

Glimpse of

ICAR-NIVEDI

Convergence of Animal Health and Research Par Excellence...



**ICAR - National Institute of Veterinary Epidemiology
and Disease Informatics (ICAR-NIVEDI)**

(ISO 9001 : 2008 Certified)

Post Box No. 6450

Ramagondanahalli, Yelahanka, Bengaluru - 560064, Karnataka, India.

www.nivedi.res.in





Bio Safety Laboratory



*Standby power generation sets and
Chiller of HVAC system*



Bio Safety Laboratory inside view



Air Handling Unit of HVAC system



Effluent Treatment Plant



Glimpse of ICAR-NIVEDI



ISO 9001 : 2008 certified



**ICAR - National Institute of Veterinary Epidemiology
and Disease Informatics (ICAR-NIVEDI)**

Post Box No. 6450

Ramagondanahalli, Yelahanka, Bengaluru - 560064, Karnataka, India

www.nivedi.res.in





Glimpse of ICAR-NIVEDI

Compilation & Editing

Dr. V. Balamurugan

Dr. R. Yogisharadhya

Dr. Awadhesh Prajapati

Dr. Jagadish Hiremath

Dr. G. Govindaraj

Citation

Glimpse of ICAR-National Institute of Veterinary Epidemiology and Disease Informatics, Bengaluru, 2016

Publisher

Dr. B. R. Shome, Director (Acting)

ICAR- National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI),

Post Box No. 6450, Ramagondanahalli, Yelahanka,

Bengaluru-560 064, Karnataka, India

Phone : +91-80-23093110/ 23093111 Fax : +91-80-23093222

Website: www.nivedi.res.in

Email: director.nivedi@icar.gov.in

Printer

CNU Graphic Printers

Bengaluru - 560 003

Mob. : 9880 888 399

CONTENTS

Disease Informatics

09



AICRP on ADMAS

20



Zoonotic Diseases with
One Health Approach

14



Extension
Outreach

21

Disease
Diagnostics

16



Capacity Building

23



Risk Analysis

18



Awards &
Recognition

24

Socio-Economic Impact
of Animal Diseases

19



Collaborative
Linkages

27



Acknowledgement

Glimpse of
ICAR-NIVEDI



We gratefully acknowledge the continued guidance and encouragement received from Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR and Hon'ble Dr. H. Rahman, Deputy Director General (Animal Science), ICAR, New Delhi.

Our sincere thanks also to the Director's and Head's of ICAR institutes located in Bengaluru, viz., ICAR-NIANP, ICAR-NBAIR, ICAR-IVRI, ICAR-NBSSLUP, ICAR-NDRI, ICAR-IIHR, KVA & FSU, Karnataka Veterinary Council, Director I-AIM, DIG-CRPF, Yelahanka, Bengaluru and also other institutes and organisations for their vital logistics support and co-operation from time to time.





From the Director's Desk

Greetings!

ICAR-NIVEDI had its humble beginning as AICRP on ADMAS in 1987, upgraded to PD-ADMAS in 2000 and finally in the year 2013 the institute was rechristened as ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI). The coordinating units of AICRP-ADMAS continued to grow in number from 4 co-ordinating units during 1987 to 32 at present. The hard work put up by the predecessors and continued efforts of the present NIVEDIans lead to the construction of new Administrative Building and Biosafety Laboratory (BSL-2 ++) at Yelahanka, Bengaluru, which was dedicated to the nation on 9th January 2015 by Hon'ble Union Agriculture Minister Shri Radhamohan Singh. ICAR-NIVEDI is a pioneering institute working with the mandate of R&D in the field of veterinary epidemiology and disease informatics. Its role is significant in developing disease models, risk analysis, animal disease forecasting & forewarning; need based diagnostics and analysis of disease economic impact. The institute has developed various technologies and patented few products which are being utilized by different stakeholders of the country. The role of this institute in the eradication of Rinderpest from India and development of National Animal Disease Referral Expert System (NADRES), an interactive software for animal disease forecasting are noteworthy. The institute has been conducting plethora of training programmes related to epidemiology, economic impact, research methodologies, sampling frame and disease diagnosis for various stakeholders associated with animal health as part of capacity building in the area. The efforts of ICAR-NIVEDI have been appreciated and recognized by various organizations by conferring international and national awards and fellowships.

Overall, I foresee, ICAR-NIVEDI to play significant role by delivering many innovative solutions and services in the form of improved diagnostic techniques, animal disease forecasting and forewarning models, animal disease economic impact analysis and capacity building in animal disease epidemiology in the country. I am confident that ICAR-NIVEDI's vision would guide all of us to undertake focused R & D activities in understanding the epidemiology of economically important diseases in the country eventually to prevent, control and eradicate the diseases for achieving food security, safety, safer animal and human health and welfare under one health approach.

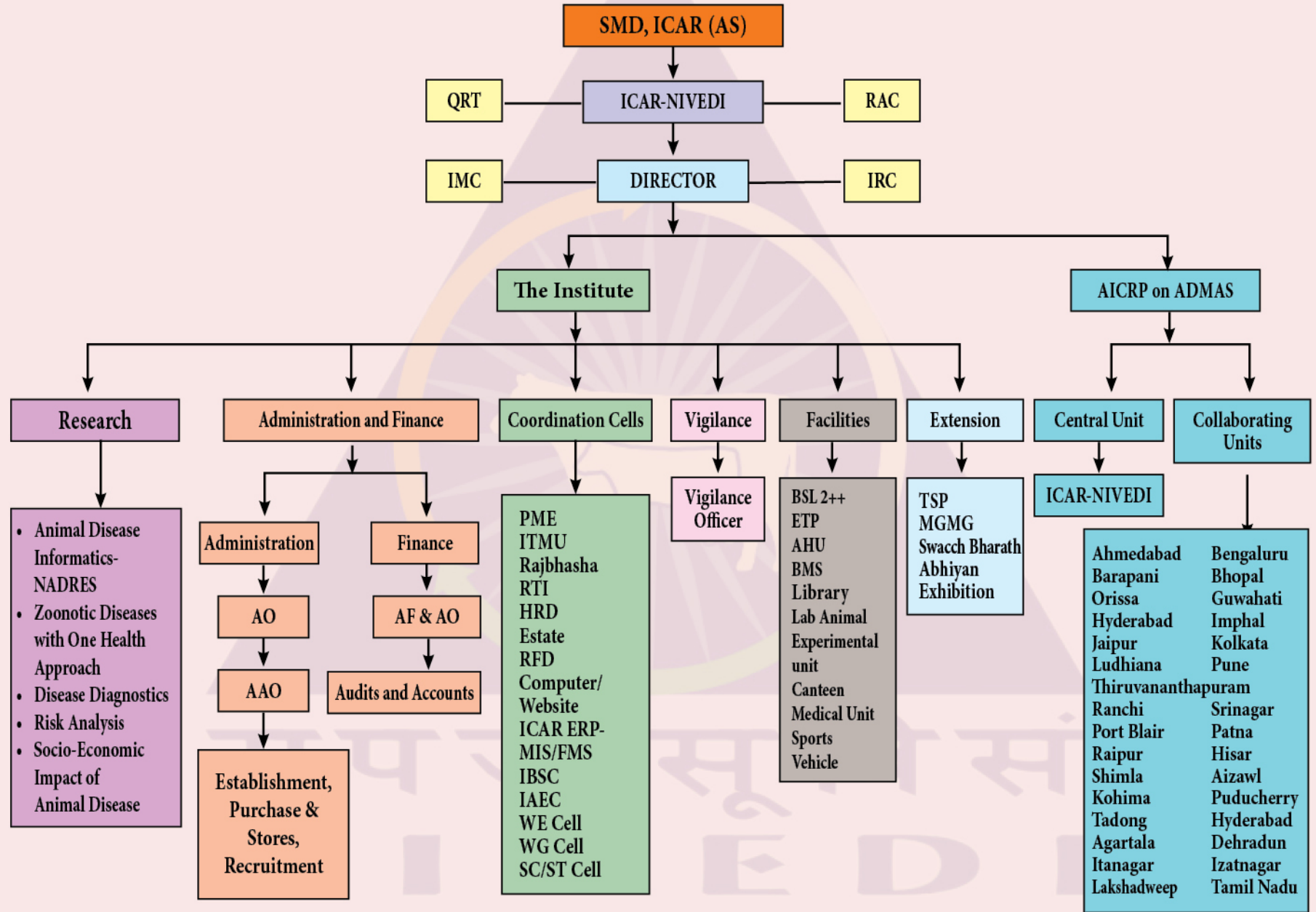
With the continued support, motivation, encouragement and inspiration from our most respected Dr. Trilochan Mohapatra, Hon'ble Secretary, DARE and Director General, ICAR, and beloved Dr. H. Rahman, Deputy Director General (Animal Science), we will continue to strive hard to achieve excellence in animal disease epidemiology and informatics.

(B.R. Shome)



Glimpse of
ICAR-NIVEDI

ORGANOGRAM



Journey of ICAR-NIVEDI

ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI), under the Indian Council of Agricultural Research (ICAR), a pioneer research institute with focus of understanding the epidemiology of economically important livestock diseases in India. The research activities include disease surveillance, monitoring and analysis of livestock disease data collected from collaborative centres of All India Co-ordinated Research Project on Animal Disease Monitoring and Surveillance (AICRP_ADMAS) located in different states of the country.

ICAR-NIVEDI made its humble beginning with the AICRP_ADMAS, during the VII five-year plan and became fully functional in 1987 with establishment of four Regional Research Units (RRUs) at Bengaluru, Hyderabad, Pune and Ludhiana. The Central Coordinating Unit (CCU) was established at the Institute of Animal Health and Veterinary Biologicals (IAH&VB), Bengaluru to co-ordinate research activities of the regional units. In the VIII plan, the institute was strengthened with support of ICAR and European Union by taking up the major responsibility under National Project on Rinderpest Eradication (NPRE) involving 32 state level diagnostic/disease investigation laboratories in the country. On 1st April 2000 (during the IX plan), the CCU was given the status of Project Directorate and named as 'Project Directorate on Animal Disease

1987

AICRP
on
ADMAS

2000

PD_ADMAS

2013

ICAR-NIVEDI

Monitoring and Surveillance (PD_ADMAS)' with ten collaborating units under AICRP_ADMAS component. In the X and XI Five year plan period, five more collaborating units were added for providing impetus to a nationwide animal disease monitoring and surveillance.

Appreciating the contributions made by the Directorate to country's livestock health sector and the need to strengthen the effort, the council rechristened PD_ADMAS as 'National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI)' on 25th October 2013 (XII plan period) with its exclusive campus at Bengaluru. Further, during the same plan period, 17 additional collaborating units covering others states were added to AICRP_ADMAS totalling to 32 collaborating units including central co-ordinating unit at ICAR-NIVEDI for providing the needed impetus to a strong nationwide network. At present ICAR-NIVEDI's centralised Administrative and Biosafety (BSL-2++) Laboratory is located in a sprawling campus at Yelahanka, Bengaluru.



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.

Mission

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

Mandate

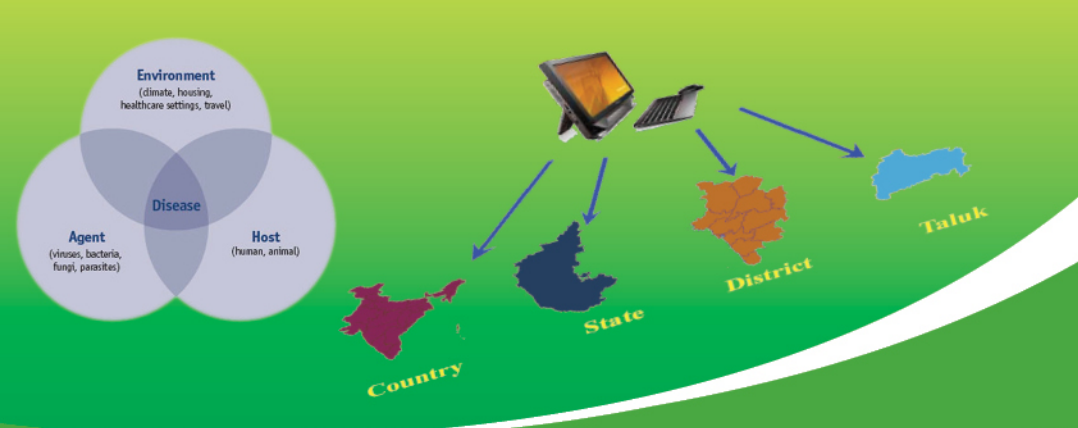
- ◆ Research and development on animal disease informatics and epidemiology
- ◆ Understanding specific disease process for rational development of diagnostics and strategic control measures for animal diseases including zoonosis
- ◆ Forecasting and forewarning of economically important animal diseases
- ◆ Economics of animal diseases and health care measures

Focus

- ◆ Improving disease monitoring and surveillance through development of pen-side diagnostics
- ◆ Risk analysis to estimate the likelihood of disease occurrence for various exposure factors
- ◆ Adapting strategies to improve animal disease data quality
- ◆ Understanding the threat from animal diseases in the background of climate change and globalization
- ◆ Disease modeling for developing early warning system and disease modeling/ forecasting
- ◆ Understanding economic impacts of animal diseases and the management strategies
- ◆ Improving human resource capacity to promote innovation
- ◆ Fostering linkages and collaborations with public and private, national and international organizations
- ◆ Improving knowledge management system



Disease Informatics



Disease Database & Forecasting

National Animal Health Information System

National Animal Health Information System through disease monitoring and surveillance was earlier developed under NATP funding. The institute started building up a database on the reported outbreaks of livestock diseases since 1987. This database over the time was improved with addition of filter checks at district, state and zonal level. In this seven diseases of national importance (bovine brucellosis, bluetongue, infectious bovine rhinotracheitis, contagious caprine pleuropneumonia, swine fever, bovine viral diarrhoea and peste des petits ruminants) have been selected for sero-surveillance study to provide a reliable and effective system for developing national animal health information. The information generated helped in on-line animal health information system and animal disease forecasting database system in controlling the animal diseases.

National Animal Disease Referral Expert System (NADRES) Updated Version

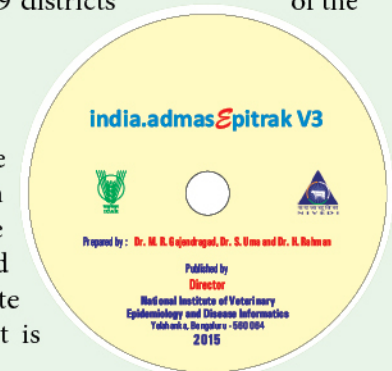
A dynamic, online Geographic Information System (GIS) based animal health information system called National Animal Disease Referral Expert System (NADRES) (www.nadres.res.in) was developed facilitating efficient storage, transmission and retrieval of animal health information system and it



is the first of its kind in the country. A forecasting module was developed for predicting possible occurrence of 15 nationally important animal diseases two months in advance at district level in the country. It is a web-based dynamic and interactive livestock disease relational database supported by GIS, which serves as an epidemiological software. It is useful for different stakeholders (field veterinarians, administrators, technocrats, research personnel, policy makers etc.,) to take precautionary measures for prevention and control of the diseases. The NADRES software is updated and the data of 609 districts of the country are linked to GIS software.

India.admasEpitrak-v3.0

India.admas Epitrak is user friendly offline software for analyzing animal health information on animal disease monitoring and surveillance epidemiology tracking has been developed and is included in the curriculum of under graduate course by Veterinary Council of India (VCI). It is the abbreviated form to represent "India animal disease monitoring and surveillance epidemiology tracking". India.admasEpitrak is livestock disease information software exclusively for the epidemiological scenario of India. India.admas Epitrak V3 is an improved version of the earlier editions. The software has



been improved with retaining the original home page. The administrative database and the risk factor database have been updated and made user friendly. The user can enter his/her data and get the analysis carried out in the form of graphs.

EpiNET.India

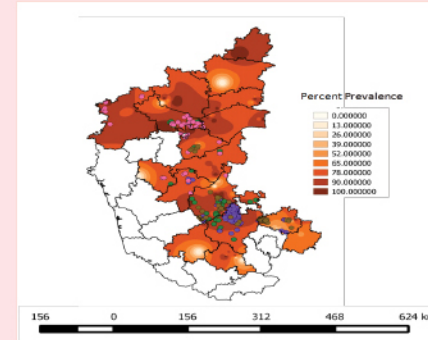
It is a monthly e-bulletin publication that provides top ten disease outbreaks reported for the past one month throughout the country with spatial and temporal distribution of disease outbreak data. The e-bulletin is widely circulated among registered users with effect from 10th october 2013. The bulletin also covers the latest news concerning animal health and disease in India. Recently, a section on epidemiological concepts has been included to provide practical application of epidemiology to masters and Ph.D students in the area of veterinary epidemiology. This e-bulletin will help in taking control measures by sensitizing the field veterinary doctors to benefit the farmer by minimizing the disease burden. The spatial and temporal pattern of the disease will aid in taking needful action to prevent the disease in the neighbouring district/states.



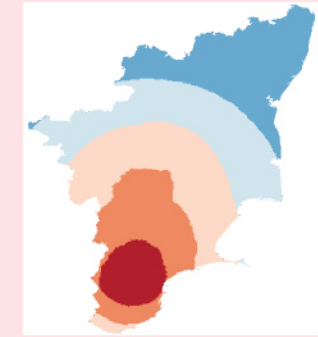
Spatio-temporal analysis of outbreaks data

Geographic Information System & Remote Sensing

Geographic Information System (GIS) offers visualization and spatial analysis tools to monitor the spread of an epidemic disease. It is suitable for the development of a disease tracking and prevention system given its spatial data acquisition and processing abilities, as well as its powerful spatial analysis functions. Using this technique, Institute has mapped prevalence of bluetongue (BT) and ovine herpes virus-2. Identification of high prevalence areas of bluetongue helps in planning and implementation of proper control measures and resource allocations.



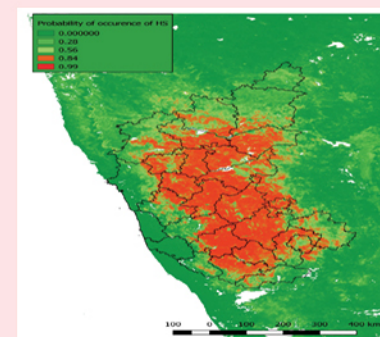
Prevalence of bluetongue in sheep population of Karnataka



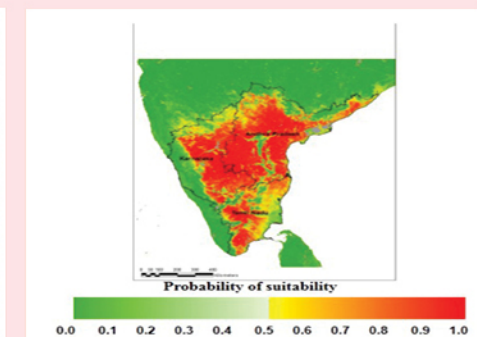
Hotspots analysis of bluetongue during 2004-2007 in Tamil Nadu

Currently, institute has taken a new initiative to use Remote Sensing (RS) and GIS in the field of veterinary epidemiology to harness its utility in disease forecasting and to take appropriate disease control intervention. Remote sensed variables were used in developing risk map for BT. Risk map for BT was developed using processed MODIS data. BT occurs in areas with low night time land surface temperature (nLST). High NDVI does not favour the BT transmission. RS and GIS techniques being applied in understanding the epidemiology of important livestock diseases and developing risk maps which will help in adoption control measures.

The application of climatic and non-climatic data to the study of diseases offers the capability to demonstrate the correlation and potentially predict the risk of disease outbreaks by mapping the relationship. The risk map for PPR was developed for Karnataka state using climatic factors such as temperature and rainfall and non-climatic factors as population density.



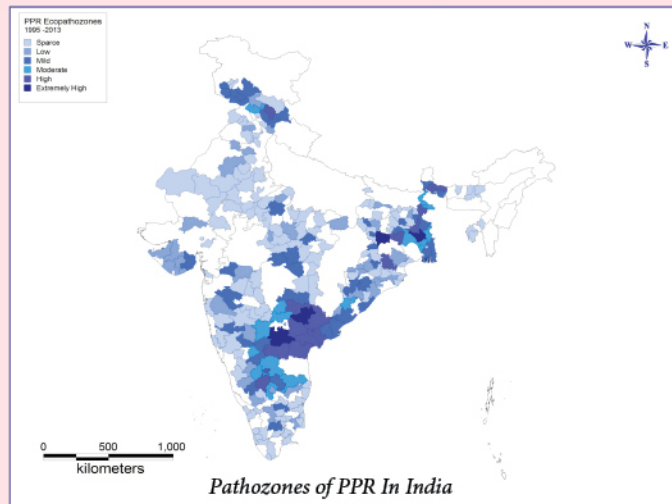
Risk map for HS in Karnataka using RS variables



Risk map for BT using remote sensed data

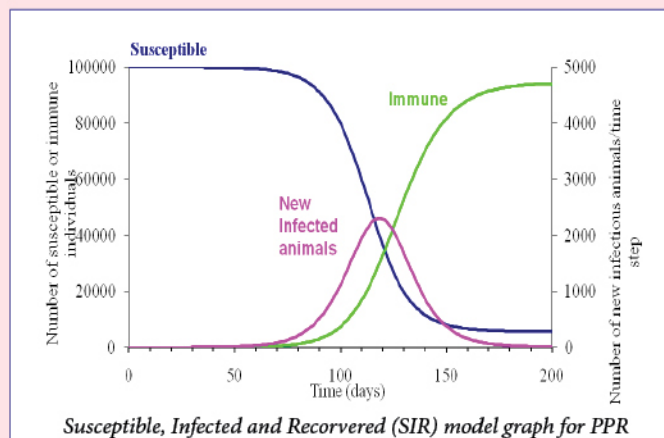
Disease Mapping

EpiInfo© software of CDC Atlanta, USA has been optimized to suit the needs to study veterinary epidemiology in the country. Further, veterinarians have been trained for the use of the software for epidemiological analysis.



Disease Modelling

Modelling of animal disease outbreak can help to understand the dynamics and epidemiology of the disease by identifying and quantifying likely contributing factors. Currently ICAR-NIVEDI is working on developing disease models on PPR, Anthrax and other transboundary diseases for identification of the various risk-factors, as well the prediction of disease outbreaks occurrence in animals.



Disease Surveillance

ICAR-NIVEDI played pivotal role in the eradication of rinderpest from the country through intensive monitoring and surveillance of disease over a period of decade. Based on the contribution in the field of animal disease eradication, institute was bestowed with the international meritorious OIE award and gold medal for outstanding contribution to the global rinderpest eradication programme by World Organization for Animal Health (OIE).

Currently, institute is actively involved epidemiology of emerging and re-emerging transboundary disease of animals (MCF, CSF, PRRS, TTV, BVD, BT, AI) and epidemiological studies on important diseases prevailing in the North Eastern states of India including surveillance and molecular analysis of MRSA, MR-CoNS, VRE, ESBL and Carbapenemase producing Gram-Negative bacteria. PPR Clinical Score card has been developed for assessing the severity of the disease pattern in sheep and goats.

Serosurveillance

The seromonitoring & seroprevalence of brucellosis, CSF, leptospirosis & infectious bovine rhinotracheitis (IBR) in animals in the country has been established and surveillance and monitoring is continued progressively. Cumulative seroprevalence for IBR (bovines), CSF (swine) and leptospirosis (cattle) was found to be 35.27%, 35.38% and 25% respectively. Similar estimation were also done to other economically important livestock diseases.

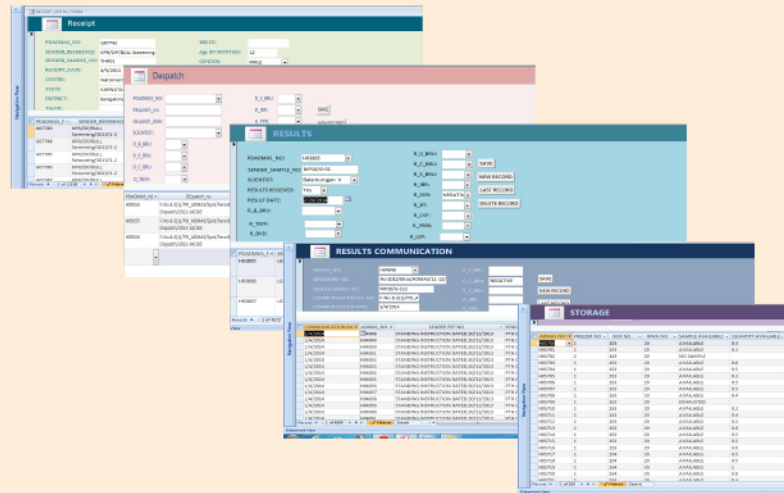
Sampling frame

For any epidemiological study, sampling is the major prerequisite. For the robust, scientifically accepted and field level sampling, institute has developed a scientifically feasible, robust sampling frame for Drawing random, representative and independent sample for epidemiological studies. For developing sampling frame, the database on list of villages with livestock population, list of ponds/lakes, fish density, geo-coordinates across country at block / district level is developed. The estimation is based on the animal/ fish level prevalence, herd / pond level prevalence, test sensitivity, herd level sensitivity and system sensitivity. Sampling frame is provided to all the AICRP-ADMAS collaborating units to carry out the livestock disease surveillance in the country.



National Livestock Serum Repository (NLSR)

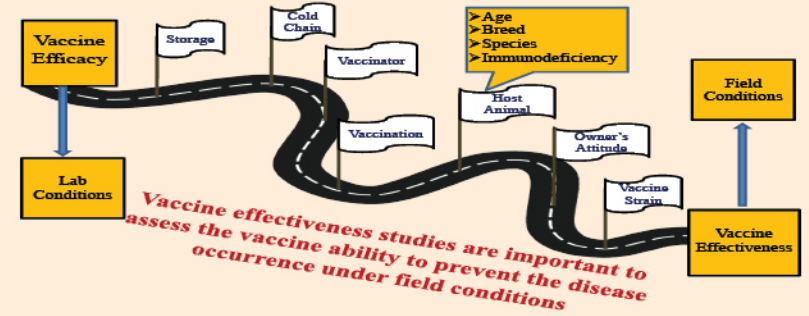
Institute has huge repository of serum collected from randomly identified villages across India through its AICRP_ADMAS collaborating units. These samples, collected from apparently healthy animals, are screened for various livestock diseases and the left over serum, after the initial screening, is stored in livestock serum repository. Currently, serum repository has 45585 serum samples, which are catalogued. In order to have an easy retrieval of screening results, metadata relating to the serum and the stored serum, a MS Access based software has been developed. The said repository acts as a store house for retrospective screening of livestock diseases and also for diagnostic assay development and validation.



Vaccine Epidemiology

Vaccine efficacy at field level is referred to as vaccine effectiveness. Unlike for human vaccines very little is done to evaluate the animal vaccines for their effectiveness. Further, identification of the factors that affect vaccine effectiveness is also critical to improve the efficacy of current vaccines. Efficacious vaccines and effective vaccination are the basis for disease control programs. Hence evaluation of current vaccines for protective ability in field condition is critical. Hence, at ICAR-NIVEDI research work is focused on evaluating the vaccine effectiveness and identification of the factors that affect field level vaccine efficacy of the FMD and PPR vaccines.

Vaccine: Efficacy to Effectiveness

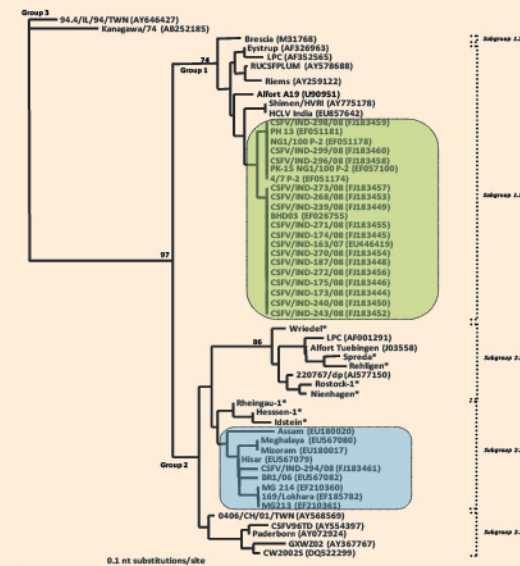


Molecular Epidemiology

Molecular epidemiology and phylogenetic analyses of major animal pathogens collected from different agro-climatic regions of India is one of core research area of the institute. Some of research finding established the following fact

CSF:

- Genetic typing of recent CSF isolates from different parts of the country revealed the emergence of CSF virus subtype 2.2 in India.



Phylogenetic analysis of CSFV isolates

IBR :

- Analysis of gB gene sequences from BoHV-1 positive clinical samples from five Indian states indicated that all the virus specimens belong to subtype 1.1, irrespective of their origin.

BT :

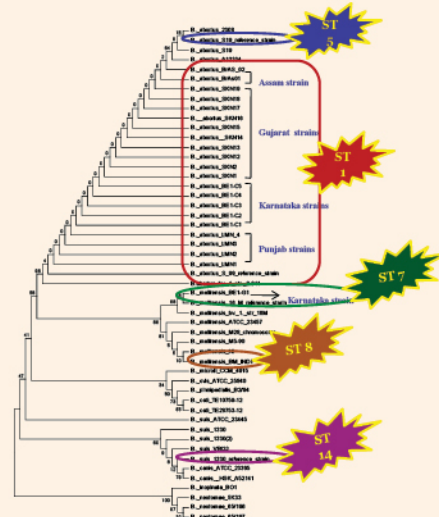
- Epidemiological analysis based on clinical samples indicated that involvement of serotypes 1 and 2 of BT virus in Karnataka. Isolation and characterization of BT virus serotype 5, first time in India.

Rabies :

- On phylogenetic analysis of G gene sequences, prevalence of genotype -1 of rabies was observed in India

Brucellosis

- Dr. aft genome sequencing of *Brucella melitensis* strain ADMAS-G1, isolated from placental fluids of an aborted goat and *B. abortus* S99, designated antigenic smooth reference strain used in diagnostic tests in India was done
- The MLST analysis showed that *B. abortus* S99, *B. abortus* S19 and *B. melitensis* ADMAS-G1 are belong to ST-1, ST-5 and ST-7, respectively. ST-1 to be the predominant *B. abortus* genotype



Phylogenetic analysis of *Brucella* MLST sequences

Leptospirosis :

- The rpoB gene based phylogenetic analyses of isolates from animals and human revealed that the prevalence of *Leptospira* intermediate species (*L. wolffii*) in India

Sheep & Goat Pox :

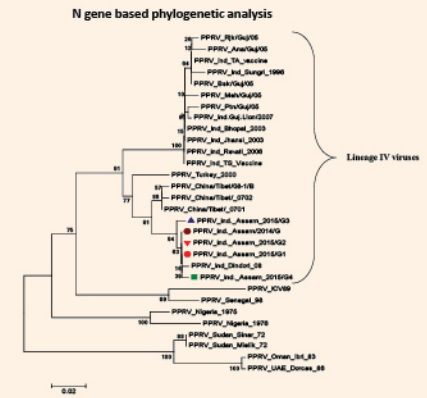
- Molecular epidemiology of Indian capripox virus isolates based on major envelope and virulence genes
- Differentiation of sheep & goat pox virus isolates by molecular methods

PPR :

- The phylogenetic analysis of the PPRV N and F gene sequences of PPRV was amplified from the suspected clinical goat samples from Assam revealed circulation of lineage IV virus in NE regions (Assam) as like similar virus circulation in rest of India

Surra :

- Phylogenetic analysis of *Trypanosoma evansi* isolates of RoTat 1.2 of Variable Surface Glycoprotein (VSG) and Invariants Surface Glycoprotein (ISG) genes revealed that it is closely related with Kenyan isolate of the organism

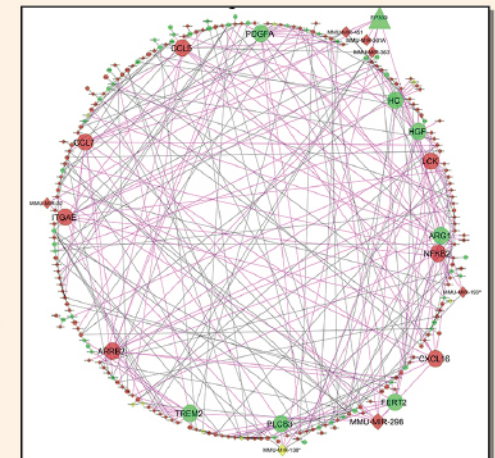


Phylogenetic analysis of PPRV isolates

Host Pathogen Interaction

Epigenetic landscape in subclinical bovine mastitis :

Molecular epidemiological investigation found *S. aureus* spa type t267 as clonal ancestor of all *S. aureus* associated with bovine subclinical mastitis in the province. Delineation of host pathogen interaction using mouse model identified putative novel target “p300 and its associated protein” for therapeutic intervention of *E. coli* induced bovine mastitis. Further challenge studies with clonal strains *S. aureus* t267 and *S. aureus* t6877 showed strain directed host immune response with epigenetic modulators viz., histone acetylation and microRNA as the key players. The study in a broader perspective showed how certain bacteria can evade the immune surveillance and cause sustained infection while others are rapidly cleared from the host body.



Biological network analysis showing the differential expression of various genes involved in immune response and their regulatory miRNAs in the *S. aureus* intramammary infection

Zoonotic Diseases with One Health Approach



Brucellosis

Brucellosis is a disease that infects multiple species of livestock causing economic losses and it is a well-known zoonotic disease. ICAR-NIVEDI is a pioneering institute in the *Brucella* research and it has all the facilities required for conducting the basic, applied and molecular research work on *Brucella* including biosafety (BSL2++) laboratory. The institute is providing policy advocacies on surveillance, vaccination, human resource development and sero-monitoring to DADF, Ministry of Agriculture

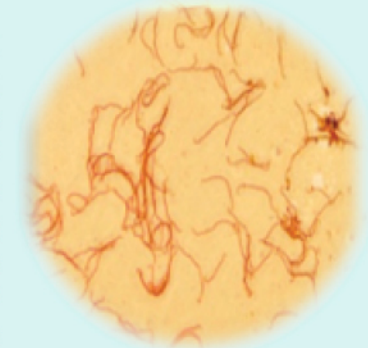


Fluorescence Polarization Assay

& Farmers Welfare, GOI, under Brucellosis Control Program (B-CP). For the surveillance of brucellosis in the country, two iELISA kits; one for small ruminants and other for bovines are being supplied to various veterinary institutions and organisations. Similarly two field based Lateral Flow Assay tests for diagnosis of brucellosis in animals and humans; and one DIVA test (fluorescent polarisation assay) for brucellosis are standardised and evaluated and are in the process of commercialization.

Leptospirosis

Leptospirosis is an ignored and most widely spread re-emerging global zoonotic disease noticed in tropical and sub-tropical rainfall regions. The research activity in leptospirosis since inception of institute has led to development of a simple leptospiral staining kit, transport media, recording of the several leptospiral abortions in bovines and other livestock species, monitoring of the leptospirosis burden or the circulating antibodies and *Leptospira* serovars or serogroups from various animal species or human belonging to different geographical locations. The facilities available in ICAR-NIVEDI include dark field microscopy examination, *Leptospira* silver staining method, isolation of organism in EMJH medium, Microscopic Agglutination Test (MAT) for sero diagnosis, recombinant antigen based diagnosis & typing of *Leptospira* isolates to species level by molecular based approaches.



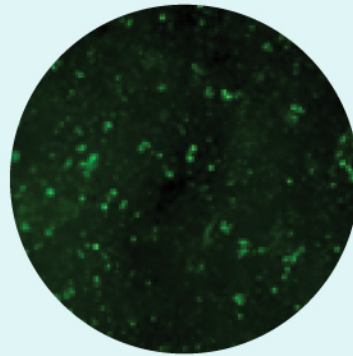
Silver stained Leptospira organism by staining kit



Isolation of Brucella organism

Rabies

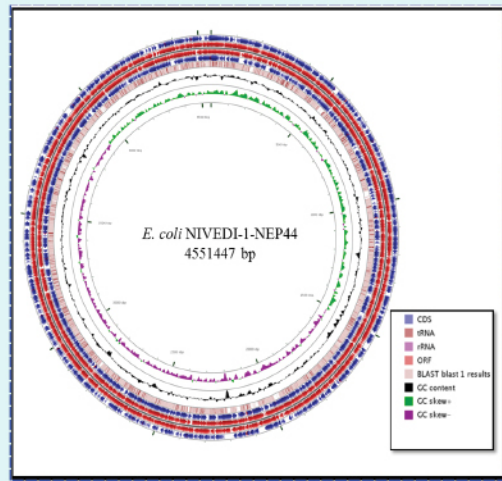
Rabies is a neglected zoonotic diseases of animals and human. At ICAR-NIVEDI, the research is focused on understanding the molecular epidemiology of rabies in livestock and mechanism of species spill over. The temporal and spatial distribution of rabies in animals in India has been mapped. The molecular diversity study revealed circulation of genotype-I in Indian subcontinent. The research team is also involved in human resource development and organizing public awareness camps time and again. The institute has developed RT-PCR and qRT-PCR for diagnosis of rabies in animals. The institute provides diagnostic services to various stakeholders by employing dFAT, RT-PCR and qRT-PCR.



Rabies positive smear by dFAT

Antibiotic Resistance

Antimicrobial resistance is a complex, multifaceted, urgent global health problem. There is increasing concern about the emergence of multiDr.ug-resistant superbugs. Occurrence of Extended Spectrum Beta Lactamase (ESBL) producing multiDr.ug resistant *E. coli* was detected in apparently healthy livestock (cattle, pig, sheep and goat) including poultry faecal sample of North Eastern India. WGS of NIVEDI P44 – an ESBL producing multi Dr.ug resistant *E. coli* (ST746) detected in poultry faecal sample revealed the complete repertoire of resistance determinants including

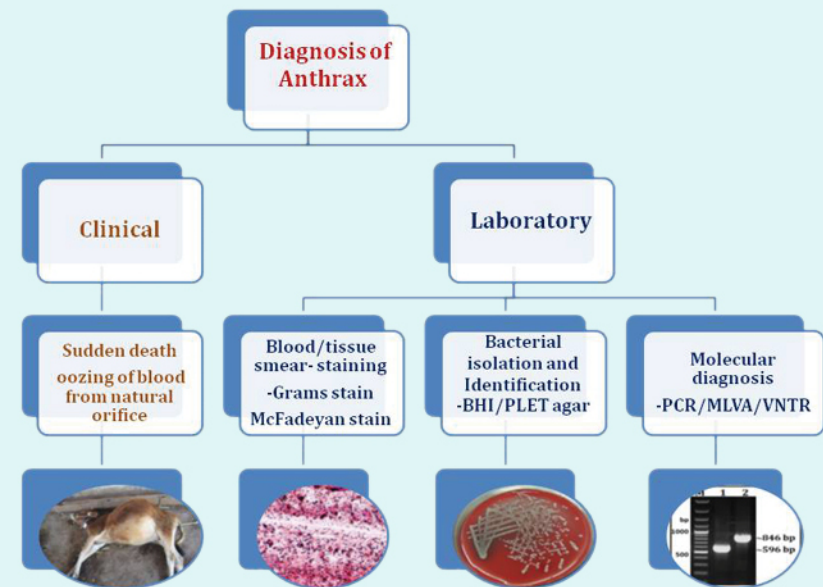


E. coli strain NIVEDI-P44, whole genome shotgun sequencing project

metal resistance and efflux pumps. Emergence of Methicillin Resistant Coagulase negative *Staphylococci* was recorded in subclinical mastitis and its environment in farms of Karnataka. Comprehensively, higher prevalence of antimicrobial resistance was noted in human samples in comparison to animal samples.

Anthrax

Research on anthrax at ICAR-NIVEDI, is focused on epidemiological investigation of anthrax outbreaks occurring in domestic as well as wild animal species, bacterial isolation & characterization, risk factor analysis, geographical mapping using GIS and RS, molecular diagnosis and comparative genomic analysis, disease forecast and forewarning. Research is also focused on development of standard protocols and rapid diagnostic tools for anthrax. Further, periodic capacity building training programmes for field veterinarians and laboratory diagnosticians working at various central/state diagnostic laboratories



Diagnosis of anthrax in animals

Disease Diagnostics



Development of diagnostic methods to detect specific pathogen offers an important tool for disease diagnosis, surveillance and monitoring. Towards this, ICAR-NIVEDI pioneered its research by developing diagnostic tests for various field needs like point of care diagnosis, epidemiological screening tests and laboratory diagnostic tests/assays.

Avidin-Biotin ELISA Kits for IBR*

Highly sensitive Indirect ELISA kit for detection of antibodies against BoHV-1 infection in cattle and buffaloes has been developed and is widely used in population survey of IBR in India. This user friendly kit needs no specific training.

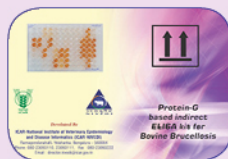


Indirect ELISA Kit for Sheep and Goat Brucellosis* (Patent No 250709)

Highly sensitive test for screening of brucellosis in sheep and goats against smooth lipopolysaccharide (sLPS) antibodies and is widely used in population survey of brucellosis in small ruminants in India.

Protein-G Based Indirect ELISA Kit for Bovine Brucellosis*

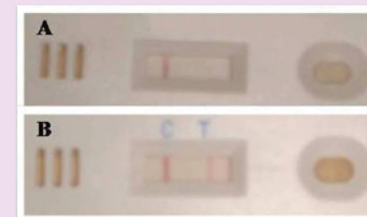
Common Protein-G conjugate ELISA is used for screening of brucellosis in cattle, camel and horses. The assay utilizes sLPS to capture the IgG anti-brucella antibodies present in the serum. This is robust and stable with one conjugate and is highly useful in the field conditions. Widely used in population survey of bovine brucellosis in India.



Lateral Flow Assay for Bovine Brucellosis

Lateral Flow Assay (LFA) is currently used for qualitative monitoring of brucellosis in resource-poor or non-laboratory environments because it is inexpensive to manufacture

and well suitable for rapid detection on site. The assay utilizes sLPS to capture the serum/blood antibodies specific to the brucellosis, followed by the identification of the captured antibody using colloidal gold Protein-G conjugate.



Combo LFA (IgG & IgM) for Human Brucellosis



Anti-brucella IgG/IgM LFA is a combo device standardized using sLPS antigen, conjugated gold colloidal particles for the detection of human anti-brucella IgG and IgM antibodies. The test promises user friendly utility which will help in medical health care centers for screening of suspected human cases of brucellosis.

Leptospira silver staining kit*

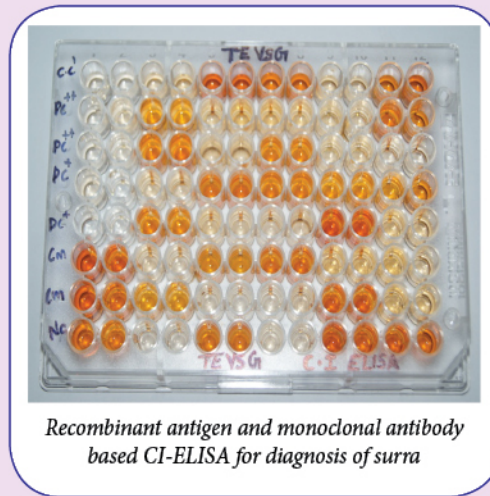
This kit can be used for demonstration of *leptospira* morphological features including fine coils with clear background of stained slides (brownish-black on a brownish-yellow background). It can be applied for identification/morphology of *Leptospira* and diagnosis of the leptospirosis. The features of technology include the characteristics morphology of the organism



is discernible against clear background of stained slides. Clouding of the smear, development of artifacts, over staining and cracks of staining can be avoided by using this kit.

Recombinant VSG and monoclonal antibody based c-ELISA for detection of *Trypanosoma evansi* antibodies

T. evansi, a parasite, which causes 'surra' in animals. The assay uses a recombinant variable surface glycoprotein (rVSG) antigen and monoclonal antibody (MAB) in competitive inhibition ELISA (CI-ELISA) format for detection of antibodies against *T. evansi*. The assay is highly specific and sensitive and can detect very minute parasitaemia in carrier animals. By this assay, it is possible to detect the *T. evansi* specific antibodies in animals namely cattle, buffaloes, horses and camels without changing any reagent/ biological.



Recombinant antigen and monoclonal antibody based CI-ELISA for diagnosis of surra

Monoclonal antibody based double antibody sandwich ELISA for the detection of *Trypanosoma evansi* antigen in animals

This sandwich ELISA is used for the detection of *T. evansi* antigen in animals. This assay is highly specific, sensitive and can be used in the detection of antigen (active infection of surra) in different host species. Moreover, in antigen -ELISA assay, detection of very minute amount of infection is possible and is highly suitable for any trypanocidal Dr.ug designing and resistance study especially, when the event of Dr.ug resistance are rising up.

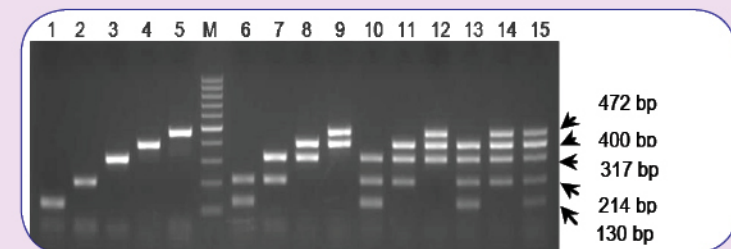
Recombinant Antigen based indirect ELISA for detection of PPRV antibodies for sero-diagnosis of PPR

Recombinant antigen (PPRV N protein) based indirect ELISA has been developed, standardized and evaluated using serum samples for sero-diagnosis of PPR in sheep and goats.

Molecular diagnostic assays

ICAR-NIVEDI has developed various molecular tools for early and specific detection of pathogen

- RT-PCR for detection of classical swine fever in clinical samples
- Species specific multiplex PCR for the detection of *Streptococcus agalactiae*, *S. dysgalactiae* and *S. uberis* species in the subclinical mastitis samples
- Species specific multiplex PCR for the detection of major *Staphylococcus* sp. viz., *S. aureus*, *S. chromogenes*, *S. epidermidis*, *S. sciuri*, and *S. haemolyticus* directly from the clinical milk samples
- Multiplex PCR (two tube format) assay for the simultaneous detection of ten most common mastitis pathogens in milk samples viz., *S. aureus*, *S. agalactiae*, *S. dysgalactiae*, *S. uberis*, *E. coli*, *S. chromogenes*, *S. epidermidis*, *S. sciuri*, *S. haemolyticus*, *S. simulans*
- Multiplex PCR for detection of all five species of *Brucella* and is handy useful tool for typing and differentiation of all five species of *Brucella*
- Multiplex PCR assay for detection and differentiation of pathogenic *Leptospira* sp.
- PCR assay targeting glycoprotein gene for the detection of latent infection of surra
- Standardized dFAT, RT-PCR and Real time RT-PCR assay for detection and diagnosis of animal rabies
- PCR assay for detection and differentiation of sheeppox and goatpox virus in clinical samples



Multiplex PCR (two tube format) assay for the simultaneous detection of ten most common mastitis pathogens

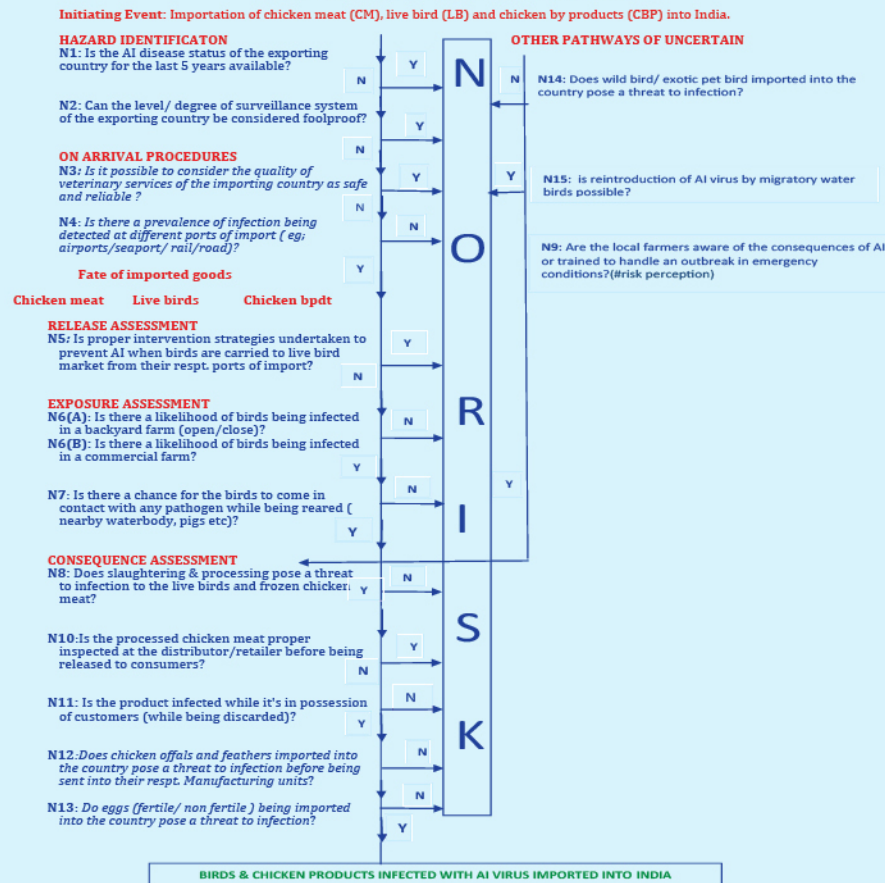
*Commercialized Technologies

Risk Analysis



Risk analysis is an important area of epidemiological research where in the likelihood and magnitude of disease occurrence in disease free area due to specified risk factors like, import of live animals, meat, semen, processed foods, etc., is assessed. Risk assessment, risk management and risk communication are three major components of risk analysis. ICAR-NIVEDI has taken up need based risk analysis studies like the introduction and maintenance of Avian Influenza virus via the importation of chicken meat, live birds and chicken by-products into the country. In similar lines a project on risk assessment of introducing PRRSV from North East India to other PRRSV free states is also in progress.

SCENARIO TREE FOR THE LIKELIHOOD OF INTRODUCTION OF AVIAN INFLUENZA VIRUS INTO INDIA VIA CHICKEN MEAT, LIVE BIRDS AND CHICKEN BY PRODUCTS



Cost

Benefit

Socio-Economic Impact of Animal Diseases

Livestock health economics is a specialized discipline and is progressively developing a solid framework of concepts, procedures and data to support the decision-making process in optimizing animal health management. Research in this field primarily deals with three interrelated aspects, viz. quantifying the economic impact of animal disease; developing methods for optimizing decisions when individual animals, herds or populations are affected and determining the profitability of specific disease control and health management programmes.

The Impacts of livestock disease are

- ◆ Productivity losses for the livestock (e.g. production losses, cost of treatment, market disturbances)
- ◆ Loss of income from activities using animal resources (in such sectors as agriculture, transportation and tourism)
- ◆ Loss of well-being of human beings (morbidity, mortality rate, food safety and quality)
- ◆ Prevention or control costs (production costs, public expenditure)
- ◆ Sub-optimal use of production potential (animal species, genetics, livestock practices)

Animal diseases causes production effects, market and price effects, trade effects, impacts on food security and nutrition, human health and environment, and financial costs. The Economic principles/models used for

assessing the impact includes equi-marginal principle, partial budgeting, cost-benefit analysis, decision analysis, linear programming, markov chain analysis etc.

In India, the systematic studies on impact of animal diseases are lacking. Hence, ICAR-NIVEDI has undertaken impact studies on some important animal diseases like Foot and Mouth Disease, Haemorrhagic Septicemia, PPR etc., A network study undertaken in collaboration with ICAR-PD_ FMD, Mukteswar on the economic impact of Foot and Mouth Disease revealed that the loss due to FMD during 2013-14 was around Rs.20,896 crore. Similarly, based on the secondary data analysis, the financial loss estimated due to PPR in sheep and goats in the country (at 10% incidence level) was Rs. 1,611 crore per annum.



AICRP on ADMAS



All India Coordinated Research Project on Animal Disease Monitoring & Surveillance (AICRP on ADMAS) is major wing of ICAR-NIVEDI with 32 co-ordinating units spread across the country.



Location of AICRP on ADMAS Centres in India

Mandate

- ◆ Sero-monitoring of animal diseases based on sample frame
- ◆ Investigation of endemic, emerging and re-emerging animal disease outbreaks using innovative technologies
- ◆ Strengthening of National Livestock Serum Repository
- ◆ Effective updating of NADRES with active disease data and climatic and non-climatic risk factors
- ◆ Surveillance of diseases/pathogens of companion, lab and wild animals
- ◆ Analysis on economic losses due to animal diseases and the control measures adopted for their management

Significant Achievements

- ◆ A database containing information on economically important livestock diseases and disease specific risk factors (climatic and non-climatic) was created
- ◆ The livestock disease module to forewarn the 13 national important livestock diseases two months in advance has been developed and integrated with NADRES and hard copy of the forewarning report is sent as bulletin to major stake holders of animal health in India
- ◆ A software to manage NLSR was developed
- ◆ Epinet.India, a monthly e-bulletin that provides top ten diseases reported in past month across the country with spatial distribution map is circulated as e-copy
- ◆ Losses due to various disease outbreaks on regular basis in the respective states

Extension Outreach



Tribal Sub Plan

Tribal Sub Plan (TSP) is primarily meant for socio-economic development of tribal people protecting them from social exploitation and bringing them to the main stream activities of the society. The purpose of programme are empowering tribal people through Animal Husbandry activities and attaining economic sustainability by augmenting household income. The objectives of plan is to reduce poverty and unemployment among Scheduled Tribes (STs), creation of productive assets in favor of the STs and provision of financial security. This programme was initiated in ICAR-NIVEDI during the year 2011-12 and implemented through AICRP on ADMAS centres located in different states. The important outreach activities undertaken under TSP programme includes distribution of small ruminants, pigs/piglets, and poultry to tribal people, supply of mineral mixtures, feed supplements and arrangements of animal health camps etc. for the benefit of tribal farmers. Till date 7369 resource poor tribal families were benefitted under this program.



Consultancy

The institute provided a comprehensive sampling frame for the Foot and Mouth Disease-Control Programme, All India network project on Blue Tongue, National Control programme on PPR, North East India animal disease surveillance, etc.,

Institute has also taken up Public Private Partnership (PPP) mode contractual research projects on various diseases (IBR, BVD, Leptospirosis, Brucellosis etc.,) with industry for the surveillance/prevalence studies.



Exhibition/Krishimela

The outcome of the research and development activities of the Institute viz., process, products and technologies are being demonstrated in various exhibitions, melas etc., for the benefit of different stakeholders.



Outbreak Investigation

Institute disease investigation team comprising scientific experts on various disciplines visited/attended different outbreaks including natural calamities on request from various stakeholders as and when required. After investigation of the disease outbreaks, diagnosis and epidemiology appropriate suggestion had been advised for the prevention and control of the disease.



Mera Gaon Mera Gaurav (MGMG)

Programme was implemented at ICAR-NIVEDI during the year 2015-16. Around five scientific teams were constituted to implement the programme. Each team identified 4 to 5 villages in Bengaluru rural district for implementing the programme. The brief activities undertaken under this programme include establishing the linkages with Panchayat, Anganvadi, Veterinary doctor, Milk producers union, Agricultural department, village leaders and farmers; Collected base line information of the MGMG villages; organized farmers scientist interaction meet to understand the problems of the farmers; created awareness on the clinical symptoms of major livestock diseases and its prevention methods; distributed farmers friendly literature and provided mobile advisory service on livestock disease symptoms and its prevention, hygiene milk production, animal husbandry practices etc.



Capacity Building

Skill Development & Technology Dissemination

The institute has conducted need based training programmes (~63) to various Scientists/ Academicians/ field Veterinarians etc., working at various levels and trained in modern laboratories techniques, epidemiological investigations, NADRES software, EpiInfo software, epidemiological analysis for forecasting of livestock diseases, etc.,

The institute is also coordinating in-service training programmes in consultation with ICAR, DADE, DBT, DST, CDC-USA, USDA and FAO etc.,

Post Graduate Research and Education

The Institute has established memorandum of understanding (MoU) with various universities /organization of mutual interest in the area of R & D activities, including post graduate research, exchange of faculties for training, research and study as per the guidelines of ICAR and DBT. Institute provided exposure, training and facilitated the project/dissertation work of post graduate students in the field of animal health.

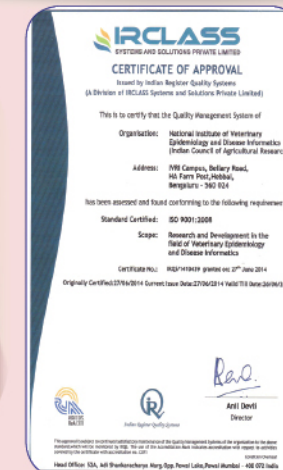
The ICAR-NIVEDI has established MoU with following institutes / universities :

- Navasari Agricultural University, Navasari, Gujarat
- Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh
- Jain University, Bengaluru, Karnataka
- REVA University, Bengaluru, Karnataka

- Maharani Ammanni College for Women, Bengaluru University, Karnataka
- Indian Institute of Technology, Guwahati, Assam
- Directorate of Medical & Health Services, Silvassa, Dadar & Nagar Haveli
- OUAT, Bhubaneswar, Odisha
- JSS University, Mysuru, Karnataka



Awards & Recognition



- ★ **DBT-Biotech Product and Process Development and Commercialization Award 2016** - Dr. Rajeswari Shome, Dr. B. R. Shome, Ms. Triveni & Dr. H. Rahaman
- ★ **Best Stall Award** for ICAR-NIVEDI during National Sheep and Farmers Fair, March 2016 at ICAR-CSWRI, Avikanagar
- ★ **ISO 9001:2008 certificate** awarded to ICAR-NIVEDI in 2014
- ★ **NAIP Fellowship 2013** (Paris, France) -Dr. G B Manjunatha Reddy
- ★ **DBT CREST Award** in Nano-biotechnology 2012- Dr. H. Rahman (University of Utah, USA)
- ★ **The Falvey Award 2012** by Asian Agri-History Foundation- Dr. H. Rahman
- ★ **ICAR International Fellowship 2011**- Dr. J. Hiremath (USA)
- ★ **BBSRC/DFID/Scottish Initiative Fellowship 2011**- Dr. Md. M. Chanda (UK)



- ★ **Sardar Patel Outstanding ICAR Institution Award 2001** for outstanding contribution in the field of animal disease monitoring and surveillance
- ★ **ICAR Awards for Team Research** for the Biennium 1999-2000 for outstanding research contribution in the field of animal disease management
- ★ **Lal Bahadur Shastri Young Scientist Award** for Agricultural Research for the Biennium 1999-2000
- ★ **DBT Biotech Product Process Development and Commercialization Award 2002** for its outstanding contribution for the development of software based veterinary ELISA diagnostic kits for the detection of the infections Bovine Rhinotracheitis (IBR) and Bovine Brucellosis in serum and milk as well as recombinant competitive ELISA kit for Rinderpest
- ★ **OIE Meritorious Award in 2002**
- ★ **FAO gold medal, 2011** for outstanding contribution to global rinderpest eradication programme



Glimpse of
ICAR-NIVEDI

Research Projects, Publications & Patents

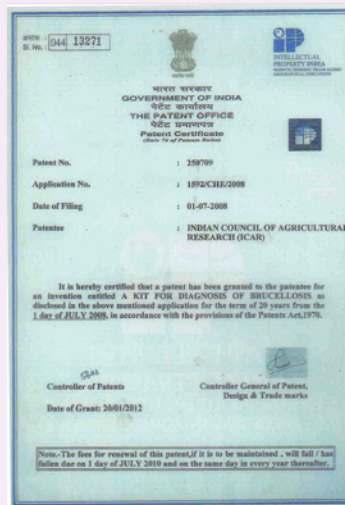
Research Projects Funding

Various Institute, Inter-institute, Public Private Partnership and External funded R & D projects in the field of epidemiology, diagnostics, socio-economic impact assessment and modeling of economically important diseases including zoonoses are undertaken. These R & D projects have been funded by following organizations



Patents

- Indirect-ELISA for sero-screening of brucellosis in sheep and goat-Patent granted on 20.01.2012 (Patent No 250709).
- Indirect-ELISA kit for serodiagnosis of brucellosis in livestock and humans (Application No. 5031/CHE/2013)
- Monoclonal antibody based double antibody sandwich ELISA for the detection of *Trypanosoma evansi* antigen in animals (Application No. 3095/CHE/2015)
- Recombinant VSG and monoclonal antibody based competitive inhibition enzyme linked immunosorbent assay for detection of antibodies against *Trypanosoma evansi* (Application No. 3095/CHE/2015)
- Pen-side diagnostic kit for Human Brucellosis (Application No. 6641/CHE/2015)

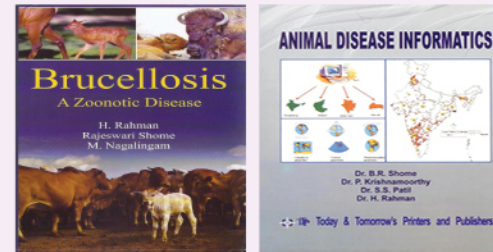


Publication (2011-2016)

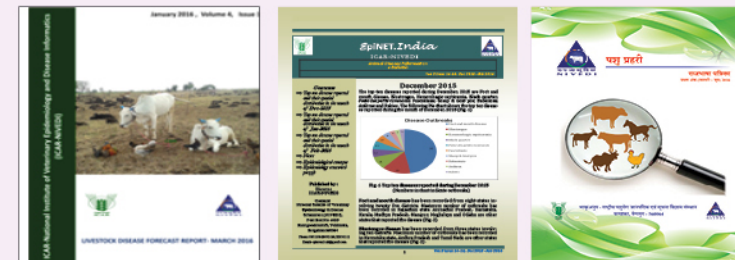
- Peer reviewed research papers (National- 59; International-94)



- Books- 2 Nos.



- Periodicals - 3 Nos.



- Extensions literatures (Folders, Leaflet, Bulletin, etc.) - >50 Nos.



Collaborative Linkages

Institute has established collaborative linkages with various international and national organizations/Institutions including NGOs for research and developments activities, training, outreach activities etc.,



Janakalyan NGO

V-HELP NGO

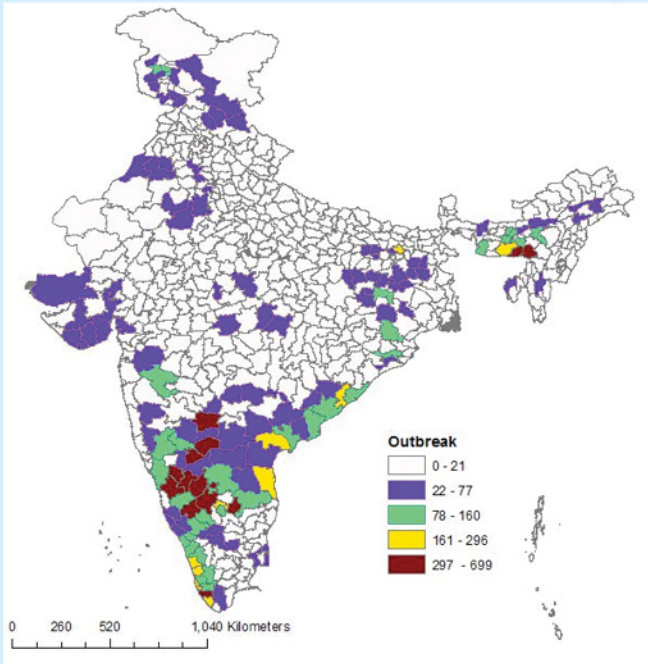




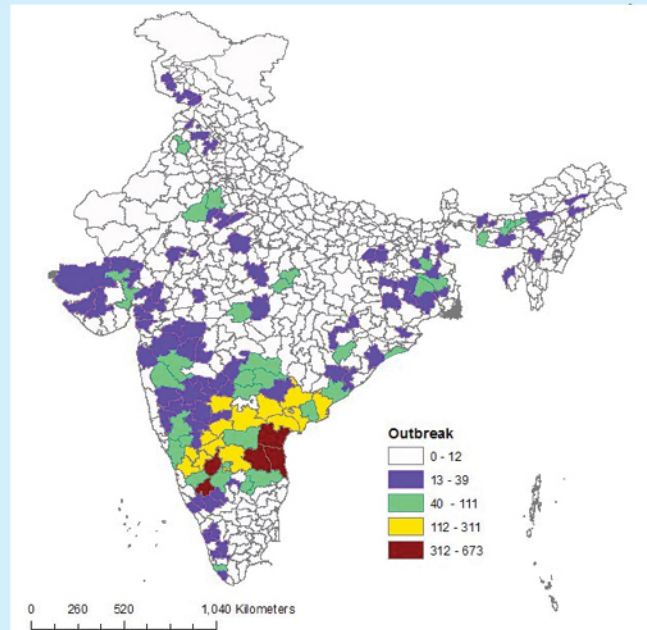
Glimpse of
ICAR-NIVEDI



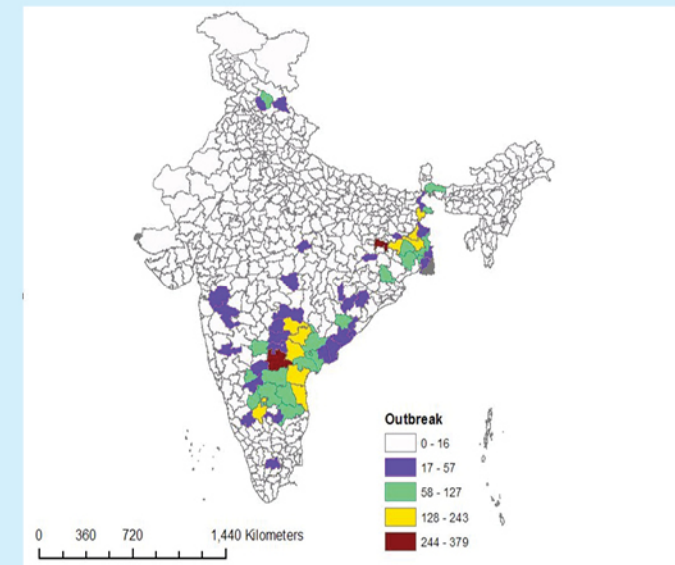
With best wishes from.... NIVEDIans



Cumulative Outbreak of Foot & Mouth Disease (2000-2015)



Cumulative Outbreak of Haemorrhagic Septicaemia Disease (2000-2015)



Cumulative Outbreak of Peste Des Petis Ruminants Disease (2000-2015)



*Animal Health is
National Wealth*



एक कदम स्वच्छता की ओर



हर कदम, हर डगर
किसानों का हमसाफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch