, U. K. S., Muthaiah, G., Shamshad, S., Chandrashekhar, R., Gulati, B. R., Chanda, M. M. and Hemadri, D. 2024. Isolation and molecular characterization of BTV isolates revealed co-infection with multiple serotypes: Implication for vaccine development. In Virocon 2024, DRDE, November, 11-13, 2024.

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26. Krishnamoorthy, P., Nagalingam, M., Kalyan, T. V., Suresh, K. P., Shome, R., Balamurugan, V. and Gulati, B. R. 2024. Prevalence of bovine tuberculosis in cattle and buffaloes across different climatic regions of India: A scientometric analysis. In National Symposium on Integrating One Health: Bridging the Gap at Human-Animal-Environment Interfaces, Krantisinh Nana Patil College of Veterinary Science, Shirwal, Nov.,V 14-15, 2024, pp. 85-86.

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# 10

# Awards, Recognitions and Personal Milestones

## WOAH Recognition of Reference Laboratory Status for PPR and Leptospirosis Labs in ICAR-NIVEDI

The World Organization for Animal Health (WOAH) Biological Standards Commission has recognized the ICAR-NIVEDI laboratories as two of the new WOAH Reference Laboratories for Peste des petits ruminants (PPR) and Leptospirosis, with designated expert Dr. V Balamurugan, endorsed by the WOAH Council on 26th

March 2024. This decision aligns with Resolution No. 33, "Designation of WOAH Collaborating Centers" adopted during the 91st World Assembly of WOAH Delegates at the General Session held on 30th May 2024. (https://www.ppr-labs-oie-network.org/)


World Organisation for Animal Health | Organisation mondiale de la santé animale | Organización Mundial de Sanidad Animal

**The Director General**

Our Ref.: GT/SL/MD 35.596

Paris, 14 June 2024

Dr Alka Upadhyaya
Department of Animal Husbandry and Dairying
Minister of Fisheries, Animal Husbandry and Dairying
'A' Wing Krishi Bhawan, Room No 218
110001 New Delhi
INDIA

**Subject: Application for designation of new WOAH Reference Laboratories for peste des petits ruminants and leptospirosis**

Dear Dr Upadhyaya,

I am pleased to inform you that during its 91st General Session, the World Assembly of Delegates of WOAH confirmed the designation of **the ICAR-National Institute of Veterinary Epidemiology and Disease Informatics in Karnataka** as new WOAH Reference Laboratories for peste des petits ruminants and for leptospirosis, with Dr Vinayagamurthy Balamurugan as the designated expert.

Thank you for your willingness to co-operate with WOAH and its Members, and I look forward to working with Dr Balamurugan in the future.

With best regards,

Yours sincerely,

Dr Monique ELOIT

Copy: Dr Vinayagamurthy Balamurugan, Dr Hirofumi Kugita, Dr Gregorio Torres

12, rue de Prony
75017 Paris, France

T. +33 (0)1 44 15 18 88
F. +33 (0)1 42 67 09 87
woah@woah.org
www.woah.org

Dr. V. Balamurugan awarded as a Fellow of the Indian Association of Veterinary Microbiologists, Immunologists and Specialists in Infectious Diseases 2024, in recognition of his Significant contributions for the advancement of Veterinary Microbiology and received Best oral presentation award in the National Conference on "IAVMICON-2024, XXXVI Annual Convention of IAVMI" on "XXXVI National Conference of "Indian Association of Veterinary Microbiologists Immunologists and Specialists in Infectious Diseases" "Impact of Animal Health on One Health and National Prosperity" held at Udaipur organized by Department of Veterinary Microbiology, College of Veterinary and Animal Science, Udaipur during 6-7th June 2024.


Dr M. Nagalingam received best poster award (third place) for abstract presentation on "Epidemiological investigation of abortions in sheep due to *Brucella melitensis*: A study in Karnataka" at Winter Symposium & South zone Microcon 2024 organized by Christian Medical College, Vellore during 1-3rd February 2024.


Dr M. Nagalingam received best oral presentation award (first place) for abstract presentation on "Assessment of prevalence and risk factors of brucellosis in sheep in Karnataka, India: A cross sectional study." at International Conference of Indian Society for Sheep and Goat Production and Utilization (ISSGPUCON-2024) on Recent Trends and Future Perspective to Improve the Performance, Health and Welfare of Small Ruminants Under Changing Climate Scenario, Rajiv Gandhi Institute of Veterinary Education and Research (RIVER), Kurumbapet, Puducherry, during 24-26th April 2024.

## Dr. Rajeswari Shome Honoured with ICAR Best Technology Certificate

Dr. Rajeswari Shome, Principal Scientist, ICAR-NIVEDI, received the ICAR Best Technology Certificate for her contribution to the development of a diagnostic kit for brucellosis. The honour was conferred by Hon'ble Union Agriculture Minister during the 96th ICAR Foundation Day celebrations held on 16 July 2024 in New Delhi.

## Dr. Sathish Shivachandra Honoured with Sir C.V. Raman Young Scientist State Award

Dr. Sathish B. Shivachandra, Principal Scientist, ICAR-NIVEDI, was conferred the prestigious Sir C. V. Raman Young Scientist State Award for his contributions to Agricultural Sciences and Animal Husbandry for the year 2022. The award was presented by the Hon'ble Chief Minister of Karnataka on behalf of the Karnataka State Council for Science and Technology (KSCST), Government of Karnataka. Additionally, Dr. Shivachandra was recognized with the 'Leadership in Veterinary Science and Entrepreneurship Award' during the ICSSR International Conference held at Assam University, Silchar, Assam, India.


- Dr. V. Balamurugan, Principal Scientist, ICARNIVEDI, was conferred the Fellowship of the Indian Association of Veterinary Public Health Specialists (IAVPHS-2024) in recognition of his outstanding contributions to Veterinary Public Health. The honour was bestowed during the XX Annual Conference of IAVPHS and National Symposium on "Integrating One Health: Bridging the Gap at the Human-AnimalEnvironment Interfaces", held from 14-15 November 2024 at Shirwal, Maharashtra.

- At the 33rd National Congress of Veterinary Parasitology (NCVP), held at the College of Veterinary Science, PVNRTVU, Hyderabad, Dr. P.P. Sengupta, Principal Scientist, received the Prof. V.S. Rathore Eminent Scientist Award on 17th December 2024 for his distinguished contributions to research in Veterinary Parasitology.
- Dr. P. Krishnamoorthy, Senior Scientist, was awarded the First Prize for Best Oral Presentation at the IAVPHS Conference 2024, held at KNP College of Veterinary Science, Shirwal, from 14–15 November 2024.

## Personnel joined/transferred/promoted

- Smt. Suma Srinivas, AF&AO, joined at ICAR-NIVEDI on 01.01.2024 (F/N) from ICAR-IIHR, Bengaluru.
- Dr. Z.B.Dubal, Principal Scientist, joined at ICAR-NIVEDI on 10.01.2024 (F/N) after transfer from ICAR-IVRI, Bareilly.
- Shri. Sadik Ali, Finance and Accounts Officer, Joined ICAR-NIVEDI on 22.04.2024 (F/N).
- Mr. Purshotam Yadav, joined as T-1 at ICAR-NIVEDI from 25.04.2024 (A/N).
- Mr. Praveen, joined as T-1 at ICAR-NIVEDI from 06.05.2024 (F/N).
- Mr. Md Razi Ahmad, joined as T-1 at ICAR-NIVEDI from 07.05.2024 (F/N).
- Dr. R. Yogisharadhya, Assistant Chief Technical Officer (ACTO), relieved from ICAR-NIVEDI on 11.01.2024 (A/N) to join as Senior Scientist-cum-Head, KVK Hailakandi, Assam.
- Dr. Awadhesh Prajapati, Assistant Chief Technical Officer (ACTO), relieved from ICAR-NIVEDI on 29.04.2024 (A/N) to join as Associate Professor at Bihar Veterinary College, Patna.
- Smt. Suma Srinivas, AF&AO, relieved from ICAR-NIVEDI on 25.04.2024 (A/N) to join at ICAR-ATARI, Bengaluru.
- Dr. Jagadish Hiremath, Principal Scientist, has been promoted from senior scientist to Principal Scientist with effect from 01.03.2023.
- Dr. G. Narayanan, Senior Scientist, has been promoted to next higher grade of Senior Scientist, Research Pay Level-13A with effect from 27.04.2023.
- Mr. Vivek Kumar joined as Assistant on 30.08.2024 (Forenoon).
- Mr. Abhishek Tomar joined as Assistant on 18.09.2024 (Afternoon).
- Ms. Aparna Kaushik joined as Assistant on 21.10.2024 (Afternoon).
- Sh. P. Muraleedharan, Administrative Officer, was relieved from ICAR-NIVEDI on 31.12.2024 (Forenoon) to join ICAR-CMFRI, Kochi, upon his promotion as Senior Administrative Officer (SAO).
- Dr. Siju Susan Jacob, Scientist, has been promoted to Senior Scientist (Research Pay Level-12), effective 1.1.2024.
- Dr. Chethan Kumar H.B, Scientist, has been promoted to Senior Scientist (Research Pay Level-12), effective 26.7.2024.

## Staff position as on 31 December 2024

| Name of the Officers & Staff | Designation |
|---|---|
| Dr. Baldev Raj Gulati | Director |
| **Scientific Staff** | |
| Dr. (Mrs.) Rajeswari Shome | 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. Z B Dubal | Principal Scientist |
| Dr. G. Govindaraj | Principal Scientist |
| Dr. Jagadish Hiremath | Principal 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 | Senior Scientist |
| Dr. Chethan Kumar H.B | Senior Scientist |
| Dr. C. S. Sathish Gowda | Scientist |
| **Technical Staff** | |
| Dr. Awadhesh Prajapati | ACTO (On lien) |
| Mr. Purshotam Yadav | Technician (T-1) |
| Mr. Praveen | Technician (T-1) |
| Mr. Md Razi Ahmad | Technician (T-1) |
| **Administrative Staff** | |
| Mr. P.Muraleedharan | AO |
| Mr. Sadik Ali | F&AO |
| Mrs. Aachal Palewar | AAO |
| Mrs. A Saranya | PA |
| Ms. Aparna Kaushik | Assistant |
| Mr. Vivek Kumar | Assistant |
| Mr. Abhishek Tomar | Assistant |
| Mrs. Sridevi G C | UDC |
| Mr. B Hanumantharaju | LDC |
| Mr. Umesh H S | LDC |
| **Multi-Tasking Staff (MTS)** | |
| Mr. M. K. Ramu | MTS |


राष्ट्रीय पशुरोग जानपदिक एवं सूचना विज्ञान संस्थान
NATIONAL INSTITUTE OF VETERINARY EPIDEMIOLOGY AND DISEASE INFORMATIC
International Women's Day Celebration at ICAR-NIVEDI

# 11

# IRC, RAC and other Review Meetings

## 16th Research Advisory Committee meeting of ICAR-NIVEDI

The 16th Research Advisory Committee (RAC) Meeting of the ICAR-NIVEDI held on 14th March 2024 under the Chairmanship of Dr M.P. Yadav, Former Director, IVRI. The other members present were Dr Ashok Kumar, ADG (AH), ICAR, Dr B.R. Gulati, Director, ICAR-NIVEDI, Dr Mandeep Sharma, Dean, CVSc, Palampur, Dr S.C. Dubey, Ex-Joint Director, NIHSAD, Dr Rajendra Singh, Ex-Principal Scientist, IVRI, Dr C. Madan Mohan, Principal Scientist, IVRI, Dr Lalit Achoth, Ex-Professor, KVAFSU and Dr S.S. Patil, Member Secretary, ICAR-NIVEDI. The members emphasized the importance of gathering realtime livestock disease data and associated risk factors, improved quality of disease data from state governments for better epidemiological analysis, recommended regular workshops and meetings focused on the One-Health approach involving multi-stakeholder participation from veterinary, medical and wildlife sectors and the establishment of a BSL-3 facility at ICAR-NIVEDI to better prepare for emerging livestock diseases.


## 18th Institute Research Committee meeting

The 18th Institute Research Committee meeting of ICARNIVEDI for the financial year 2023-24 was held on 16th April, 2024 under the chairmanship of Dr. B. R. Gulati Director, ICAR-NIVED, Bengaluru. The external experts, Dr. Aniket Sanyal, Director, ICAR-NISHAD and Dr. S. C. Yadav, Principal Scientist (Retired), ICAR participated in the meeting. Dr. V. Balamurugan, Nodal Officer, PME cell and Member Secretary, IRC, welcomed the house. In the opening remarks, the Chairman provided an overview of the research accomplishment during 2023-24. Dr. Aniket Sanyal underscored the pivotal role of ICARNIVEDI in disease informatics and the surveillance of important livestock disease in the country. Dr. S. C. Yadav in his initial

remarks emphasized the significance of NIVEDI's disease data and serum repository, urging scientist to make the utmost use of this valuable resource. Dr. V. Balamurugan, Nodal Officer, PME cell presented the recommendation of 16th RAC for the members of the IRC. In this meeting, the thirty seven ongoing research projects were reviewed and three new project proposals were approved by the Chairman.


## ITMC meetings of ICAR-NIVEDI

Institute Technology Management Committee (ITMC) meetings were held on 29th February 2024 (Virtual), 12th March 2024 and 21st June 2024 in which the proposal for equipment purchase for ABI from ICAR-ABI-NAIF Capital fund was approved. Proposed technologies for the commercialization were evaluated for the further Techno Commercial Assessment Meeting (TCA). The copyright proposals submitted by NaaViC team, ABI centre, ICAR-NIVEDI were approved by ITMC and 17th year renewal of Patent No. 250709 (A Kit for diagnosis of Brucellosis) was approved. Validation procedure for web applications and statistical methodologies were evaluated and approved.

## Mid-Term Research Progress of ICAR-NIVEDI Reviewed

The Mid-Term Institute Research Committee (IRC) Meeting of ICAR-NIVEDI for 2024-25 was held on 8th October 2024, chaired by Dr. Baldev R. Gulati, Director, ICAR-NIVEDI. Dr. Divakar Hemadri, ADG (Animal Health), ICAR, participated as an external expert. Dr. Hemadri praised the institute's scientists for their significant contributions to animal disease epidemiology. The meeting focused on the progress of both institutional and externally funded research projects from April to September 2024, with detailed discussions on the plans for October 2024 to March 2025. Key recommendations from the IRC included epidemiological analysis of disease outbreaks, temporal analysis of data, whole genome sequencing and predictive modelling of important livestock diseases. The meeting reinforced ICARNIVEDI's commitment to advancing livestock health research and highlighted the importance of strategic planning for the institute's research initiatives in the coming months.

## NIVEDI Conducts 26th IAEC Meeting

The 26th Institutional Animal Ethics Committee (IAEC) Meeting of ICAR-NIVEDI was held on 18th September 2024. During the meeting, IAEC members raised several queries, which were addressed by the Principal Investigators. Following detailed discussions, the committee approved the required number of animals for four research proposals presented. The IAEC emphasized the importance of using the minimum number of animals necessary for experiments while ensuring ethical and scientific rigor in research.

## 10th Institutional Biosafety Committee Meeting Held at NIVEDI

The 10th Institutional Biosafety Committee (IBSC) Meeting of ICAR-NIVEDI was held on 15th October 2024, under the chairmanship of Dr. Baldev R. Gulati, Director, ICAR-NIVEDI. The committee reviewed biosafety compliance and approved 25 research projects involving recombinant DNA technology and biohazardous materials. Discussions focused on risk assessments, biosafety protocols and containment measures to ensure adherence to safety standards. The committee recommended regular health monitoring for staff and enhanced biosafety practices for ongoing and future research. Additionally, the BSL-2+ facility was evaluated and deemed suitable for the approved studies.


**Visit of Mrs. Alka Upadhyaya, Secretary (AHD), DAHD, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India to ICAR-NIVEDI**

# 12

# Distinguished Visitors

- Hon'ble Shri Gabriel D Wangsu, Cabinet Minister for Agriculture, Horticulture, Animal Husbandry, Veterinary and Fisheries and Food and Civil Supplies, Government of Arunachal Pradesh visited on 28th November 2024.


- Mrs Alka Upadhyaya, Secretary (AHD), DAHD, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India, visited on 5th April, 2024.
- Mrs. Varsha Joshi, Additional Secretary (CDD/IT), DAHD, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India, visited on 5th April, 2024.
- Dr. Raghavendra Bhatta, Deputy Director General (AS), New Delhi, visited on 4th March 2024 and 4th October 2024.
- Dr. Abhijit Mitra, Animal Husbandry Commissioner, DAHD, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India, 5th April, 2024 and 17th October 2024.
- Dr. Vishnuvardhana, Vice Chancellor, University of Horticultural Sciences, Bagalkot. visited on 6th June 2024.
- Dr. P.L. Patil, Vice-Chancellor, UAS, Dharwad, visited on 2nd August 2024.

- Prof. L.S. Shashidhara, Director, National Centre for Biological Sciences (NCBS), Bengaluru, visited on 8th July 2024.
- Dr. Aniket Sanyal, Director, ICAR-NIHSAD, Bhopal, visited on 16th April 2024 and 17th October 2024.
- Dr. Artabandhu Sahoo, Director, ICAR-NIANP, Dr. Tusar Kanti Behera, Director, ICAR-IIHR, Dr. S.N. Sushil, Director, ICAR-NBAIR and Dr. V. Venkatasubramanian, Director, ICAR-ATARI, Bengaluru, visited on 1st July 2024.
- Dr G Kadirvel, Director, ICAR-ATARI, Zone VI, Guwahati visited, on 24th January 2024.
- Dr. S. R. K. Singh, Director, ICAR-ATARI, Jabalpur, Madhya Pradesh, visited on 3rd September 2024.
- Dr B.R. Shome, Former Director (Acting), ICAR-NIVEDI, visited on 20th June 2024.
- Mrs. Anandi Venkateswaran, Director (Finance and Budget), DAHD, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India, visited on 9th February 2024.
- Ms. Koj Rinya, IFS, Secretary to the Government of Arunachal Pradesh, visited on 28th November 2024.
- Dr. Sindura Ganapati, Visiting PSA Fellow, Office of the Principal Scientific Adviser (PSA), Government of India, visited on 25th November 2024.
- Dr. Ashok Kumar, Assistant Director General (AH), ICAR, Krishi Bhavan, New Delhi, visited on 14th March 2024 and 8th July 2024.
- Dr. Divakar Hemadri, ADG (Animal Health), ICAR, New Delhi, visited on 15th August 2024, 4th, 8th and 17th October 2024.
- Mr. Tang Hao – Regional Animal Health Workforce Development Specialist, Project Manager – VLC – Asia and the Pacific and Mr. Peter Black – Epidemiology Specialist – FAORAP visited during 28-29th February 2024.
- Professor Peter Hudson, Former Director, Huck Institutes of the Life Sciences; Willaman Professor of Biology, Penn State, USA visited on 5th March 2024.
- Dr. Georgina Limon-Vega, Scientist, Epidemiology from Pirbright Institute, visited on 9th February 2024.
- Dr. Didier RABOISSON, Attaché for Scientific and Academic Cooperation, French Institute in India-French Embassy in India, visited on 16th December 2024.
- Dr JPS Gill, Director of Research GADVASU, Ludhiana, visited during 28-29th February 2024.
- Dr. Pallab Chaudhuri, Joint Director, ICAR-IVRI, Bengaluru Campus, Bengaluru visited on 7th March 2024.
- Dr S. C. Dubey, Former Joint Director, ICAR-NIHSAD, Bhopal, Dr Mandeep Sharma, Dean, Dr. G.C. Negi College of Veterinary and Animal Sciences, Palampur, Dr. Rajendra Singh, Former Head, Division of Pathology, ICAR-IVRI, Izatnagar and Dr C. Madan Mohan, Principal Scientist, Division of Veterinary Biotechnology, ICAR-IVRI, Izatnagar, visited on 14th March 2024.
- Dr. Sandeep Kumar Singh, Joint Commissioner, CCS National Institute of Animal Health, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India, visited on 29th May 2024.

- Dr Sujit Nayak, Joint Commissioner, DAHD, Govt. of India, New Delhi visited on 30th May 2024.
- Mrs. Sarita Chauhan, Joint Secretary (LH), DAHD, Shri. G N Singh, Joint Secretary (Admin/ Trade/GC/IC), DAHD, Dr. Bhushan Tyagi, Joint Commissioner (RGM), DAHD, Dr. P. S. Mahesh, Joint Commissioner & Director, CEAH, DAHD and Dr. Arun, Joint Commissioner, CEAH, DAHD, Ministry of Fisheries, Animal Husbandry & Dairying, Govt. of India, visited on 5th April, 2024.
- Dr. Adhiraj Mishra, Assistant Commissioner, DAHD, visited on 22nd November 2024.
- Dr. Manjunath S. Palegar, Director, Office of the Commissioner, Dept. of Animal Husbandry and Fisheries, Hebbal, Bengaluru, visited on 1st July 2024.
- Dr. Raj Kumar Singh – Specialist, Dr. Acty George – Technical Officer, Epidemiology and Zoonoses – FAOIN, Mr. Rajesh Dubey, Operations & Programme Specialist, visited during 28-29th February 2024, 10th June 2024 and visited on 22nd November 2024.
- Dr Prabhdeep Kaur, Professor, Isaac Centre for Public Health, Indian Institute of Science, Bengaluru, visited on 27th March, 2024.
- Dr. S. C. Yadav, Principal Scientist (Retired), ICAR, visited on 16th April 2024.
- Dr. Vikram Singh, ECTAD team member, FAOIN, visited on 10th June 2024 and 22nd November 2024.
- Dr. Suresh S Honnappagol, Former Animal Husbandry Commissioner, Ministry of Agriculture & Farmers Welfare, Government of India, visited on 5th August 2024.
- Dr. Tushar N. Nale, Public Health Specialist and Deputy Director, Centre for One Health, NCDC, New Delhi, visited on 5th August 2024.
- Dr. Nihar Nalini Mohanty, Assistant Director, CCS National Institute of Animal Health, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India, visited on 29th May 2024.
- Dr. S. Nagarathna, Professor and Head, Department of Neuromicrobiology, NIMHANS, and Dr. Utpal S Tatu, Professor, Department of Biochemistry, Indian Institute of Science, Bengaluru, visited on 9th August 2024.
- Prof. K. M. L. Pathak, Former DDG (Animal Science), ICAR, visited on 11th November 2024.
- Dr. Jasbir Singh Bedi, Director, Centre for One Health, GADVASU, visited on 22nd November 2024.
- Dr. Prabhdeep Kaur, Chair, the Isaac Centre for Public Health, IISc, Dr. Farah Ishtiaq, Tata Institute for Genetics and Society (TIGS), Dr. Amrutlal K. Patel, Gujarat Biotechnology Research Centre (GBRC) and Dr. Dhanasekaran Shanmugam, CSIR-National Chemical Laboratory, Pune, visited on 25th November 2024.
- Shri S.J. Goswami, Officer on Special Duty (OSD) to the Minister and Shri. Benjamin Pertin, District Horticulture Officer (DHO), HQ, Arunachal Pradesh, visited on 28th November 2024.

# ICAR-NIVEDI in Media...

ವಿಜಯವಾಣಿ
ನಂ.1 ಕನ್ನಡ ದಿನಪತ್ರಿಕೆ

## ಇನ್‌ಕ್ಯೂಬೇಟರ್ ಸಮ್ಮೇಳನ ಯಶಸ್ವಿ

■ ವಿಜಯವಾಣಿ ಸುದ್ದಿಜಾಲ ಬೆಂಗಳೂರು

ನಾವಿಕ್ ಅಗ್ರಿ ಬಿಸಿನೆಸ್ ಇನ್‌ಕ್ಯೂಬೇಷನ್ ಸೆಂಟರ್ ಹಾಗೂ ನ್ಯಾಷನಲ್ ಇನ್‌ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ವೆಟೆರ್ನರಿ ಎಪಿಡೆಮಿಯಾಜಿ ಮತ್ತು ಡಿಸೀಸ್ ಇನ್ಫಾರ್ಮ್ಯಾಟಿಕ್ಸ್ (ಎನ್‌ಐವಿಇಡಿಐ) ಸಹಯೋಗದಲ್ಲಿ ರಾಜ್ಯಾದ್ಯಂತ ಕಾರ್ಯನಿರ್ವಹಿಸುತ್ತಿರುವ 33 ಇನ್‌ಕ್ಯೂಬೇಟರ್‌ಗಳನ್ನು ಒಗ್ಗೂಡಿಸಲು ಆಯೋಜಿಸಿದ್ದ 'ರಾಜ್ಯಮಟ್ಟದ ಇನ್‌ಕ್ಯೂಬೇಟರ್ ಕಾನ್ಕ್ಲೇವ್' ಯಶಸ್ವಿಯಾಗಿ ನಡೆಯಿತು.

ಕೇಂದ್ರ ಮತ್ತು ರಾಜ್ಯ ಸರ್ಕಾರವು ಕರ್ನಾಟಕ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಅಕಾಡೆಮಿ (ಕೆಎಸ್‌ಟಿಎ), ಕರ್ನಾಟಕ ಸರ್ಕಾರದಿಂದ ಕೆ-ಟೆಕ್ ಜತೆಗೆ ಬಿಸಿಐಸಿ ಪ್ರತಿನಿಧಿಸುವ ಉದ್ಯಮ ಪಾಲುದಾರರನ್ನು ಸಮಾವೇಶ ಒಳಗೊಂಡಿತ್ತು. ಈ ಕಾರ್ಯಕ್ರಮವು ಅಕಾಡೆಮಿ ಅಥವಾ ಸಂಶೋಧನಾ ಸಂಸ್ಥೆಗೆ ಸಂಬಂಧಿಸಿದ ಉದ್ಯಮ, ಸರ್ಕಾರ, ತಂತ್ರಜ್ಞಾನ ವ್ಯಾಪಾರ ಇನ್‌ಕ್ಯೂಬೇಟರ್‌ಗಳ ಕುರಿತು ಅಗತ್ಯ ಮಾಹಿತಿಯನ್ನು ಒದಗಿಸಿತು.

» ನಾವಿಕ್ ಅಗ್ರಿ, ಎನ್‌ಐವಿಇಡಿಐ ಆಯೋಜನೆ

ಜಾಗತಿಕ ಆರಂಭಿಕ ಪರಿಸರ ವ್ಯವಸ್ಥೆಯಲ್ಲಿ 3ನೇ ಶ್ರೇಯಾಂಕದ ಮೂಲಕ ಭಾರತೀಯರು ಮುಂಚೂಣಿಯಲ್ಲಿದ್ದಾರೆ. ಕರ್ನಾಟಕದಾದ್ಯಂತ ಇರುವ ಇನ್‌ಕ್ಯೂಬೇಟರ್‌ಗಳು ಎಷ್ಟು ಸಿಖರವಾಗಿವೆ ಎಂಬುದರ ಕುರಿತು ಉತ್ತಮ ತಿಳಿವಳಿಕೆ ನೀಡುವುದರ ಜತೆಗೆ ಅತ್ಯಾಧುನಿಕ ತಂತ್ರಜ್ಞಾನ ನಿರ್ಮಿಸಲು ಸಂಪನ್ಮೂಲದಲ್ಲಿನ ಸಮಸ್ಯೆ ಹಾಗೂ ಅದರ ಸರಿಯಾದ ಬಳಕೆ ಕುರಿತು ಮಾಹಿತಿ ನೀಡಲಾಯಿತು.

ನಾವಿಕ್ ಅಗ್ರಿ ಬಿಸಿನೆಸ್ ಇನ್‌ಕ್ಯೂಬೇಷನ್ ಸೆಂಟರ್ ಹಾಗೂ ನ್ಯಾಷನಲ್ ಇನ್‌ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ವೆಟೆರ್ನರಿ ಎಪಿಡೆಮಿಯಾಜಿ ಮತ್ತು ಡಿಸೀಸ್ ಇನ್ಫಾರ್ಮ್ಯಾಟಿಕ್ಸ್ (ಎನ್‌ಐವಿಇಡಿಐ) ಸಹಯೋಗದಲ್ಲಿ ನಡೆದ 'ರಾಜ್ಯ ಮಟ್ಟದ ಇನ್‌ಕ್ಯೂಬೇಟರ್ ಕಾನ್ಕ್ಲೇವ್'ನಲ್ಲಿ ಬಿಸಿಐಸಿ ಅಧ್ಯಕ್ಷ ಡಾ.ಎಸ್. ದೇವರಾಜನ್, ಐಸಿಎಆರ್ ಮತ್ತು ನಿವೇದಿ ನಿರ್ದೇಶಕ ಡಾ.ಬಿ.ಆರ್. ಗುಲಾಟಿ, ಕೆಎಸ್‌ಟಿಎ ಸಿಇಒ ಡಾ.ರಮೇಶ್, ಕಿಟ್ಸ್‌ನ ಪರ್ಣಿಕಾ ಪವನರಾಮ್ ಇದ್ದರು.

ಇನ್‌ಕ್ಯೂಬೇಟರ್‌ಗಳ ಅಡಿಯಲ್ಲಿ ಅಭಿವೃದ್ಧಿಪಡಿಸಲಾದ ತಂತ್ರಜ್ಞಾನಗಳ ಪೋಷಣೆಯನ್ನು ಖಚಿತಪಡಿಸಿಕೊಳ್ಳಲು ಮೂಲಭೂತ ವಿಜ್ಞಾನ, ತಂತ್ರಜ್ಞಾನದ ಪರಿಷ್ಕರಣೆ, ಮಾರುಕಟ್ಟೆಯ ಹಾದಿಗಳು ಮತ್ತು ಪ್ರಾಯೋಗಿಕ ವ್ಯಾಕ್ಸಿಯ ಅಂತರವನ್ನು ನಿವಾರಿಸಲು ಕ್ರಾಸ್ ಡೊಮೇನ್ ಅನ್ನು ಪರಿಗಣನೆಗೆ ತೆಗೆದುಕೊಳ್ಳುವ ಬಗೆ ಹಾಗೂ ಭವಿಷ್ಯದಲ್ಲಿ ಇದಕ್ಕೆ ಉದ್ಯಮ ಮತ್ತು ಸರ್ಕಾರಿ ಸಂಸ್ಥೆಗಳಿಂದ ನಿರೀಕ್ಷಿಸಲಾಗುತ್ತಿರುವ ಬೆಂಬಲ ಕುರಿತು ಚರ್ಚಿಸಲಾಯಿತು.

ಸಮಾರಂಭದಲ್ಲಿ ಬಿಸಿಐಸಿ ಅಧ್ಯಕ್ಷ ಡಾ.ಎಸ್.ದೇವರಾಜನ್, ಐಸಿಎಆರ್ ಮತ್ತು ನಿವೇದಿ ನಿರ್ದೇಶಕ ಡಾ. ಬಿ.ಆರ್. ಗುಲಾಟಿ, ಕೆಎಸ್‌ಟಿಎ ಸಿಇಒ ಡಾ.ರಮೇಶ್, ಕಿಟ್ಸ್‌ನ ಪರ್ಣಿಕಾ ಪವನರಾಮ್, ನಾವಿಕ್ ಟೀಮ್‌ನ ಮುಖ್ಯಸ್ಥ ಡಾ. ಎಸ್.ಬಿ. ಶಿವಚಂದ್ರ ಮತ್ತು ವ್ಯಾಪಾರ ವ್ಯವಸ್ಥಾಪಕ ಎಸ್.ಎಂ. ಹರ್ಷೇಂದ್ರ ಹಾಗೂ ಇತರರು ಇದ್ದರು.

## ಐಸಿಎಆರ್-ನಿವೇದಿ ದಿನಾಚರಣೆ

'ಐಸಿಎಆರ್-ನಿವೇದಿ' ದಿನಾಚರಣೆ ವೇಳೆ ಡಾ. ಬಲದೇವ್ ರಾಜ್ ಗುಲಾಟಿ, ಡಾ. ಬಿ.ಜಿ.ಎಂ. ರೆಡ್ಡಿ, ಡಾ. ಮಿ. ಬಾಲಮುರುಗನ್, ಡಾ. ತುಷಾರ್ ಕಾಂತಿ ಬೆಹೆರಾ ಮತ್ತಿತರರು ಭಾಗವಹಿಸಿದ್ದರು.

ಬೆಂಗಳೂರು: ಭಾರತೀಯ ಕೃಷಿ ಸಂಶೋಧನಾ ಮಂಡಳಿ (ಐಸಿಎಆರ್) ವತಿಯಿಂದ ನಗರದಲ್ಲಿ 'ಐಸಿಎಆರ್ - ನಿವೇದಿ' ದಿನವನ್ನು ಆಚರಿಸಿಕೊಂಡಿತು.

ಐಸಿಎಆರ್- ನಿವೇದಿ ನಿರ್ದೇಶಕ ಡಾ. ಬಲದೇವ್ ರಾಜ್ ಗುಲಾಟಿ ಅವರು ಸಂಸ್ಥೆಯ ಮೂಲ, ಆದೇಶ ಮತ್ತು ಚಟುವಟಿಕೆಗಳ ಸಂಕ್ಷಿಪ್ತ ಅವಲೋಕನ ಒದಗಿಸಿದರು. ಡೂನೋಜೂನ್ ಗೆಲ್ಲು ಖಾಯಿಲೆಯಿಂದಾಗುವ ರೋಗ ನಿರ್ವಹಣೆಯ ಅವಶ್ಯಕತೆಗೆ ಸಂಕ್ಷಿಪ್ತ ಮಾಹಿತಿ ನೀಡಿದರು.

» ಪ್ರಾಣಿಗಳ ರೋಗ ನಿರ್ಣಯ ತಜ್ಞರ ಪರಾಮರ್ಶೆ

ಹಂಪಿ ಪ್ರದರ ಕಷ್ಟಾವಲು ಯೋಜನೆಯನ್ನು ಪರಿಚಯಿಸಿದರು. ಐಸಿಎಆರ್- ನಿವೇದಿ ವಿಜ್ಞಾನಿಗಳಿಗೆ ಉತ್ತಮ ಸಂಶೋಧನಾ ಕೊಡುಗೆಗಾಗಿ ಪ್ರಶಸ್ತಿ ನೀಡಲಾಯಿತು. ಡಾ. ಜಿ.ಬಿ.ಎಂ. ರೆಡ್ಡಿ ಅವರು ಉತ್ತಮ ಸಂಶೋಧನಾ ಪ್ರಬಂಧ ಪ್ರಶಸ್ತಿ ಪಡೆದರು. ಡಾ. ಮಿ. ಬಾಲಮುರುಗನ್ ವಿಶೇಷ ಕೊಡುಗೆ ಪ್ರಶಸ್ತಿ ಸ್ವೀಕರಿಸಿದರು. ಐಸಿಎಆರ್- ಐಎಎಆರ್‌ಐನ ನಿರ್ದೇಶಕ ಡಾ. ತುಷಾರ್ ಕಾಂತಿ ಬೆಹೆರಾ, ಐಸಿಎಆರ್‌ನ ಪ್ರಾಣಿ ಆರೋಗ್ಯದ ವಿಭಾಗದ ಡಾ. ಆಶೋಕ್ ಕುಮಾರ್ ಇತರರಿದ್ದರು.

ಕರ್ನಾಟಕದ ಪಶುಪಂಗೋಜನೆ ಹಾಗೂ ಪಶುವಿಜ್ಞಾನ ವಿಭಾಗದ ನಿರ್ದೇಶಕ ಡಾ. ಮಂಜುನಾಥ್ ಎಸ್. ಪಾಳೇಗಾರ್, ರೋಗ ನಿರ್ಣಯ ನೆಮ್ಮಗೆ ಕುರಿತು ಮಾತನಾಡಿದರು. ರೋಗದ ಹಾಗೂ ರೋಗ ನಿರ್ಣಯದ ಅಭಿವೃದ್ಧಿಯಲ್ಲಿ ಸಂಸ್ಥೆಯ ಕಾರ್ಯವನ್ನು ಐಸಿಎಆರ್ ಡಾ. ಆಕಾಬಂಧು ನಾಷಾ ಜ್ಞಾಪಿಸಿದರು. ಪ್ರಾಣಿಗಳ ಆರೋಗ್ಯದಲ್ಲಿ ಪ್ರಾಣಿಗಳ ಪೋಷಣೆಯ ಪ್ರಾಮುಖ್ಯತೆ, ಜಠರದ ಆಕ್ಸಿಯ ಕ್ಷೀಣಗಳಲ್ಲಿ ಹಯೋಗದ ಪ್ರಮುಖ್ಯಗಳ ಆಗತ್ಯವನ್ನು ವಿವರಿಸಿದರು.

## INSTITUTE RELEASES PLAN ON SWINE FEVER

EXPRESS NEWS SERVICE
@Bengaluru

CITY-based Indian Council of Agricultural Research-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI) released the surveillance plan on classical swine fever (CSF) on the foundation day of the institute on July 1.

"CSF is endemic in India and is the most common disease affecting pigs. It is a highly contagious, dreadful disease affecting susceptible domestic and wild pigs, causing 100 per cent mortality in piglets and varying symptoms/signs in adult pigs depending upon age, breed and virulence of the virus," said Principal Scientist & PRO, ICAR-NIVEDI Sathish B Shivachandra.

"As per the 20th livestock census, India has 9.06 million pigs and out of these, 47 per cent are in the North East, where people are culturally and socially bound by household pig rearing. There is a reduction of 12.03pc in the pig population compared to the 19th livestock census," he added.

"India had started vaccinating pigs in a few NE states in 2014-15, depending on the availability of resources which got extended to other states during 2022. In order to make the control programme successful, continuous surveillance and sero monitoring of CSFV antibodies post vaccination in pig population is essential," said Shivachandra.

Principal scientists, NIVEDI, KP Suresh and SS Patil have developed a sampling statistically significant so that pigs vaccinated in the village/block of each state are represented for evaluation of CSF vaccination. A total of 36,000 pigs will be evaluated after vaccination to assess the effect of CSF vaccine in the field so that the diseases can be controlled and eradicated subsequently," said the scientist.

Meanwhile, Director, NIVEDI, BR Gulati spoke about the genesis of the institute, mandate and its activities during the Foundation Day function.

## Two vet labs at Central institute in Bengaluru get global recognition

BALA CHAUHAN @Bengaluru

IN a landmark development for veterinary science in India, the World Organisation for Animal Health (WOAH) has designated ICAR-NIVEDI, Bengaluru's 'Peste des Petits Ruminants' (PPR) or goat plague and 'Leptospirosis' laboratories as WOAH reference laboratories. "The laboratories are equipped with advanced facilities for genomic characterization, molecular diagnostics, and large-scale surveillance. They support the Central Government's goal of eradicating PPR by 2030 under the National Strategic Plan, in alignment with the PPR-Global Eradication Programme (GEP)," said Principal Scientist & PRO, ICAR-NIVEDI, Sathish B Shivachandra.

With recognition of the two laboratories at NIVEDI, India now hosts four WOAH reference laboratories, three of which are in Bengaluru, including the one for rabies at the Veterinary College. The fourth one, on avian influenza, is at the ICAR-National Institute of High-Security Animal Diseases (NIHSAD) in Bhopal.

NIVEDI (National Institute of Veterinary Epidemiology and Disease Informatics) plays a crucial role in combating and management of leptospirosis by providing diagnostic service, surveillance and one-health joint capacity building training, under the centrally sponsored national one health programme for prevention and control of zoonoses. "The global recognition of the two laboratories at NIVEDI highlights the institute's pivotal role in monitoring, surveillance, diagnostic support, and capacity building for PPR and leptospirosis across India," added Shivachandra.

Principal Scientist, NIVEDI, V Balamurugan has been appointed the designated expert for these laboratories. Director, ICAR-NIVEDI, Baldev R Gulati said, "NIVEDI's designation as one of six WOAH reference laboratories for leptospirosis and one of four for PPR globally places the institute at the forefront of international efforts to combat these deadly diseases".

"This achievement underscores NIVEDI's commitment to improving global animal health and supporting agricultural economies worldwide, setting the stage for future successes in veterinary epidemiology and disease control," added Gulati.

Leptospirosis is a global zoonotic disease caused by bacteria called leptospira, affecting both humans and animals. Known as one of the leading neglected diseases, it is re-emerging as a significant public health problem, particularly in areas with high prevalence. Annually, an estimated 1.03 million people are infected, leading to about 58,900 deaths worldwide. Adult males aged 20-49 are most commonly affected. In India, leptospirosis is a major concern with an annual rate of 19.7 cases per 1,00,000 people. The disease also has a substantial impact on animals, particularly livestock, causing frequent outbreaks and economic losses. PPR is a contagious viral disease that primarily affects goats and sheep and wreaks havoc in developing countries.

## Bengaluru scientists develop test kit for lumpy skin in cattle

BOSKY KHANNA @Bengaluru

BENGALURU based scientists have developed a easy to use test kits that will help in early detection of Lumpy Skin Disease (LSD) and Brucellosis among the cattle.

The kits have been developed by scientists and experts from Indian Council for Agricultural Research - National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI). The kits were distributed to farmers and laboratories, during the annual review meeting of the National Animal Disease Epidemiology Network in the Bengaluru campus, on Tuesday.

The first case of LSD was detected in India in 2019, and were done in labs. Now, these antibody test kits that have been designed, are similar to the PCR test kits that were used during Covid-19. The results will be available within minutes. Before releasing the test kits, they were tested on over 15,000 samples, and was developed after a year's study.


**ICAR-National Institute of Veterinary Epidemiology and Disease Informatics**

Post Box No.6450, Ramagondanahalli, Yelahanka, Bengaluru-560119, Karnataka, India.

Ph: +91-80-23093110, 23093111

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

@icar_nivedi /icarnivediofficial @icarnivedi3383