ANNUAL REPORT 2019

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

(ISO 9001 : 2015 Certified)

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Annual Report
2019

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

Post Box No. 6450, Ramagondanahalli, Yelahanka, Bengaluru-560064, Karnataka, India
Ph: +91 80 23093100; 23093110; 23093111 Fax: +9180 23093222
Website: www.nivedi.res.in

Editorial committee:

Dr. G. Govindaraj
Dr. Jagadish Hiremath
Dr. M. Nagalingam
Dr. Siju Susan Jacob
Dr. Awadesh Prajapati

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ICAR-NIVEDI also thank Deputy Director General (Animal Science) and Assistant Director General (Animal Health) for co-operation, encouragement and support.

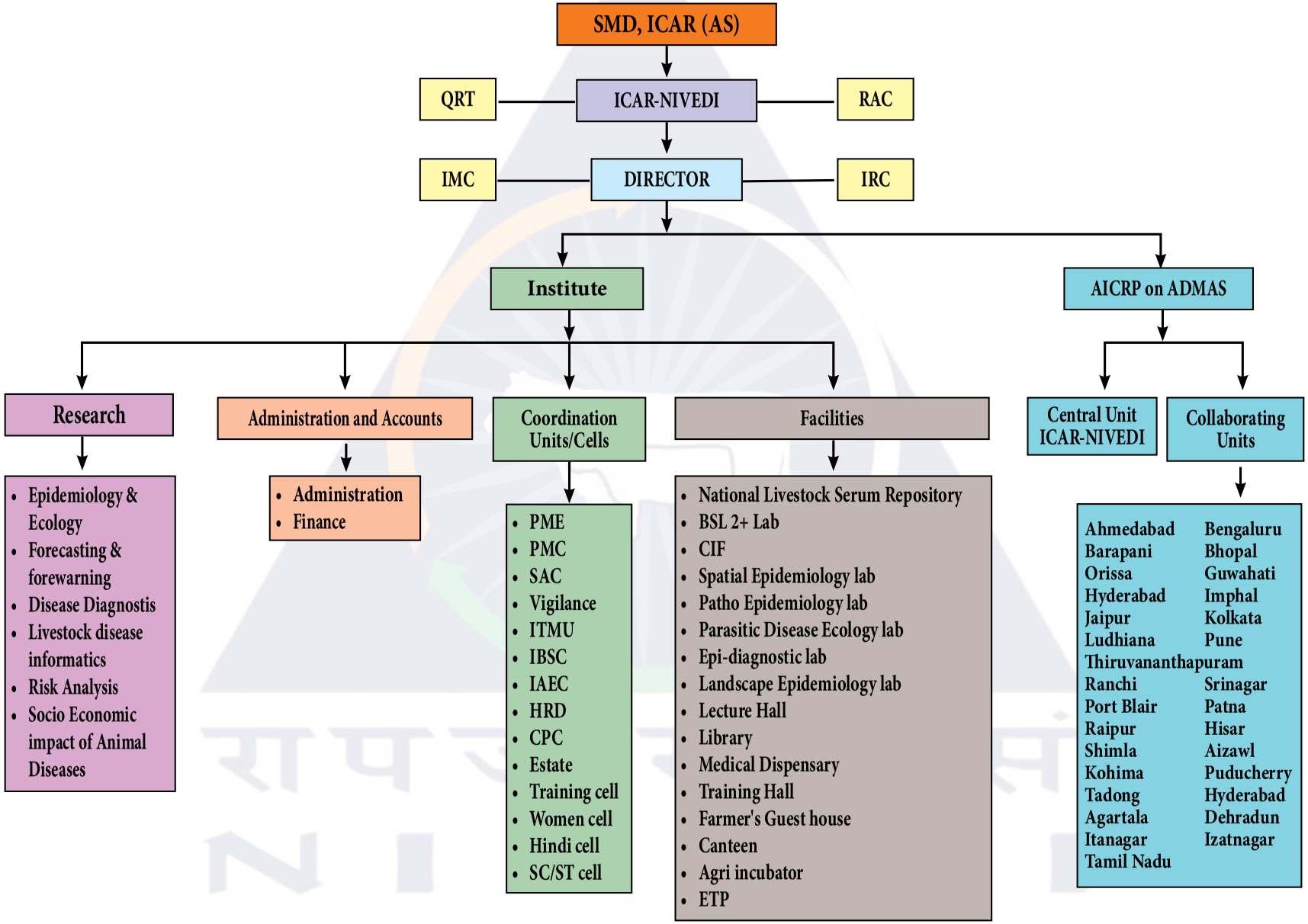
Our sincere thanks are also due to the Directors and Heads of ICAR institutes located in Bengaluru for their moral and logistics support extended from time to time.

The institute conveys sincere thanks to all the staff of AICRP on ADMAS centres located in different states/ UT's and their respective Animal Husbandry Departments / Universities for their valuable inputs, suggestions and consistent co-operation. Last but not the least, I thank all the staff members of ICAR-NIVEDI for their timely support in executing various intended activities of the institute.

Jai Hind!

(Parimal Roy)
Director

ORGANOGRAM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Risk Analysis
Socio Economic impact of Animal Diseases
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Vigilance
ITMU
IBSC
IAEC
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CPC
Estate
Training cell
Women cell
Hindi cell
SC/ST cell
National Livestock Serum Repository
BSL 2+ Lab
CIF
Spatial Epidemiology lab
Patho Epidemiology lab
Parasitic Disease Ecology lab
Epi-diagnostic lab
Landscape Epidemiology lab
Lecture Hall
Library
Medical Dispensary
Training Hall
Farmer's Guest house
Canteen
Agri incubator
ETP
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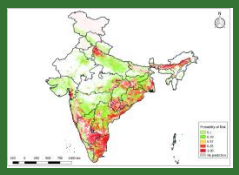
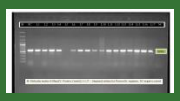
NATIONAL INSTITUTE OF VETERINARY EPIDEMIOLOGY AND DISEASE INFORMATICS

MAJOR RESEARCH AREAS

Epidemiology and Ecology

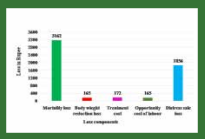



Epi-diagnostics and Disease Surveillance



Disease Informatics


Animal Health Economics




Capacity Building


EXECUTIVE SUMMARY

This Annual report accounts for the year 2019 with the duration from January to December 2019. During the period reported upon, National Animal Disease Referral Expert System v2 (NADRESv2), an improved version has been developed, which uses artificial intelligence system of models. The system uses outbreak data, weather parameters and remote sensing variables to forecast the occurrence of 13 livestock diseases two months in advance.

During 2019, a Bluetongue (BT) forewarning App that predicts the occurrence of BT two months in advance at block level in Karnataka and Mobile app for block level prediction of Haemonchosis in Rajasthan State was developed. Further, a 'Cattle Diseases Diagnosis Expert System (CaDDES)' has been developed for cattle disease diagnosis. During April to December 2019, a total of three IBR ELISA, 14 *Brucella* protein G ELISA, five *Leptospira* staining kits were supplied. The total revenue generated amounts to ₹ 3,33,000.

A total of 6089 pig serum samples were screened for PRRSV specific antibodies, of which 22.1% were positive and 5887 pig serum samples screened for Classical Swine Fever (CSF) revealed 36.6% seropositivity. Similarly, 5431 pig serum samples screened for brucellosis revealed 4.4% seroprevalence. A total of 15812 sheep and goat serum samples from 18 states screened for PPRV antibodies revealed high population immunity in the states with regular vaccination programme.

The serotyping of the samples collected from BT outbreaks from Karnataka during 2019 indicated the involvement of at least six serotypes (BTV1, 2, 5, 16, 23 & 24). Even though, it is well established that *F. gignatica* infection in India is transmitted by *Radix auricularia,* the studies undertaken at the institute revealed the involvement of *Radix rufescens* as the intermediate host for *F.gigantica*. The surveillance of ovine brucellosis revealed that besides smooth *Brucella*, rough *B.ovis* also contribute to the overall burden of brucellosis in sheep. Risk map developed for Anthrax revealed more risk in southern and eastern states of India.

During 2019, a bovine LeptoLAT kit for detection of antbodies against *Leptospira* for diagnosis of bovine/human leptospirosis has been developed and it is under validation. Further, an assay to detect CSFV has been developed and validated at three laboratories viz., ICAR-IVRI (Bengaluru), TRPVB, TANUVAS (Chennai) and ICAR-IVRI (Izatnagar).

An AMR study from 256 isolates received from the project partners from India covering animal, foods of animal origin, aquaculture, environment and human hospital settings were sequenced using WGS approach and the preliminary analysis revealed *S.aureus* ST 772 is epidemiologically important in animal and aquaculture as in human. Further, *E. coli* ST131 was identified as epidemiologically important in Indian context in one-health environment.

The loss assessment studies revealed mortality loss, weight reduction, treatment cost, opportunity cost of labour and distress sale per animal due to sheep and goat pox in Assam was ₹ 3162, ₹ 165, ₹ 172, ₹ 165 and ₹ 1856, respectively. Further, a project aimed to assess loss due to PPR in Karnataka and Madhya Pradesh during 2018-19 revealed as loss of ₹192 crore and ₹47.5 crore per annum, respectively.

The institute organized six days SAARC Regional Training program on 'Laboratory biosafety and biosecurity for handling transboundary animal diseases and zoonotic emerging pathogens' Bengaluru with participants representing six SAARC member countries. Further, a three-day training programme cum workshop on 'Risk Factors and Economic Impact Analysis of Zoonotic Diseases' under ICAR-network project on OPZD and five-day Capacity building programme on 'Hands-on training in laboratory diagnosis of leptospirosis' for the IDSP personnel was organised. A meeting of all the stakeholders to develop framework for anthrax surveillance, prevention and control was organized during 26-27th June 2019 at Bhubaneswar, Odisha.

ABOUT ICAR-NIVEDI

ICAR-NIVEDI had its humble beginning as AICRP on ADMAS in 1987, upgraded to PD-ADMAS in 2000 and finally in the year 2013 it was rechristened as ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI). The coordinating units of AICRP-ADMAS continued to grow from four co-ordinating units during 1987 to 31 at present. 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 economic impact of livestock diseases. The institute has developed various technologies and patented few products which are being utilized by different stakeholders in 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 note worthy. The institute has been conducting plethora of training programmes on epidemiology, economic impact, sampling frame, GIS and RS and disease diagnosis that benefits national and international stakeholders. The efforts of ICAR-NIVEDI have been appreciated and recognized by various organizations by conferring international and national awards and fellowships.

ICAR-NIVEDI plays a significant role by delivering many innovative solutions and services in the form of improved animal disease forecasting and forewarning models, diagnostic techniques, economic estimates of animal diseases and its control. The institute works with the following vision, mission, focus and mandates:

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.

Focus

- Improving disease monitoring and surveillance through development of penside diagnostics
- Risk assessment for occurrence of economically important animal diseases
- Adapting strategies to improve animal disease data quality
- Understanding the threat from animal diseases in the background of climate change and globalization
- Developing early warning system and disease modelling/forecasting
- Understanding economic impacts of animal diseases and the management strategies
- Promoting innovations and improving human resource capacity

Mandate of ICAR-NIVEDI

- Epidemiology, informatics and economics of animal disease including zoonoses.
- Surveillance, forecasting and forewarning for management of animal diseases including zoonoses.
- Repository and capacity development.

Mandate of AICRP on ADMAS

- Strengthening of National Livestock Serum Repository
- Effective updating of NADRES with active disease data, 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
- Sero-monitoring of animal diseases based on sample frame
- Investigation of endemic, emerging and reemerging animal disease outbreaks using innovative technologies

Institute Research Projects

IPC:ANSCNIVEDISIL201500300066 Project ID: IXX12176

Epidemiologyof Haemorrhagic Septicaemia in India

SB Shivachandra, MM Chanda, J Hiremath, P Krishnamoorthy and R Yogisharadhya

Haemorrhagic septicaemia (HS) outbreaks occur among ruminants which greatly affect the economic sustainability of small land-holder farmer's livelihoods. To understand the status of HS in India in order to aid in design of national control policy for HS, we carried out spatial and temporal analysis of more than 25,000 HS outbreaks that occurred in three decades (1987-2016) across several states of India. The detailed results of the same have been processed for publication. In the reporting period, 157 suspected clinical specimens such as blood, nasal swabs and tissue samples from sheep/ goats/ cattle/ buffaloes/ pigs from Madhya Pradesh, Odisha, Jharkhand and Karnataka states were screened for presence of *P. multocida* by conventional methods as well as *P. multocida* (PM) specific PCR assay. A total of 33 samples were found positive for *P. multocida* in PM-PCR assay (~460 bp product). Further, pure bacterial cultures of *P. multocida* were obtained following mice inoculation and standard bacteriological methods. Epidemiologically, the need for rapid and robust molecular typing methods to differentiate pathogenic strains is of utmost importance. Hence, using enterobacterial repetitive intergenic consensus (ERIC-PCR) and repetitive extragenic palindromic (REP-PCR) assays, a total of 42 *P. multocida* isolates pathogenic to mice isolated from the different samples of cattle, buffalo, sheep, goat, pig and rabbits were characterized. The effectiveness of these two methods with regard to ease of interpretation, typeability, reproducibility, and discriminatory power was also evaluated. Using ERIC-PCR, eight clusters and eight single isolates were defined whereas, REP-PCR clustered the isolates into eight clusters and five single isolates. Both ERIC-PCR and REP-PCR produced comparable results though the discriminatory index for ERIC-PCR (0.9001) was higher than REP-PCR (0.8235). The study indicated that the isolates were highly heterogeneous and genetically diverse. In conclusion, molecular typing methods like ERIC-PCR and REP-PCR are rapid and powerful epidemiological tools for classifying the *P. multocida* strains of diverse animal host origins.

IPC: ANSCNIVEDISIL201700200080 Project ID: IXX13244

Monitoring and Surveillance of Sheep Pox and Goat Pox Diseases

GB Manjunatha Reddy, V Balamurugan, SB Shivachandra, M Nagalingam and R Yogisharadhya

A total of 113 clinical samples from sheep and goat suspected for pox were collected/received during the reporting year. Also, eleven post-mortem samples were collected during outbreak investigations. Out of these samples (scabs, skin, lungs and swabs), 26 were positive for sheep pox and 12 were positive for goat pox. Positive samples were subjected for virus isolation and confirmed by sequencing (partial and full length P32 gene). The RPO (RNA polymerase subunit) and GPCR (G-protein-coupled chemokine receptor) genes were sequenced and phylogenetic analysis revealed high homology with all the other Indian Capripox virus isolates at nucleotide as well as amino acid levels. The host specificity was observed with respect to sheep with sheep poxvirus and goat with goat poxvirus.

The ORF117 was amplified, cloned and over expression of ORF117 protein was carried out. The recombinant ORF117 was found to be more reactive than other proteins in western blot with field convalescent serum samples. Preliminary ELISA was carried out with field samples for assessing the reactivity and found to be satisfactory.

IPC:ANSCNIVEDISIL201700400082 Project ID: IXX13196

Epidemiological Surveillance of Transmission Foci of Fasciolosis

Siju SJ, PP Sengupta, R Yogisharadhya and A Prajapati

Fasciola gigantica (liver fluke) is causing fasciolosis in ruminants and is transmitted by lymnaeid snails. Being a snail borne disease, accurate and rapid epidemiological surveillance of the transmission foci of fasciolosis is essential to plan the control strategies. During this period, a total of 711 snails were collected from 31 water bodies representing 7 districts (Bengaluru urban, Bengaluru rural, Kolar, Mandya, Ramanagara, Tumakuru and Hassan) in Karnataka and screened for the presence of larval stages of *F.gigantica*. Analysis of water parameters (pH, Total Dissolved Solids, Dissolved Oxygen, Salinity, Conductivity, Alkalinity, Total hardness, Chloride, Nitrate, Flouride, Iron and Turbidity) collected from the waterbodies revealed, positive correlation of snail density with nitrate content. Agricultural activities especially the use of nitrogen fertilizers may be the cause of increase in nitrate content of lake water that in turn favour snail survival by favouring the aquatic plant growth. Molecular characterization studies using Cytochrome Oxidase I (COX1) as the marker was employed for molecular taxonomic studies of Lymnaeid snails. Even though, it is well established that *F. gignatica* infection in India is transmitted by *Radix auricularia*, our studies revealed the involvement of *Radix rufescens* as the intermediate host for *F.gigantica* (Fig. 1). The prevalence of *Fasciola* infection in snails using PCR with in-house designed primers revealed the prevalence as 20.77%.

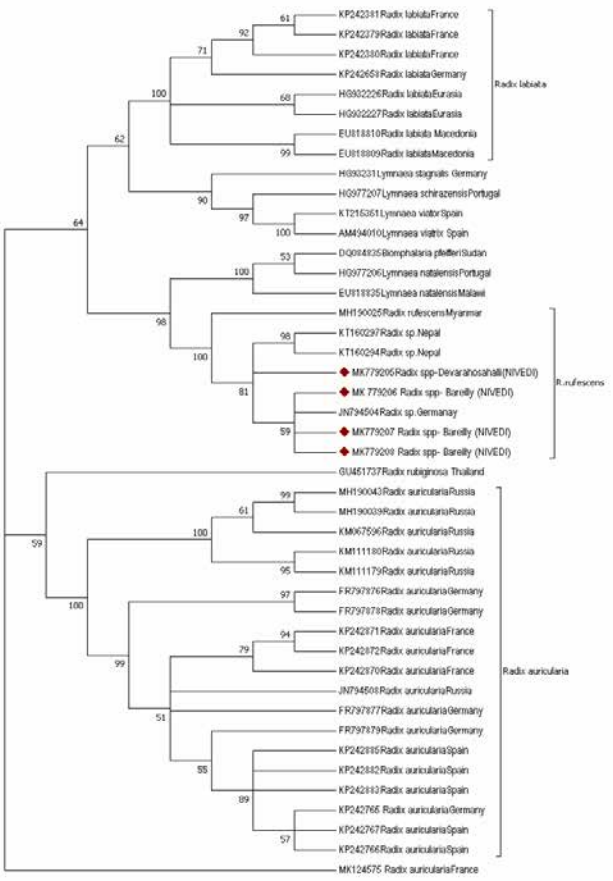


Fig. 1: Phylogenetic analysis of snail population based on COX 1 gene using Neighbour-joining method by MEGA7

IPC:ANSCNIVEDISIL201500400067 Project ID: IXX12421

Epidemiology of Porcine Reproductive and Respiratory Syndrome in India

J Hiremath, D Hemadri, KP Suresh, SS Patil, G Govindaraj and MM Chanda

Porcine reproductive and respiratory syndrome virus (PRRSV) is highly infectious, economically important and emerging viral disease of pigs which was reported first time in India in 2013 and subsequently the outbreaks were reported every year in North East India. A study was undertaken to model the significant risk factors for PRRS. Based on significant risk factors, risk map for PRRS in North East India was prepared (Fig. 2). Further, the status of PRRSV in South Indian states and Goa was assessed through

serosurvey using samples collected/received from AICRP_ADMAS centres. Highest seropositivity was observed in Karnataka (33%) followed by Goa (30%), Telangana (28%), Kerala (12%) Tamil Nadu (11%) and Andhra Pradesh (10%). The risk map developed in this study will help the policy makers for planning PRRS disease control in North Eastern region of India.

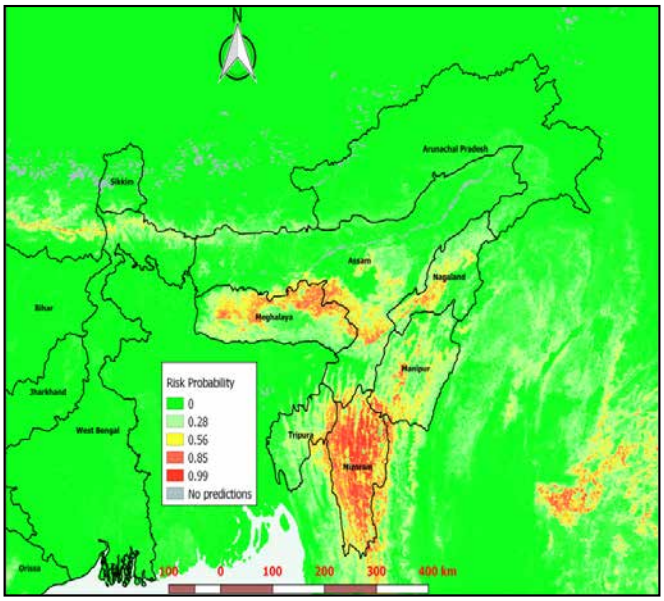


Fig. 2: PRRS risk map for North East India

IPC:ANSCNIVEDISIL201500600069 Project ID: IXXI12456

Identification of Ecological Risk Factors for Occurrence of Anthrax in India

MM Chanda, D Hemadri, PP Sengupta, R Sridevi and SB Shivachandra

The main objectives of the project were to develop risk map, identify temporal and village level risk factors for occurrence of anthrax in India. During the period under report, all India risk map was validated (Fig. 3). The risk of Anthrax is more in Southern states (Karnataka, Andhra Pradesh, Telangana and Tamil Nadu), eastern states (Orissa, Jharkhand, Chattisgarh and West Bengal) and in parts of Gujarat, Uttar Pradesh and Arunachal Pradesh.

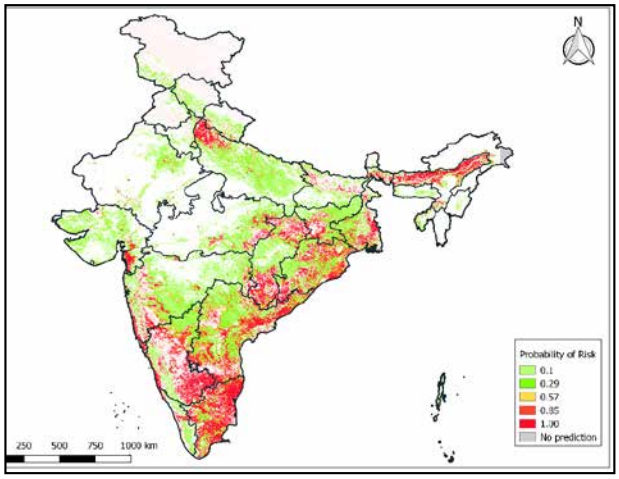


Fig. 3: Risk map for occurrence of Anthrax in India using remotely sensed variables

IPC : ANSCNIVEDISIL201800600096 Project ID: IXX14748

Understanding the Carrier Status of Small Ruminants (Sheep and Goats) in Endemic Areas with respect to *Pasteurella multocida*

R Sridevi, M Nagalingam, P Krishnamoorthy, GB Manjunatha Reddy and RYogisharadhya

A total of 230 samples were collected from small ruminants with healthy and diseased condition from 10 districts of Karnataka. The samples were processed by conventional and molecular methods. *Pasteurella* isolates differentiated from *Mannheimia* isolates by growth in MacConkey Media. Those isolates suspected for *Pasteurella* like were processed for various PCRs - Family specific, Genus and species specific, capsular type, LPS type, Virulence profiling and Antibiotic resistance PCR (Fig. 4). Among the isolates, none of them found to be positive by HS specific PCR, 95% were found to be *Pasteurella multocida* Capsular type A and 5% to Capsular Type D. Around 22 % isolates were classified as LPS type 3 (Heddleston serovar 3 & 4) by LPS genotyping. Virulence pattern revealed that the isolates carried tbp A gene (77%), pfh A (72%), Fim 4 (72%), HgbA (66%), Tox A (61%), Nan B (22%) and Nan H (16%). None of the isolates demonstrated presence of Macrolide antibiotic resistance genes by PCR. Epidemiological Questionnaire data on management, health and bio security aspects was also collected. *P. multocida* isolates were obtained only from sheep showing respiratory signs/illness. None of the goats samples screened showed positivity for *P. multocida*.

Fig. 4: Molecular identification of suspected isolates by Pasteurellaceae specific PCR

IPC : ANSCNIVEDISIL201800500095 Project ID: IXX14750

Surveillance of Ovine Brucellosis with Reference to *Brucella ovis*

M Nagalingam, R Shome, V Balamurugan, GB Manjunatha Reddy and R Sridevi

The project intends to estimate the seroprevalence of *Brucella ovis* in sheep and determine the major risk attributes of ovine brucellosis in Karnataka. During the reported period, a total of 325 serum and 72 milk samples were collected from 21 sheep flocks as per the sampling plan. Rose Bengal Plate Test (RBPT), indirect ELISA for both smooth *Brucella* antibodies and rough *B. ovis* antibodies were performed on the collected sera. Out of the screened samples, 12.3 % were positive by RBPT, 21.5 % by ELISA for smooth strain and 4.0 % by ELISA for *B. ovis* (Table 1). Out of 21 flocks, seven flocks were positive by ELISA for smooth strain, one flock was positive by ELISA for *B. ovis* and four flocks were positive by both the tests. Out of 72 milk samples, 20 were positive (27.8 %) by *Brucella* genus specific PCR. It is also observed that few animals are positive only by PCR and few only by ELISA. It implies mere culling of serologically positive sheep from the flock do not eliminate brucellosis completely and combination of both antigen and antibody detection will enhance the sensitivity in identifying positive reactors in the sheep flocks. The detection of *Brucella* in sheep milk by PCR indicates the active shedding of pathogen by the host and warrants public health measures. It is also evident from the study that not only the smooth *Brucella* but also the rough *B.ovis* contribute to the overall burden of brucellosis in sheep.

Table 1: Screening of sheep serum samples for smooth and rough *Brucella* antibodies

No. of serum collected		Total No. of Serum collected	RBPT		ELISA for smooth strain		ELISA for rough strain	
Male	Female		Positive	Negative	Positive	Negative	Positive	Negative
78	247	325	40 (12.3%)	285	70 (21.5%)	255	13 (4.0%)	312

Note : Figures in parantheses represent percent positivity

IPC:ANSCNIVEDISIL201700300081 Project ID: IXX13245

Development of Assay for Detection of Antibodies against CSFV Infection in Pigs

SS Patil, KP Suresh, SB Shivachandra, D Hemadri and P Roy

Classical Swine Fever (CSF) is a highly contagious and economically important disease of pigs. Currently indigenous kits are not available for detection of CSFV antibodies. Hence, the project was undertaken to develop an assay for detection of antibodies using recombinant Erns protein. During the reported period, standardization of indirect ELISA using Erns protein as antigen for the detection of CSFV antibodies was carried out. ELISA was validated using 456 pig serum samples and cut off values, sensitivity and specificity were determined. Intra-laboratory validation was performed in four labs of the institute and inter-laboratory validation at three laboratories viz., ICAR-IVRI (Bengaluru), TRPVB, TANUVAS (Chennai) and ICAR-IVRI (Izatnagar).

IPC : ANSCNIVEDISIL201700500083 Project ID: IXX13141

Development of an Expert System for Cattle Disease Diagnosis: A Participatory Approach

P Krishnamoorthy, KP Suresh, G Govindaraj and P Roy

The project aims to develop expert system for cattle disease diagnosis using participatory data collection methods. During the reported period, 178 questionnaire data were collected from veterinarians in Assam, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Tamil Nadu, Puducherry and AICRP on ADMAS centers. The weighted matrix was developed for the signs or symptoms based on the Aiken's value index and web application "Cattle Diseases Diagnosis Expert System (CaDDES)" was developed (Fig. 5). The internal validation of the web application based on the weighted matrix of symptoms or signs was completed.

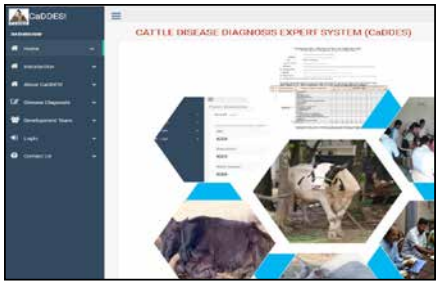


Fig. 5: Home page of Cattle Disease Diagnosis Expert System (CaDDES)

IPC:ANSCNIVEDICIP201800900099 Project ID: IXX14760

Indian Network for Fisheries and Animal Antimicrobial Resistance (INFAAR)

BR Shome, R Shome and P Krishnamoorthy

A total of 236 samples {cow milk (n=105), buffalo milk (n=23), poultry cloacal swabs (n=45), sheep/ goat rectal swabs (n=61) and pig rectal swabs (n=2)} were collected from 16 villages across four taluks in Chikkaballapur District, Karnataka during January to December 2019 as per the sampling plan. Questionnaire data on various farm level factors related to animal health, farm management and antibiotic use were also collected. Isolation and identification of microorganisms from collected samples was carried out using biochemical and molecular methods. Out of 236 samples, 112 *E. coli* isolates (47.4%) and out of 128 milk samples processed for *Staphylococcus*, 113 *Staphylococcus* isolates were identified. Overall, 29 *Staphylococcus aureus* and 56 Coagulase Negative *Staphylococci* (*S. sciuri*-23, *S. epidermidis*-20 and *S. haemolyticus*-2 and *S. chromogenes*-11) isolates were identified through species specific PCR and 28 were other unidentified Coagulase negative Staphylococci (24.7%) from milk samples. The antibiogram revealed 6.25% and 4.46% of *E. coli* isolates were ESBL (Extended spectrum beta-lactamases) and ACBL (AmpC beta lactamases) producers, respectively. Similarly, 11.5% of CoNS isolates were positive for methicillin resistance by mec A PCR. Among the antibiotics, Ampicillin, Nalidixic acid, Tetracycline, Amikacin exhibited resistance in 23.2%, 23.2%, 20.5%, 18.75% of the *E. coli* isolates whereas, highest resistance to Penicillin and Cefoxitin was observed in isolates of *Staphylococcus*.

IPC:ANSCNIVEDISIL201700600084 Project Code: IXX13346

Estimation of Economic Loss of Sheep and Goat Pox in Endemic States of India

G Govindaraj, GB Manjunatha Reddy, V Balamurugan, P Krishnamoorthy, R Yogisaradhaya

The study assessed the economic loss due to sheep and goat pox and identified the major constraints in vaccination adoption in Assam. The data were collected during 2019 from sheep and goat rearing farmers in Kamrup, Darrang, Jorhat, and Morigaon districts using multistage random sampling procedure. The deterministic models were applied to quantify the impact of the disease. A total of 373 sheep and goat farmers were interviewed, and the pox was observed in 40 farms (12.3%) during 2019. The estimated animal level disease incidence was 10.3%. The estimated mortality loss, weight reduction loss, treatment cost, opportunity cost and distress sale loss per animal was ₹ 3162, ₹165, ₹ 172, ₹ 165 and ₹1856, respectively. The major constraints in vaccination adoption were lack of awareness on vaccination, knowledge regarding vaccine preventable diseases and lack of access to vaccine.

Institute Service Projects

National Animal Disease Referral Expert System (NADRES)

KP Suresh, D Hemadri, SS Patil, P. Krishnamoorthy and Siju SJ

National Animal Disease Referral Expert System v2 (NADRES v2) was developed and implemented using artificial intelligence system of models (Fig. 6). The system uses disease outbreak data from NADRES v2, weather parameters from GES DISC GLDAS_NOAH025_M.2.1 and remote sensing variables (Normalized Difference Vegetative Index and Land Surface Temperature) from MODIS products (MODI13Q1 & MODI1A2) to forecast occurrence of 13 livestock diseases two months in advance (Fig. 7). NADRES v2 technology provides both online and offline data entry facility. Each AICRP center is provided with login ID and password for data entry, verification, analysis and reporting. Spatial analysis of disease data was incorporated such as risk maps, hotspot maps and disease maps.

Automated messages are sent to AICRP centers to provide the monthly disease outbreak report feedback on monthly forewarning reports in the prescribed format. Automated LCD application was developed to display the monthly disease forecast at the institute.

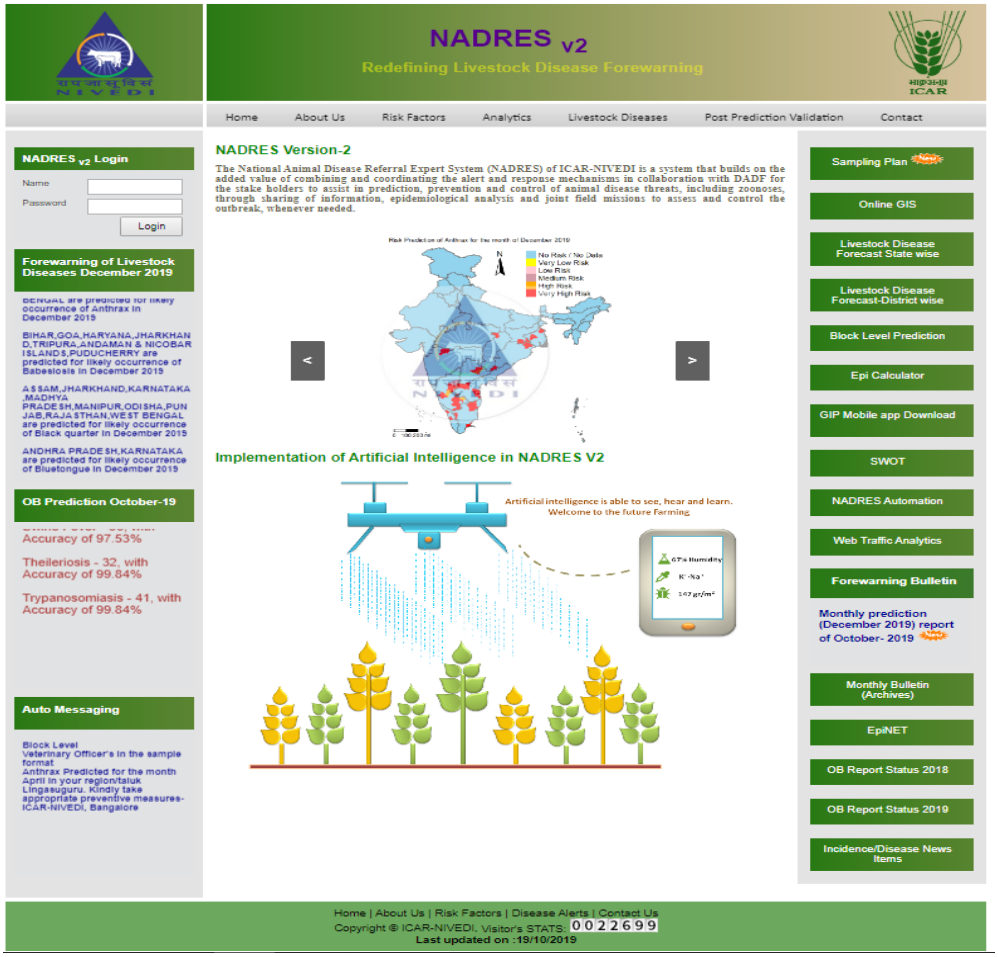


Fig. 6: NADRES v2 Web application implemented with Artificial intelligence for entry, analysis and prediction of diseases

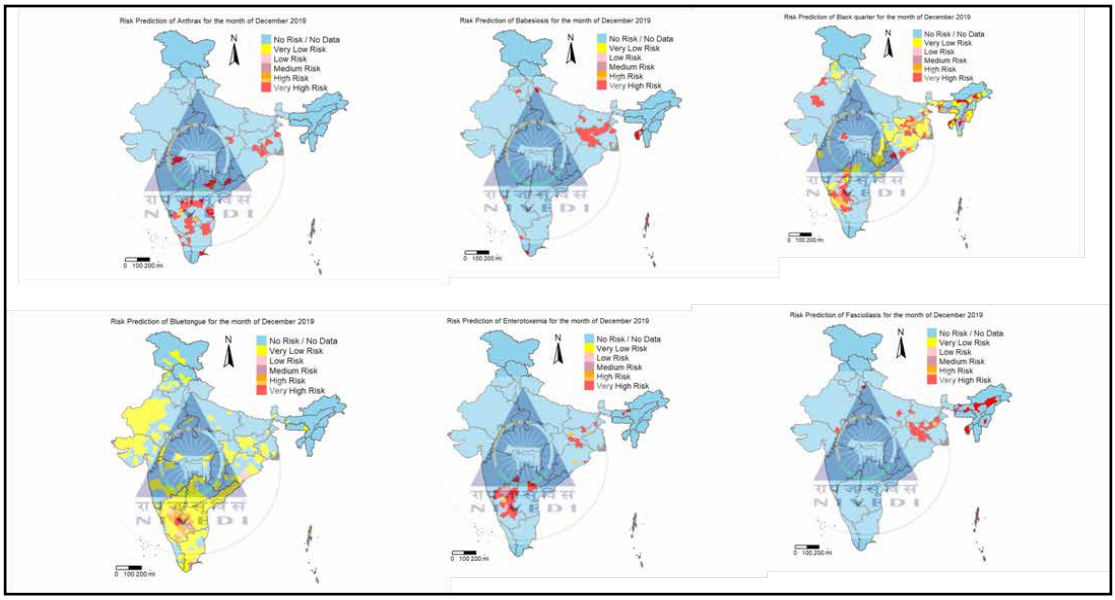


Fig. 7: Risk Prediction of livestock diseases using NADRES v2

IPC:ANSCNIVEDISIL201100300022 Project ID:IXX08279

Maintenance and Updating of Livestock Serum Repository

D Hemadri, KP Suresh and SS Patil

A total of 9552 pig serum samples collection was targeted during 2018-19 from 31 AICRP on ADMAS centers (located in 29 states and 2 union territories), of which 6117 samples from 29 centers were received. This year the serum samples were not received from Bihar and Gujarat and less than 50% of targeted samples were received from Assam, Tripura and West Bengal. During 2019, a total of 6089 serum samples were screened for PRRSV specific antibodies, of which, 22.1% were positive. Similarly, 5887 pig serum samples screened for classical swine fever revealed 36.6% seropositivity.

IPC:ANSCNIVEDISIL201300200045 Project ID:IXX10708

Sero-epidemiology of Brucellosis

R Shome, BR Shome and M Nagalingam

Brucellosis in swine is a contagious disease with greater zoonotic potential. During the reporting period, a total of 6000 stratified random pig serum samples sourced from AICRP on ADMAS centers of which 5431 serum samples were screened for brucellosis using iELISA kit standardized at ICAR-NIVEDI and 569 samples were not tested due to non-availability or poor serum quality. The results revealed 4.3% seroprevalence of brucellosis in pigs. The highest seroprevalence was recorded in Maharashtra [44.30% (35/79)] and Telangana [24.74% (24/97)] states. In nine states viz.,Maharashtra,Telangana, Odisha, Goa, Punjab, Chhattisgarh, Nagaland, Arunachal Pradesh and Madhya Pradesh seropositivity greater than 5% was recorded. The seronegativity was recorded in samples sourced from 12 states (Mizoram, Tripura, Tamil Nadu, Himachal Pradesh, Sikkim, Kerala, Puducherry, Manipur, Andhra Pradesh, West Bengal, Andaman Nicobar, and Jammu and Kashmir) (Fig. 8). This study provided the latest updates on nationwide seroprevalence of brucellosis in swine.

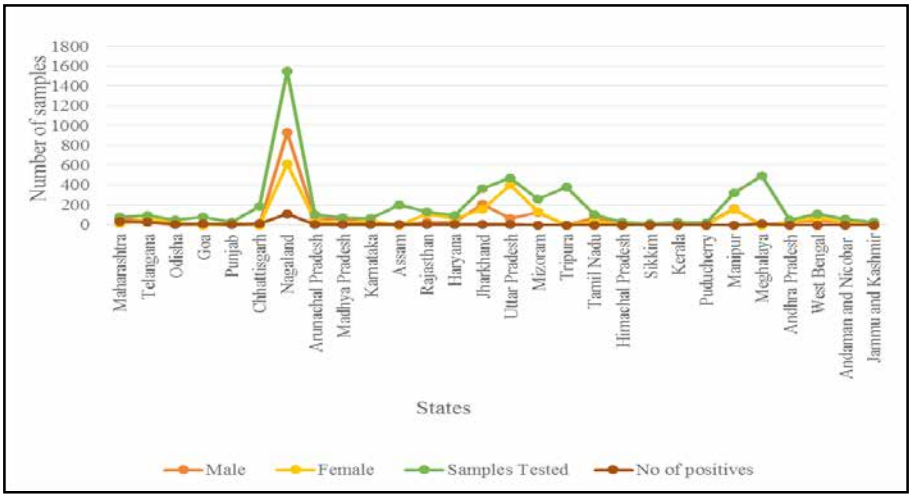


Fig. 8 : State wise number of samples tested for brucellosis in pigs

IPC:ANSCNIVEDISIL201200800032 Project ID:IXX10709

Seroepidemiology of Infectious Bovine Rhinotracheitis in India

SS Patil and D Hemadri

Infectious Bovine Rhinotracheitis (IBR) commonly referred as Red nose disease in cattle is a highly contagious, infectious respiratory disease that is caused by Bovine Herpesvirus-1 (BoHV-1). During the reporting period, serosurveillance in different states of India were undertaken. A total of 1267 bovine serum samples were tested for the presence of IBR antibodies using the NIVEDI's Avidin-Biotin ELISA kit and the seropositivity was found to be 35.59 % (Table 4). The highest seropositivity was observed in Andhra Pradesh (62%) and the lowest in Kerala (2%) and Rajasthan (2%). A total of 10 IBR AB ELISA kits were prepared and supplied to five different laboratories in India.

Table 4: Details of bovine serum samples screened for IBR

State	No. of Samples	No of Positives	Positivity (%)
Andhra Pradesh	100	62	62
Gujarat	3	0	0
Karnataka	211	101	48
Kerala	100	2	2
Maharashtra	553	195	35
Madhya Pradesh	100	60	60
Odisha	100	29	29
Rajasthan	100	2	2
Total	**1267**	**451**	**36**

Eighteen cattle serum samples from Odisha having a history of abortions were screened for IBR antibodies, of which 10 samples were found positive. A total of 95950 bovine serum samples during 1995-2019 were screened for IBR antibodies, of which 33,131 were found positive (34.52%).

Seroprevalence of Peste des Petits Ruminants (PPR) in Sheep and Goats in India

V Balamurugan

A total of 15812 serum samples from 18 states were screened for PPRV antibodies by IVRI PPR cELISA kit. The highest seroprevalence/seropositivity of PPR was observed in Uttar Pradesh (65.69%) followed by Odisha (54.2%), Himachal Pradesh (37.09%), Madhya Pradesh (34.43%), Assam (34.25%), Jammu and Kashmir (32.3%), Bihar (30.91%), Uttarakhand (29.35%), Mizoram (15.69%), Nagaland (14.66%), Manipur (10.29%), Tripura (5.48%), Meghalaya (4.73%) and Sikkim (1.16%). Among the studied states, the highest population immunity was observed in Gujarat (68.34%), followed by Rajasthan (64.77%), Haryana (57.32%) and Punjab (55.22%) (Fig. 9).

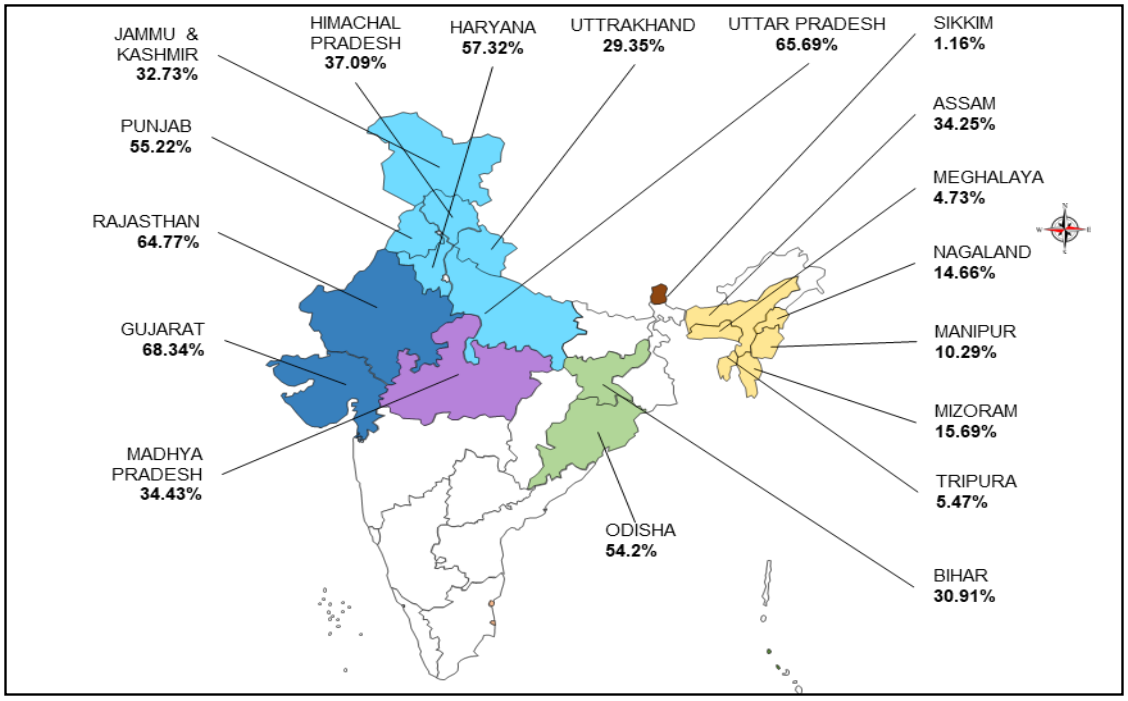


Fig. 9: Status of PPRV antibodies prevalence in different states of India

Externally Funded Projects

ICAR Project: All India Network Programme on Bluetongue

D Hemadri, MM Chanda and KP Suresh

During 2019, the state of Karnataka experienced more bluetongue outbreaks. A total of 81 suspected outbreaks in nine districts (Fig. 10) of Karnataka were attended and collected 342 clinical samples (blood or tissues). The detailed breakup of the samples collected and the locations of the suspected outbreaks attended is provided in Fig. 11. The seasonal variation in bluetongue outbreaks was observed in Karnataka e.g. in Mandya district (located in the southern part of the state), the disease occurred in the summer months (March and April), whereas in northern districts, outbreaks occurred in the winter months (October to December). The outbreaks in the Mandya district during the summer months was unusual and might be due to relatively naïve sheep population, presence of irrigated land and suitable weather conditions for *Culicoides* breeding. In northern districts, unprecedented heavy rains during the monsoon and post monsoon months led to heavy floods converting drylands to wetlands, which is conducive for *Culicoides* breeding.

The clinical signs among the various flocks varied between the districts. Besides the usual clinical signs in endemic settings like high fever, nasal discharge, bleeding from nares and limping, severe clinical signs such as cyanotic and swollen tongue, torticollis, cud vomition were also observed in flocks of Bellary and Chitradurga districts, Karnataka. Analysis of the age group of the affected animals based on the samples collected indicated that nearly 40% of the affected animals were in the age group of four months to one year and this increased to 70% when the upper limit of the age extended to two years. The morbidity rate varied from 8.1 to 44.5% with a mean morbidity rate of 12.9%. The district-wise Case Fatality Rate (CFR) varied from 21.2 -52.9% with a mean CFR of 33.1%. The preliminary virus isolation (n=132) and serotyping indicated the involvement of at least six serotypes (BTV1, 2, 5, 16, 23 & 24) in the outbreaks.

Fig. 10: Karnataka map showing locations of bluetongue outbreaks attended

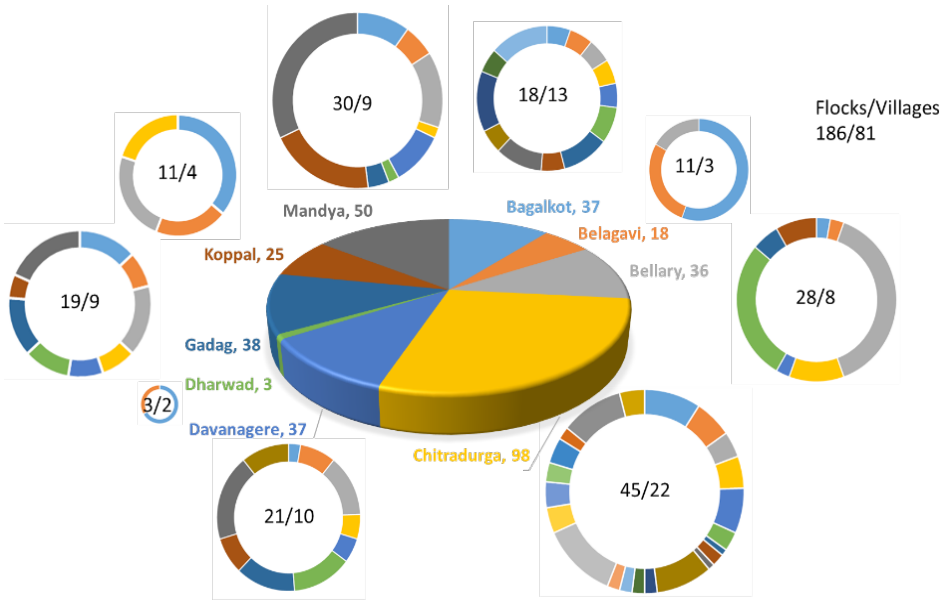


Fig. 11: The pie chart (large) showing district-wise collection of clinical samples and the smaller surrounding pies indicate flocks and the number of villages surveyed in the district

IPC:ANSCNIVEDIISOP200900500017 Project ID :OXX0223

ICAR Project: All India Network Project on Outreach Programme on Zoonotic Diseases

V Balamurugan, PP Sengupta, R Sridevi and G Govindaraj

During the reported period, studies on leptospirosis, toxoplasmosis and Q-fever were carried out as per work plan. A total of 1279 serum samples from animals {cattle (n=224), buffaloes (n=43), sheep (n=158), goats (n=248), and dogs (n=48)} and humans {Pyrexia of Unknown Origin (PUO) cases (n=358), random samples (n=153)} were screened for leptospirosis by microscopic agglutination test (MAT), of which, 138 animals {cattle (n=49), buffaloes (n=07), sheep (n=17), goats (n=33), and dogs (n=32)} and 160 humans {PUO (n=101), random (n=59)} samples showed positive reactivity for *Leptospira* serogroup specific antibodies when using 18 reference pathogenic *Leptospira* panel of antigens (Table 5).

A total of 94 serum samples from cattle with a history of abortion and reproductive disorders were screened for toxoplasmosis using *Toxoplasma gondii* ruminant kit, which revealed a seropositivity of 14.89% (14 / 94). On screening of 107 serum samples from 44 farms with a history of abortions/and reproductive disorders by *Trans* PCR, 84 were positive for *Coxiella burnetii* genomic DNA, which indicated the ongoing active Q fever infection in all the studied farms. Three days training programme cum workshop on 'Risk Factors and Economic Impact Analysis of Zoonotic Diseases' was conducted under ICAR-network project on OPZD and 15 PI/Co PI's from collaborating units were participated.

Table 5: Statewise serum samples tested for leptospirosis in animals and humans

States/Districts/ Places	Species	No. of samples tested by MAT	No. of samples reacted in MAT
Maharashtra	Cattle	27	16
	Buffaloes	39	04
	Sheep	158	17
	Goats	248	33
	Humans	396	95
Karnataka	Cattle	16	11
	Humans	9	6
Chattisgarh	Dogs	48	32
	Cattle	17	8
	Buffalo	4	3
Madhya Pradesh	Cattle	11	2
Gujarat	Humans	153	59
	Cattle	153	12
Total		1279 (Livestock-721, Humans-558)	298 (Livestock-138, Humans-160)

IPC:ANSCNIVEDICOP201600800077 Project ID:OXX03488

ICAR Project: All India Network Programme on GIP

PP Sengupta, KP Suresh, Siju SJ and M Pratheepa

The disease data on haemonchosis (EPG) (2002–2017) was collected from CSWRI, Avikanagar unit. The bioclimatic variables data were retrieved from the "GLDAS_NOAH025_M_V2.1" dataset and the remote sensing variables were extracted from MODIS satellite images. The outbreak data (EPG>1000) was subjected to disease modelling with weather and remote sensing parameters as risk variables (Fig. 12). Additionally, suitability analysis was carried out to determine the potential sites for disease occurrence and to determine correlation of the climate variables with disease. The analysis revealed the significance of Land surface temperature (LST) on disease incidence with threshold values of LST as 30–32.62°C. Also, Moran's I Statistics was calculated and potential four cluster groups were identified based on the spatial distribution of disease. The four clusters were further correlated with environmental and remote sensing parameters resulting in two clusters, Cluster-1 (Sikar) and Cluster-2 (Bilwara, Pali and Ajmer) with highest number of outbreaks indicating the influence of environment on disease incidence. Further, GIP mobile application that provides forewarning of haemonchosis at block level in Rajasthan was developed (Fig. 13). This mobile app can be downloaded from Google play store from the below mentioned link: https://play.google.com/store/apps/details?id=info.nivedi.gip

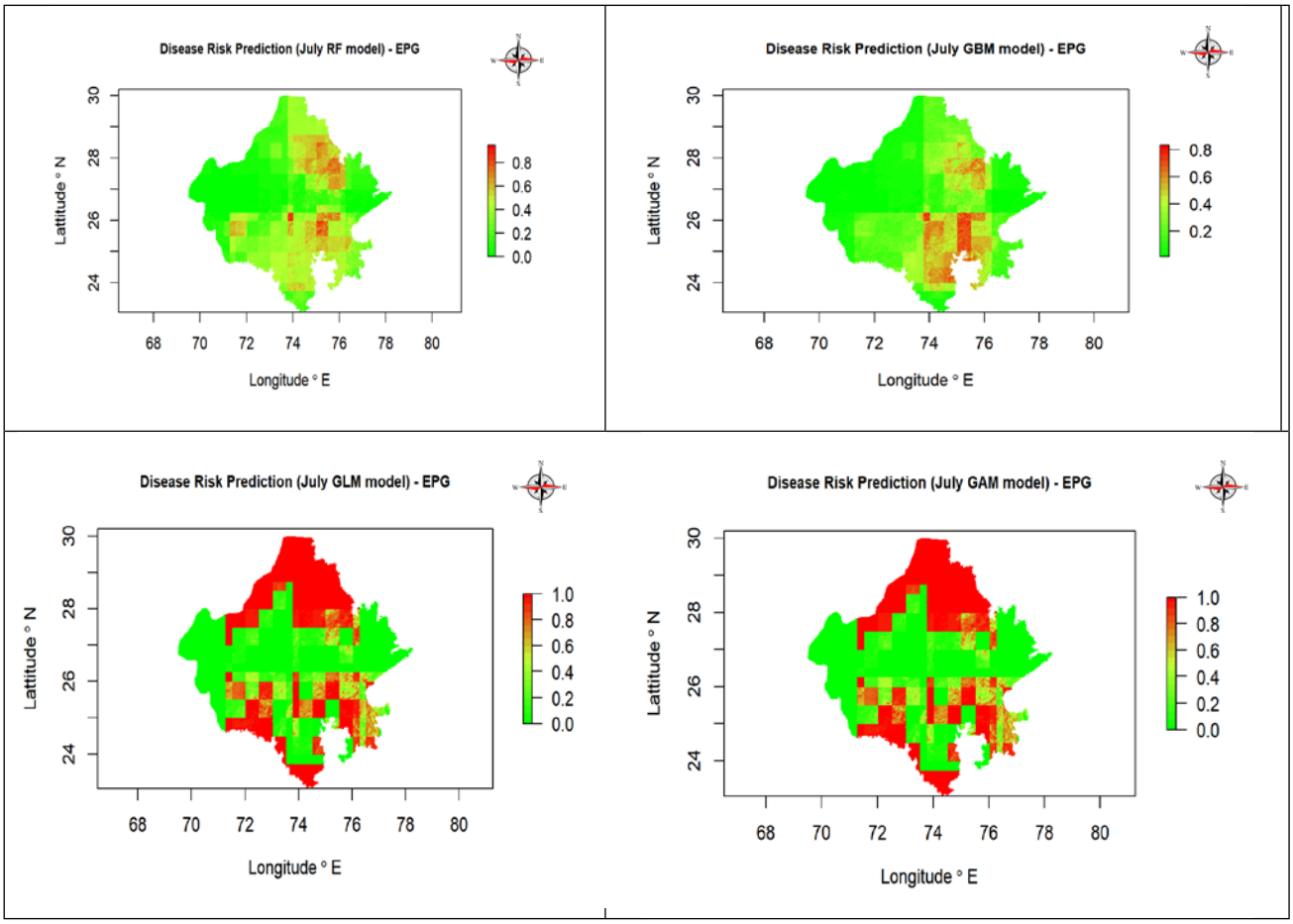


Fig. 12: Risk prediction of haemonchosis in Rajasthan

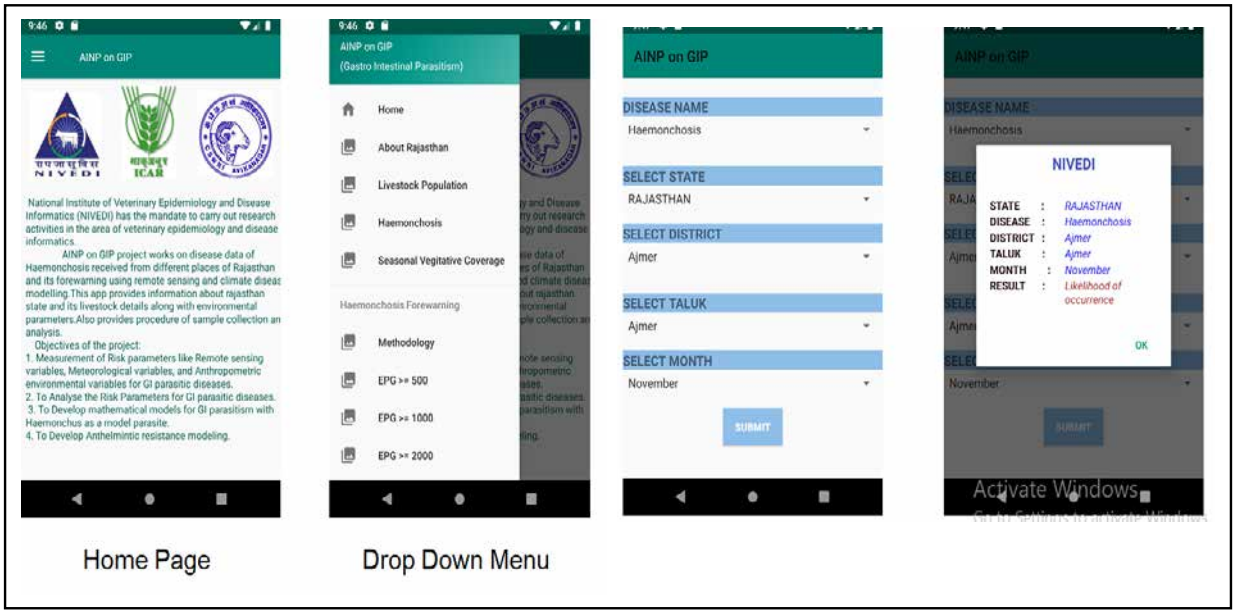


Fig. 13: Mobile App for block level prediction of haemonchosis in Rajasthan state

ICAR Project: National Innovations on Climate Resilient Agriculture -Modelling the Effect of Climate vulnerability on Transmission of Vector-Borne Livestock Diseases in India using Remote Sensing and Geographical Information System

KP Suresh, P Krishnamoorthy and Siju SJ

During the period under report, PCR screening of pathogens causing Anaplasmosis, Babesiosis, Bartonellosis, Coxiellosis, Pasteurellosis, Rickettsia, Theileriosis and Trypanosomiasis were carried out from tick samples collected in Karnataka and Kerala. Grid based rainfall and temperature data was extracted for Karnataka using GES DISC GLDAS_NOAH025_M.2.1 and Normalized Difference Vegetative Index (NDVI) and Land Surface Temperature (LST) data from MODIS products (MOD13Q1 and MOD11A2).

The systematic review of data on prevalence of anaplasmosis from thirty countries subjected to meta-analysis revealed a pooled prevalence of 39% [95% CI:30–49%, PI:2–95%]. The year-wise analysis showed higher prevalence during 1978–2010 [46%] compared to 2011–17 [31%]. The region-wise prevalence estimate by meta-analysis for India is depicted in Fig. 14.

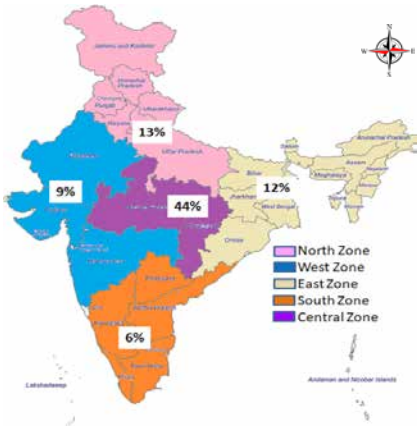


Fig. 14: The regionwise prevalence estimate for anaplasmosis by meta-analysis for India

The work undertaken for Bluetongue using space-time cluster analysis of 15 year data revealed the presence of outbreak clusters in Karnataka using SaTScan v9.6. The discriminant function analysis was carried out to determine the significant climate variables responsible for cluster formation (Fig. 15).

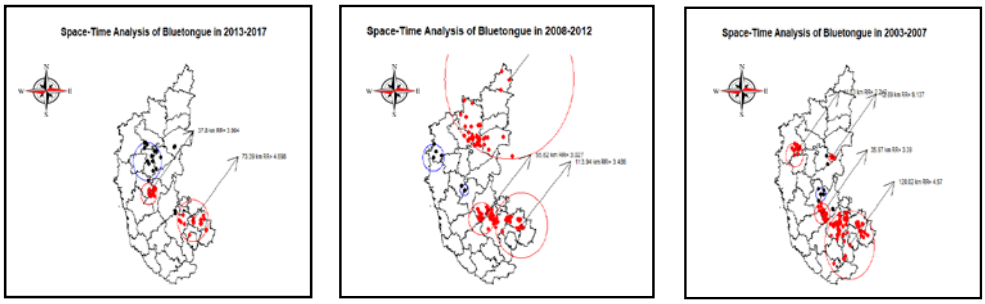


Fig. 15: Bluetongue disease outbreak clusters in Karnataka

Further, risk maps were developed for Bluetongue disease for Karnataka and Tamil Nadu states using various weather, remote sensing, and anthropogenic variables. The best fit models were selected based on Cohen's Kappa, Receiver Operating Characteristic (ROC) curve and True Skill Statistic (TSS) and combined to develop average prediction model. Furthermore, *Culicoides* species distribution in India in different seasons was predicted using machine learning reverse prediction models (Fig. 16).

A BT forewarning App that predicts the occurrence of BT two months in advance at block level in Karnataka was developed under this project (Fig. 17).

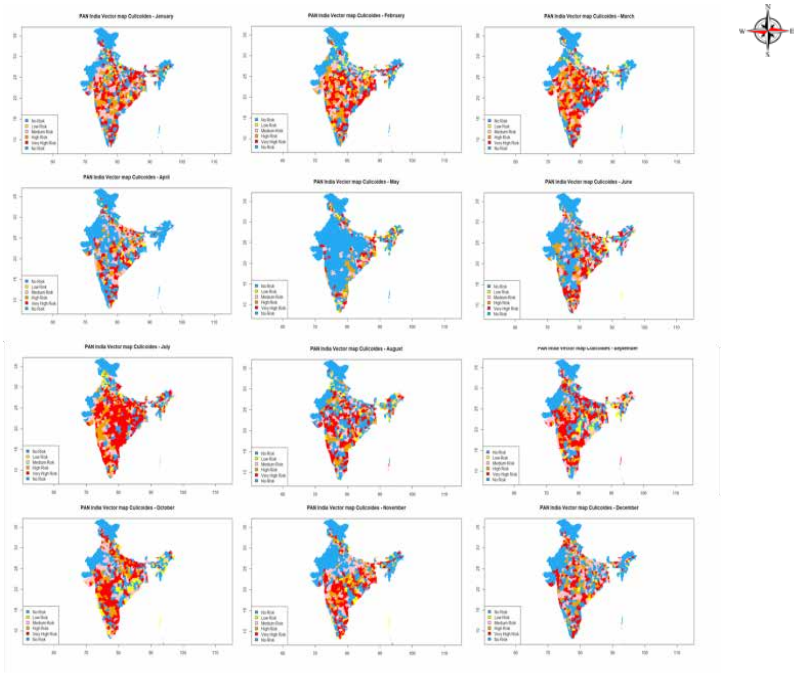


Fig. 16: Month-wise prediction of *Culicoides* species responsible for Bluetongue in India based on reverse prediction models

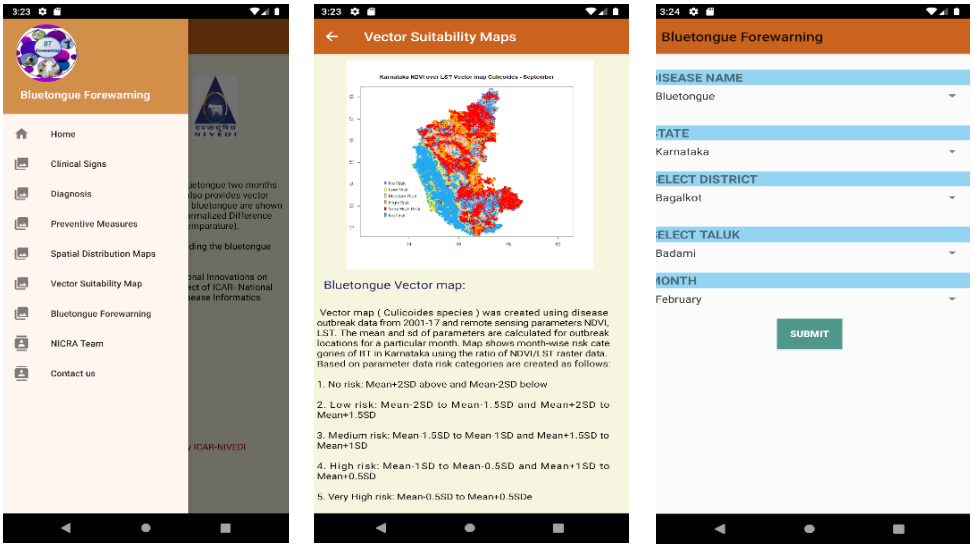


Fig. 17: Mobile App for block level prediction of Bluetongue disease in Karnataka

IPC: ANSCNIVEDISOP201700900087 Project code: OXX04084

ICAR Project:Precision Diagnostic Approach for Fasciolosis in Cattle and Buffaloes

PP Sengupta, Siju SJ and R Yogisharadhya

Fasciolosis in animals caused by *Fasciola gigantica* is one of the most economically important livestock diseases. In the present project, metacercariae were harvested from snails and were hatched to Newly Excysted Juveniles (NEJs) in the laboratory based on standard protocols. Total RNA was isolated from NEJs and cDNA was synthesized. PCR for amplification of Cathepsin B gene was standardized, cloned the desired product into expression vector and recombinant proteins (Cathepsin B2 and B5) were expressed in prokaryotic expression system using pET32b expression vector. Further, the recombinant proteins tagged with histidine were purified by Ni–NTA chromatography and checked by SDS-PAGE. Protein concentrations were estimated and stored at -20°C with protease inhibitors. Hyper immune sera (HIS) were raised against native (purified excretory secretory antigen of adult *Fasciola gigantica*) as well as recombinant Cathepsin (B2) in rabbits. The reactivity of the recombinant protein was confirmed with HIS by western blotting (Fig. 18).

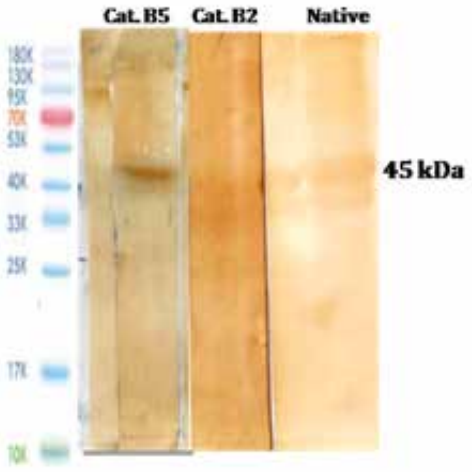


Fig. 18: Western blot analysis of recombinant and native Cathepsin proteins

IPC:ANSCNIVEDISOP201701000088 Project ID: OXX04086

ICAR Project: Development of Diagnostic Test for Detection of Classical Swine Fever Virus

SS Patil, SB Shivachandra, Jagdish Hiremath and KP Suresh

Classical swine fever is a highly contagious disease of pigs. The project was aimed at development of diagnostic test for detection of CSFV antigen in pigs. During period reported upon, monoclonal antibodies were produced against recombinant BCAD domain of E2 region of CSFV. Screening and isotyping of sub clones (hybridoma) was done (Fig. 19 and 20) and reactivity confirmation of anti-CSFV mAbs with CSFV-E2 antigen was carried out by western blot.

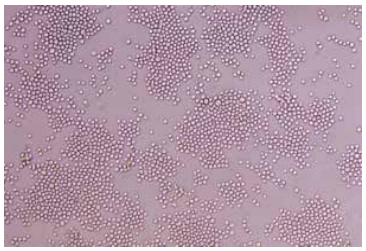


Fig. 19: Clone:2F2.1C3, Isotype: mIgG2b,k

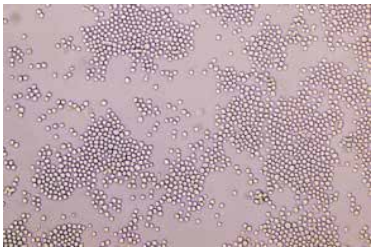


Fig. 20: Clone:1C9.1G10, Isotype: mIgG1, k

IPC:ANSCNIVEDISOP201701100089 Project ID: OXX04085

ICAR Project: Development and Validation of Novel Multiplex Sero-Diagnostic Assay for Diagnosis of Porcine Respiratory Disease Complex

J Hiremath, D Hemadri and SS Patil

The multiplex sero-diagnostic methods which are less time demanding, cost effective and consume very small quantity of clinical samples are need of the hour especially for multi-etiological disease condition like Porcine Respiratory Disease Complex caused by combination of viral agents majorly Porcine Circo Virus-2 (PCV2), classical swine fever virus (CSFV) and Porcine parvo virus (PPV). The current project with objectives of generating conserved immunogenic recombinant proteins of CSFV, PPV2, and PCV2 and standardization of flowcytometry based multiplex microbead array for detection of antibodies against CSFV, PPV2, and PCV2 was initiated. The major achievements include expression of CSFV recombinant E2 protein and confirmation by western blotting using Anti-His antibodies (Fig. 21).

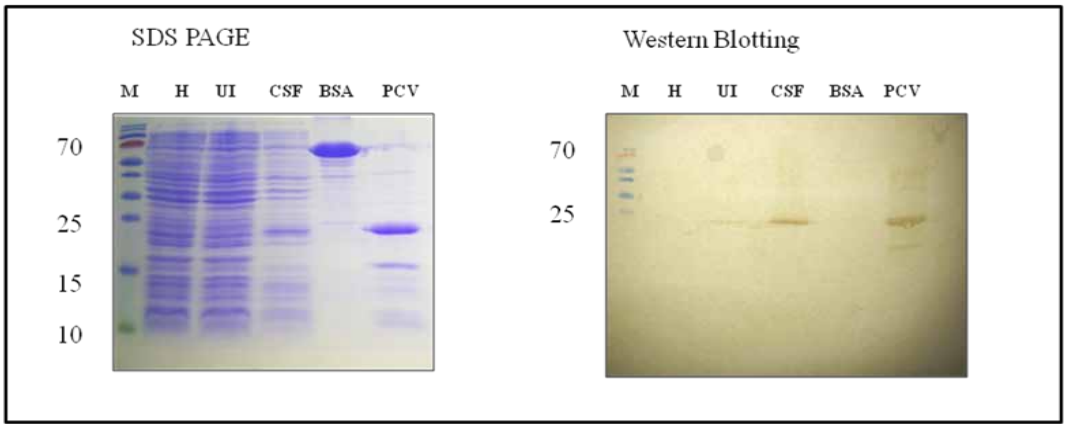


Fig. 21 : Anti-His western blotting for recombinant CSFV E2 Protein: M-Marker (10-70 KDa), H-Host (*E. coli* BL21 Codon plus) UI- Uninduced, CSF-Induced, 23.5 KDa expected size of recombinant protein, BSA-Negative control, PCV-recombinant PCV2 capsid protein as positive control
(A) SDS PAGE (B) Anti- HIS western blot analysis for recombinant CSFV E2 protein

DADF Project: Brucellosis Control Program

R Shome, M Nagalingam and P Roy

Brucellosis caused by *Brucella* spp. is an important zoonotic disease prevalent among bovine population in India. A total of 3144 bovine serum samples received from 159 blocks of 22 districts in Chhattisgarh state were screened for brucellosis using protein G indirect ELISA kit. The overall sero-positivity recorded was 4.64% with more than 5% seropositivity in seven districts. In seven districts, seronegativity was observed (Table 6 and Fig. 22). This study conclusively highlighted the seroprevalence of bovine brucellosis at district level within the state. The prevalence estimated at district level might be useful for prioritizing regions for vaccination, designing control strategies and improvisation of clinical surveillance system.

Table 6: Brucellosis surveillance in various districts of Chhattisgarh state

District name	No. of blocks	Total samples received (positive samples)	Percentage positivity
Janjgir-Champa	10	210 (39)	18.57
Narayanpur	2	11 (2)	18.18
Durg	13	230 (38)	16.52
Mungeli	4	75 (11)	14.67
Raipur	15	30 (4)	13.33
Kanker	7	63 (6)	9.52
Balod	2	172 (16)	7.92
Raigarh	8	258 (10)	3.87
Bemetara	5	222 (5)	2.25
Bilaspur	11	111 (2)	1.80
Baloda Bazar	6	243 (4)	1.64
Jashpur	9	150 (2)	1.33
Surguja/Ambikapur	19	267 (3)	1.12
Dhamtari	4	166 (1)	0.60
Mahasamund	5	173 (3)	0.58
Bastar	12	72 (0)	0.00
Dantewada	4	405 (0)	0.00
Gariaband	5	50 (0)	0.00
Kabirdham	3	106 (0)	0.00
Korba	5	49 (0)	0.00
Rajnandgaon	9	66 (0)	0.00
Sukma	1	15 (0)	0.00
Total	159	3144 (146)	4.64

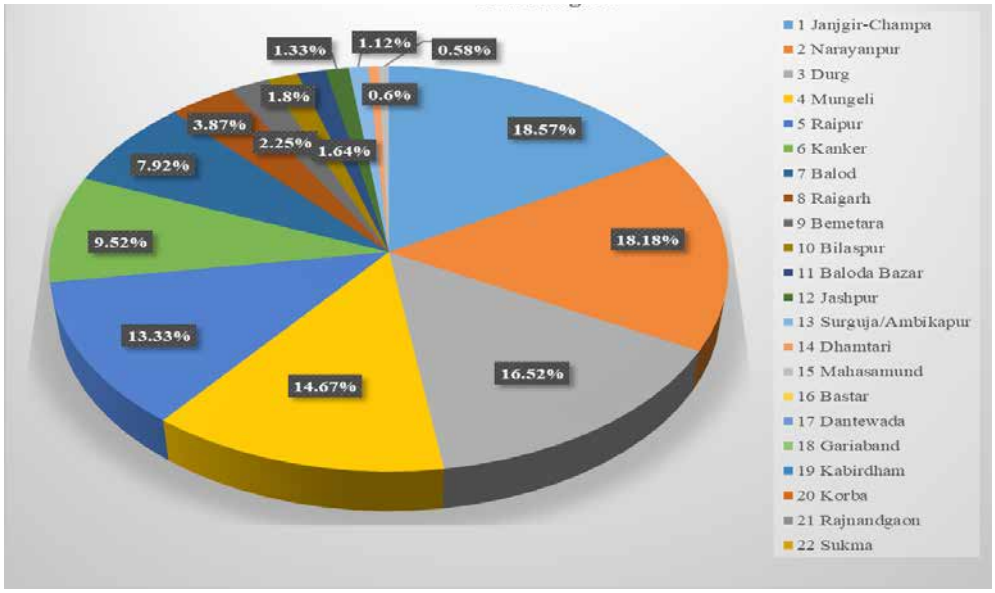


Fig. 22: Percentage of brucellosis positive samples in different districts of Chhattisgarh

IPC: ANSCNIVEDISOL201800200092 Project ID: OXX04261

DADF Grant in Aid Project: PPR Control Programme, Surveillance, Monitoring and Vaccination Impact of PPR in Sheep and Goats in India

V Balamurugan, G Govindaraj, KP Suresh and P Roy

During the period under report, the sampling plan for seromonitoring of PPR vaccination under PPR-CP programme of DAHD, GOI was developed for Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Himachal Pradesh, Rajasthan and Telangana. A total of 352 pre-and post-vaccination serum samples received from 35 districts of Bihar state were screened for PPRV antibodies by using PPR-C-ELISA kit, of which 142 (40.34%) were found positive for PPR virus antibodies. Further, a study was conducted to assess the economic impact of the PPR in the identified long term PPR-CP implemented (Karnataka, since 2010-11) and recently implemented (Madhya Pradesh, 2016-17) states of India. The data was collected from 410 households in Bhopal, Betul and Sagar districts of Madhya Pradesh and 350 households in Chikkaballapur, Bidar and Gulbarga districts of Karnataka. The estimated loss due to PPR in Karnataka during 2018-19 was ₹ 192 crore whereas it was ₹ 47.5 crore in Madhya Pradesh.

IPC:ANSCNIVEDICOP201300900052 Project ID: OXX02581

NFDB Project: National Surveillance Programme for Aquatic Animal Diseases (NSPAAD)

KP Suresh and GB Manjunatha Reddy

During the period under report, baseline, biological, disease outbreak, hatcheries data were updated (Fig. 23). Aquatic disease prediction maps were created using R Language with the NSPAAD database

(Fig. 24). Data formats were uploaded for baseline landing center and hatcheries for finfish and shrimp. Basic epidemiological analysis (tables and graphs) was created at validator level. New Query has been developed using PHP, HTML, SQL technologies to display total number of samples collected and number of samples found positive for Biological Finfish and Crustaceans. Two web pages are designed for Biological Finfish and Biological Crustaceans for EPI analysis at validator level which can display the total number of samples collected, total number of positive samples for a particular state, pathogen and year.

Description	No of entries
Baseline farmData	12774
Biological-Finfish	3313
Biological- Crustaceans	7316
Biological – Molluscs	266
Disease Outbreaks – Finfish	150
Disease Outbreaks – Crustaceans	975
Disease Outbreaks – Molluscs	18
Baseline Landing Center	144
Baseline data of Finfish Hatcheries	573
Baseline data of Shrimp Hatcheries	243

Fig. 23: Details of NSPAAD centers and baseline, biological and outbreak data entry status

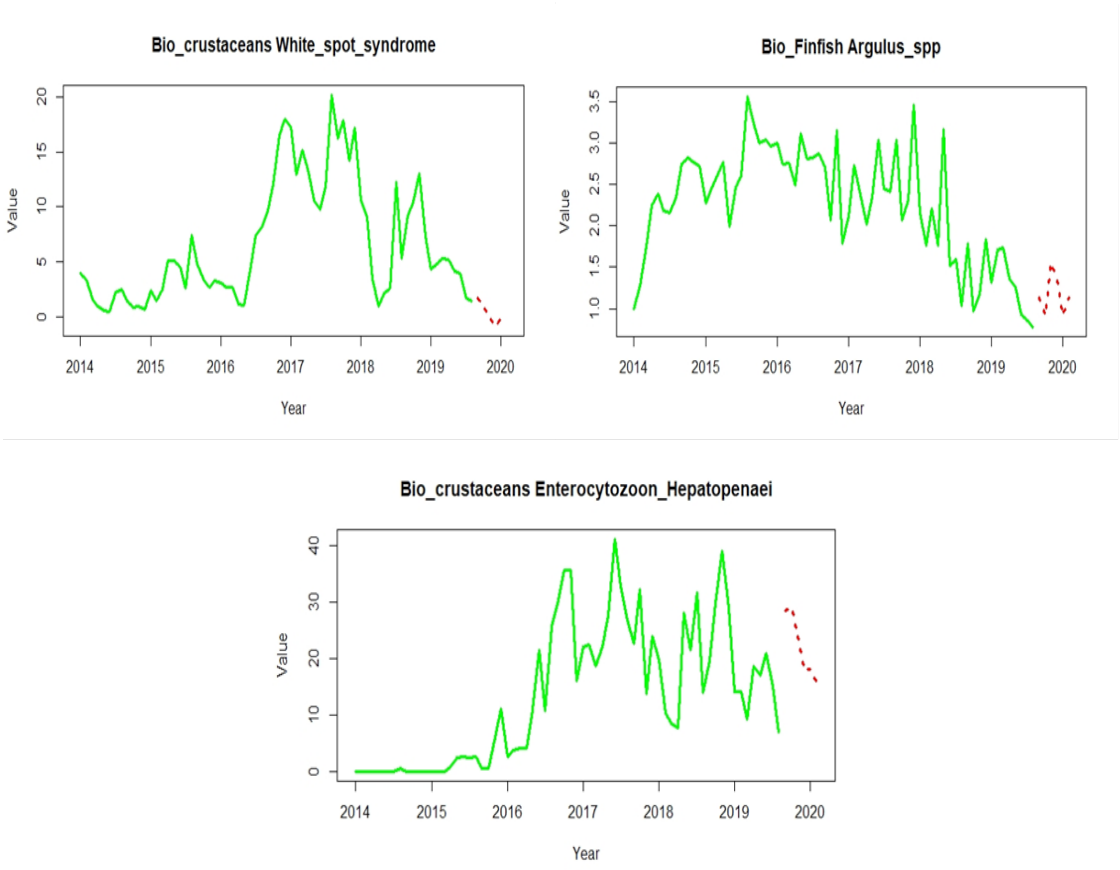


Fig. 24: Prediction of major aquatic animal diseases using NSPAAD database

IPC: ANSCNIVEDISOL201700100079 Project ID: OXX03762

ICMR Project: Development of Recombinant Antigen based Diagnostics for Bovine and Human Leptospirosis

V Balamurugan, M Nagalingam and R Sridevi

This project envisaged to express recombinant protein (s) of pathogenic *Leptospira* in *E. coli* expression system to develop serodiagnostics for human and bovine leptospirosis. The genes of the target proteins (Leptospiral surface adhesion protein and Lipoprotein) were amplified, cloned, expressed and characterized. Latex beads coated with recombinant protein (s) was prepared and assessed its reactivity in Latex Agglutination Test (LAT), initially with panel of standard positive and negative serum followed by hyper immune serum. Further, the test is assessed using field serum samples from cattle with history of abortion or other reproductive disorders and human serum samples with the history of pyrexia. The diagnostic sensitivity and specificity of LAT was assessed in comparison with Microscopic Agglutination Test (MAT). The Bovine LeptoLAT kit is under evaluation/validation for detection of antibodies against *Leptospira* for diagnosis of bovine/ human leptospirosis.

IPC: ANSCNIVEDICOP201700800086 Project ID: OXX04095

ICMR (FAO) Project: To Build Capacity for Integrated Surveillance of Antimicrobial Resistance (AMR) in Pathogen/ commensals in Food Producing Animals, Food of Animal Origin and their Environment and Food-borne Pathogens from Humans

BR Shome, G Govindaraj and P Krishnamoorthy

During the period under report, as per the project plan, eight labs predominately working on AMR in veterinary sector were evaluated for their capacity to undertake the AMR research activities. A common SOP for AST in Veterinary sector was developed and two times blind folded evaluation was carried out by EQAS nodal center, CMC Vellore. Among selected eight centers, ICAR- NIVEDI achieved score ~ 95% and 99%, the highest among all the participating labs. Hands-on training workshop was conducted at CMC Vellore and PGIMER, Chandigarh for staff members from eight centers.

IPC: ANSCNIVEDICOL201900400103 Project ID: OXX04785

Intersectoral Coordination for Prevention and Control of Zoonotic Diseases

Regional Co-ordinator: Parimal Roy & Nodal officer: V Balamurugan

National Institute of Veterinary Epidemiology and Disease Informatics (ICAR-NIVEDI), Bengaluru has been identified as key institute in Southern region working in the field of zoonotic diseases (Brucellosis, Leptospirosis, Anthrax, Rabies, Cysticercosis, Japanese Encephalitis and other viral zoonotic diseases) and involved in Capacity Building, Surveillance & Diagnosis of zoonotic diseases to Strengthen Intersectoral Coordination in the Southern states (Kerala, Karnataka, Telangana and Lakshadweep). Under this programme, NIVEDI undertakes activities such as laboratory support for diagnosis of identified zoonotic diseases; facilitation of the meeting of state zoonosis committees; joint

trainings of medical and veterinary professionals and preparation of relevant IEC materials catering the needs of Karnataka, Kerala, Lakshadweep and Telangana.

The institute organized five-days Capacity building programme on "Hands-on training in laboratory diagnosis of leptospirosis" during 14-18th October, 2019 for the IDSP personnel with a batch of 18 participants represented nine states of the country. A laboratory training manual on 'Laboratory Diagnosis of leptospirosis' and 'Leptospirosis (Rat Fever)-Technical Bulletin' were prepared and provided to the participants.

IPC: ANSCNIVEDISOL201700700085 Project ID: OXX04081

DST Project: Understanding the Genetic Diversity of *Taenia solium* Cysticercosis and Development of Recombinant Antigen based Diagnostic Assays for Serosurveillance

Siju SJ, PP Sengupta, MM Chanda, S Nagarathna and R Yogisharadhya

Porcine cysticercosis caused by metacestode of *T. solium* is a growing concern in developing countries owing to its zoonotic potential. During the reporting period, cysticercus infected pork sample was collected from pig slaughter house. The regions encoding for Internal transcribed spacer 1 (ITS-1) and Cytochrome B (Cyt b) were amplified, cloned and sequenced. Sequence analysis revealed the parasite as *T. solium* and not as *T. asiatica.* Further, six recombinant proteins (Ag1, Ag1V1, Ag2, Ag2V1, TsoL14 and TSOL 10 kDa) of *T.solium* cysticerci were expressed in prokaryotic expression system and purification by affinity chromatography was standardized. In addition, four crude antigens (scolex antigen, cyst fluid antigen, excretory secretory antigen and whole cyst antigen) were extracted from the cyst, quantified and stored. Hyperimmune sera were raised against all the native as well as recombinant antigens and the titre of antibodies was determined by reciprocal dilution in indirect ELISA. Western blot was standardized and confirmed the reactivity of the hyperimmune sera with the respective antigens. Indirect ELISA using native as well as recombinant antigens were standardized.

IPC: ANSCNIVEDISOL201800700097 Project ID: OXX04490

DST- Immuno-epidemiological Characterization of Pig as Amplifying Host of Japanese Encephalitis

J Hiremath, GB Manjunatha Reddy, MM Chanda, SS Patil and SB Shivachandra

Immunoepidemiological characterization of pig as an amplifying host of Japanese encephalitis (JE) is essential to identify the points of intervention to reduce the disease burden in human. The study location was selected based on human JE outbreak data collected from National Vector Borne Disease Control Programme (NVBDCP) and Integrated Disease Surveillance Programme (IDSP) for the period 2013 to 2019. For pigs, the JE seropositive data was collected from published research papers and annual reports. Among the South Indian states, Tamil Nadu reported highest number of JE outbreaks in human followed by Karnataka, Kerala, Telangana and Andhra Pradesh. Within Tamil Nadu, the Villupuram district with high seropositivity in pigs was selected. Additionally, in the reporting year, the RT-PCR, qPCR and ELISA tests for JE screening were standardized and a total of 120 pig serum/blood samples collected/ received from Chhattisgarh (37), Madhya Pradesh (37) and Karnataka (46) were screened by RT-PCR and 11 samples (Chattisgarh-07, Karnataka-04) were found positive.

IPC: ANSCNIVEDISOL201900200102 Project ID: OXX04779

DST- Disease Burden Quantification in Small Ruminants and Impact of Adopting Preventive Interventions on Rural Livestock Farmers in Odisha

G Govindaraj, Gopal Charan Bal, M Nagalingam, V Balamurugan and Siju S Jacob

The project envisages to assess the status of various small ruminant diseases and financial & other associated burden to the sheep and goat rearing farm families in Odisha. Further, the benefits and constraints of preventive (vaccination) and therapeutic (deworming) interventions will be assessed for developing evidence-based policy for mitigating disease burden in small ruminants. The status of sheep and goat diseases in Odisha based on secondary data revealed that major diseases in Odisha were ET, PPR, HS and Anthrax.

DBT-NER Centre for Advanced Animal Diagnosis and Management Consortium (ADMaC)

Project Coordinator: P. Roy

IPC:ANSCNIVEDISOL201400100054 Project ID:OXX01506

Sub Project 1: Surveillance and Molecular analysis of MRSA, MR-CoNS, VRE; ESBL and Carbapenemase producing Gram-negative bacteria in farm animals and the animal handlers and livestock products in NE India

BR Shome, KP Suresh and P Krishnamoorthy

The project aims to characterize and understand the dynamics of the resistance determinants in extended-spectrum β-lactamase (ESBL), AmpC β-lactamase (AmpC) and metallo β-lactamase (MBL) producing *E. coli* strains by molecular approach. In this laboratory-based, cross-sectional study, 300 Gram-negative bacterial isolates were collected from diagnostic and tertiary health-care centers. *E. coli* isolates were identified and confirmed by culture method and *E. coli*-specific mPCR. Out of 203 *E. coli* isolates, β-lactam resistance was observed in 66% of isolates. ESBL-, AmpC-, and MBL-resistance determinants were detected in 59%, 30%, and 12% of isolates, respectively (Table 7). CTXM-IV (48%), CMY (40%), and SIM (38%) were the most prevalent β-lactam-resistant genes identified in *E. coli* strains. The resistant *E. coli* isolates were further characterized by PCR-based plasmid replicon typing and integron assay. Among these isolates, 57% harbored plasmid replicon types with L/M (23%) and Y (19%) as the most dominant replicon types. Integrons were detected in 35% of such isolates with Class 1 and Class 3 representing 53% and 47%, respectively.

The study reveals an increased prevalence of β-lactamase-mediated resistance in *E. coli*. Co-occurrence of resistance genes and mobile genetic elements in a high percentage of isolates is a major concern. To combat the serious threat of antimicrobial resistance, it is imperative to develop strategies for robust surveillance and understand the molecular basis of resistance acquisition and transmission.

Table 7: *E. coli* isolates from various human clinical specimens obtained from various diagnostic centres and their correlation with β-lactam resistance

Specimens	Total No of Gram negative bacterial isolates	Number of *E. coli* isolates	ESBL producers	MBL producers	AmpC producers
KIMS Hospital & RC					
Pus	27	21	9	9	2
Urine	31	23	12	7	3
Sputum	22	12	7	5	0
Fluid	9	4	3	1	0
Blood	11	3	2	1	0
Total	100	63	33	23	5
Gokula Metropolis					
Pus	20	16	7	3	1
Urine	25	23	9	4	2
Sputum	32	19	7	2	1
Fluid	15	10	3	0	0
Blood	8	6	2	0	0
Total	100	74	28	9	4
Kanva Diagnostics					
Pus	25	8	3	3	2
Urine	30	11	7	2	2
Sputum	18	8	5	2	1
Fluid	12	4	2	0	2
Blood	15	2	1	1	0
Total	100	33	18	8	7

IPC:ANSCNIVEDISOL201400200055 Project ID:OXX03176

Sub Project 2: Sero-epidemiological Study of Brucellosis in Livestock in North East Region of India using ELISA and Fluorescent Polarization Assay

R Shome, GB Manjunatha Reddy and R Sridevi

Two serological tests, competitive enzyme linked immune sorbent assay (cELISA) and fluorescence polarization assay (FPA), developed were compared with rose bengal plate test (RBPT), indirect ELISA

(iELISA) and commercial cELISA kit. For test evaluation, 1386 serum samples [apparently healthy animals (n = 260), samples from *Brucella* infected farms (n = 701) and *B. abortus* S19 vaccinated animals (n = 425)] were analyzed to assess suitable diagnostic test in *B. abortus* S19 post vaccinated bovine population. In apparently healthy brucellosis free farms, RBPT, iELISA, in-house FPA and cELISA were found to be highly specific whereas commercial cELISA was more sensitive in infected farms. On further comparison of RBPT, in-house FPA and cELISA in infected farms, the FPA showed sensitivity nearly equal to RBPT and in-house cELISA showed greater sensitivity. In animals with persistent vaccinal antibodies, only in-house FPA and cELISA recorded higher specificity of 88.0 and 90.59%, respectively (Table 8). With these findings, RBPT, iELISA and cELISA are suggested for screening infected herds, and in-house developed FPA and cELISA tests can be used for confirmatory diagnosis of brucellosis in *B. abortus* S19 post vaccinated animal populations.

Table 8 : Evaluation of assay specificity using the samples from brucellosis vaccinated cattle farms (n=425)

Diagnostic test	Number of positives	Percentage positivity (%)	Diagnostic specificity
RBPT and iELISA and either RBPT/ iELISA	411	96.70	3.30
RBPT	381	89.64	10.36
iELISA	351	82.58	17.42
Commercial cELISA	215	50.58	49.42
In-house FPA	51	12.00	88.00
In-house cELISA	40	9.41	90.59

IPC:ANSCNIVEDISOL201400300056 Project ID:OXX03175

Sub Project 3: Epidemiological Study of Classical Swine Fever (CSF), Porcine Reproductive and Respiratory Syndrome (PRRS) and Porcine Torqueteno (TTV) in Pigs in North East (NE) Region of India

D Hemadri and SS Patil

A total of 193 pig serum samples from Mizoram were screened for the detection of antibodies against the CSF by Priocheck indirect ELISA kit and 12 (6.21%) samples were positive. A total of nine samples (serum (n=4) and tissue (n=5)) from Mizoram were subjected to virus isolation and all the nine samples found negative for CSFV by RT-PCR using 5' UTR. Out of 33 samples (serum (n=25), blood (n=5), tissue (n=3)) from Karnataka, Goa and Maharashtra, two samples from Karnataka were found positive for CSFV infection by single step RT-PCR.

Sub Project 4: Development of Infectious Disease Information System (IDIS) and Risk Assessment Models for Transboundary Animal Diseases (TAD) & other Emerging Livestock Diseases in NE Region of India

KP Suresh, D Hemadri, SS Patil and P Roy

Disease status maps were developed and classified based on North-East India's agro-climatic zones. Grids were created using R software for the North-Eastern states and the livestock data for 2018 was projected for each state. Disease modeling, risk mapping, and suitability mapping were done (Fig. 25 & 26) for the 13 livestock diseases. LST and NDVI play a significant role in the occurrence of diseases and it was found that LST value ranging from 24.16 °C to 28.52 °C has contributed to 97 % (293 out of 302) disease outbreaks. Meanwhile, NDVI values ranging from 0.43 to 0.71 (moderate to dense vegetation) has contributed to 92.38 % (279 out of 302) disease outbreaks. It is noteworthy that, the ratio of NDVI over LST values ranging from 0.020 to 0.040 has induced 70.86 % (214 out of 302) disease outbreaks. The NER LDF Mobile App developed earlier was improved and updated.

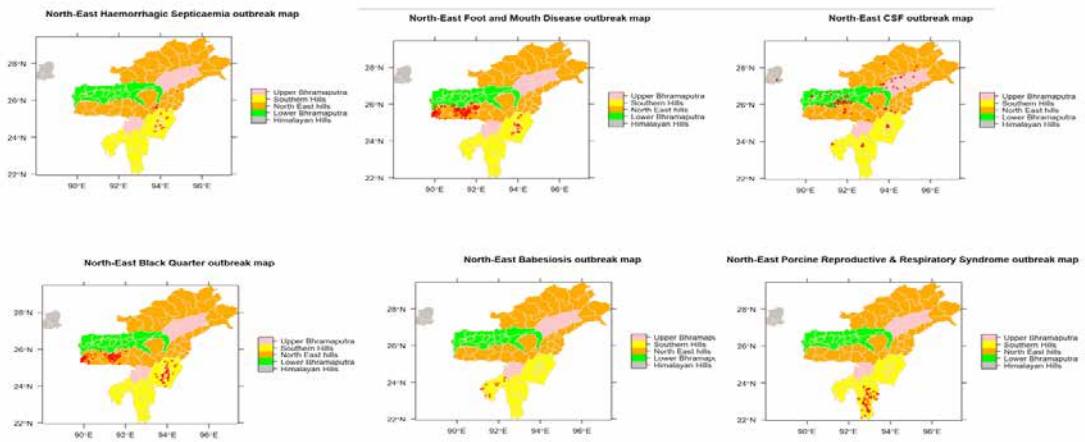


Fig. 25: Livestock disease maps in different agro-climatic regions of NER

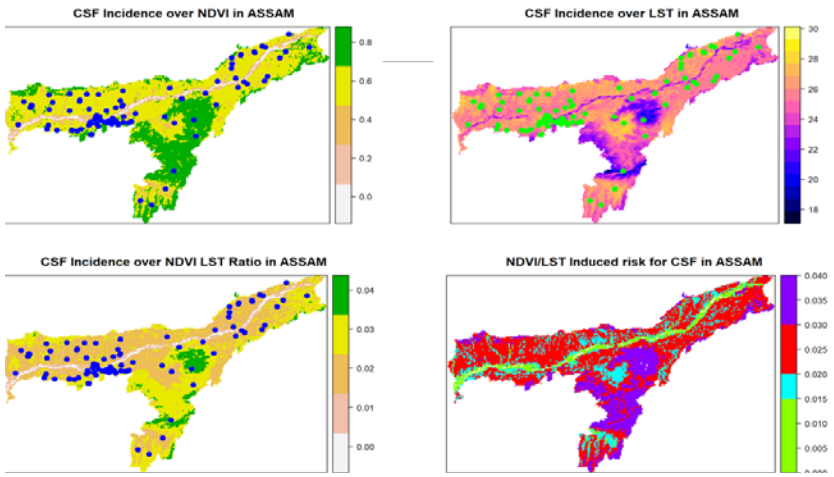


Fig. 26: Suitability map of classical swine fever under the cover of vegetation and temperature in Assam

IPC:ANSCNIVEDICOL201700100078 Project ID: OXX03736

DBT-NER Project: Molecular and Sero-Diagnosis of Surra in Livestock in North Eastern States of India

PP Sengupta, Siju SJ, S Borthakur, G Patra, K Sarma and FA Ahmed

Surra caused by *Trypanosoma evansi* is a wasting disease with wide host range causing significant economic loss to the livestock industry. As the routine parasitological methods are not sensitive, molecular methods like indirect ELISA and PCR are employed to diagnose infection in carrier animals. During this period, a total of 833 blood samples from Assam, Mizoram and Tripura (Table 9) were screened for the presence of *T. evansi* by PCR targeting Variable Surface Glycoprotein gene which revealed 178 (42.5%), 116 (35.6%), 18 (38.29%) and 12 (27.9%) of cattle, pig, dog and goat as positive. Higher prevalence of *T. evansi* infection in North Eastern Region of India demands better disease control strategies along with vector control measures. One Indirect ELISA test for serosurveillance of surra was validated at ICAR-IVRI, Izatnagar during this period.

Table 9: Samples screened for *T. evansi* by PCR in different North Eastern States of India

State	Number of samples screened	Number of positive samples	Percentage (%)
Mizoram	410	163	39.75
Assam	332	124	37.34
Tripura	91	37	40.65
Total	883	324	38.9

IPC: ANSCNIVEDICOP201800400094 Project ID: OXX04444

DBT-NER Project: Molecular Platform for Epidemiology, Disease Mapping and Development of Diagnostics for Economically Important Diseases of Ducks

SS Patil, KP Suresh, PP Sengupta and P Roy

The district level duck disease outbreak data in NER was collected for the period 2012-2019 and incidence maps were generated using R software. Among the NER states, Tripura reported the maximum occurrence of the disease. Meta-analysis based on 74 studies on duck diseases revealed a world-wide prevalence of 25% (Campylobacteria, DHAV, Duck Tembusu Virus, NDV, Salmonella, WNV), with I^2 = 100% and τ^2 = 2.7689 and 17% in India (Duck Plague, Duck Virus Enteritis, Avian Influenza, WNV and JE) with I^2 = 100% and τ^2 =3.7604.

IPC: ANSCNIVEDICOP201900200101 Project ID: OXX04635

ICAR-ILRI: Assessment of the economic impact of priority animal diseases and the cost-effectiveness of their control strategies in India- A PPR survey

G Govindaraj and V Balamurugan

The project envisages to quantify the direct and indirect impact of priority animal diseases in India and provide the insights of economic and non-economic effects. The project focus on three important priority animal diseases *viz*, PPR, HS and Brucellosis. In the initial years the focus is on PPR in small ruminants and further would be extended to HS and Brucellosis. Besides the impact on production parameters the project considers the disease effect on decisions made by other actors in the entire value chain through systems dynamic modeling approach. During the reported period, a workshop on conducting participatory sessions to collect and triangulate data from various stakeholders for Systems Dynamics Model building was organized by ILRI. The survey instruments for various value chain actors in the PPR value chain were developed and pilot tested. The main survey to assess the impact of PPR has been initiated in Anantapur, Andhra Pradesh.

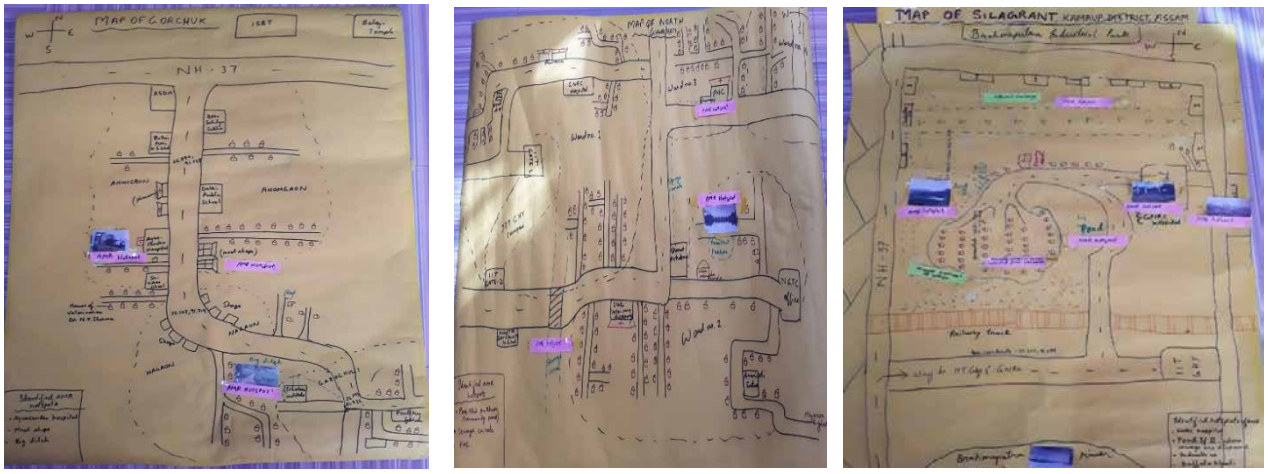
IPC: ANSCNIVEDICOP201800800098 Project ID: OXX04457

Does Antimicrobial Resistance (AMR) in Livestock Contribute to AMR in People in NE India? An Interdisciplinary Study Investigating Antibiotic Use, Drivers of AMR, and Transmission Dynamics

BR Shome, G Govindaraj, P Krishnamoorthy, M Nagalingam, V Balamurugan, R Sridevi and R Yogisharadhya

During the period under report, a total of 256 isolates received from the project partners from India covering animal, foods of animal origin, aquaculture, environment and human hospital settings were sequenced using WGS approach. The preliminary analysis of results revealed *S. aureus* ST 772 is epidemiologically important in animal and aquaculture as in human. Further, *E. coli* ST131 was identified as epidemiologically important in Indian context in One-health environment. A total of 102 samples from three selected sites Silagrant (n=35), Garchuk (n=32) and NGTC wards (n=35) in Guwahati were collected. On subjecting the samples for isolation 168 Gram positive and 152 Gram negative bacterial isolates were obtained and subjected to Antimicrobial susceptibility testing (ABST) using automated BD-Phoenix (M-50) ID and AST system. ABST profile for Gram positive bacteria showed 97% of *Staphylococcus* isolates from NGTC resistant to penicillin followed by Silagrant (76.9%) and Garchuk (59%). Similarly, resistance to cefoxitin among *Staphylococci* were 55% in Garchuk followed by 34% in Silagrant and 20% in NGTC. ABST profile for Gram negative bacteria showed 92.3% of the *Klebsiella* isolates from Garchuk, 84.3% from NGTC and 72.7% from Silagrant, whereas, the 20% of *E. coli* isolates from Garchuk, 11% from Silagrant and 9% from NGTC resistant to ampicillin. Further, *Klebsiella* isolates were also resistant to amoxicillin clavulanate in NGTC (46%), Garchuk (31%) and Silagrant (18.2%). First sampling AST data analysis reveals no significant difference in resistant bacteria in the three sites. However, depending on the classes of antibiotics, variations among the sites were observed.

The social science component of the project aims to record the use of antibiotics on farms, and to investigate the human behavioral and animal health factors that influence antibiotic use in Guwahati, Assam. Three sites in Guwahati viz., Silagranth, North Guwahati Town Committee (NGTC) and Garchuk were selected for implementing the project activities and hypothesized as high, medium and low category respectively based on the possible AMR risk level. A transect walk was conducted with different stakeholders in the selected sites and maps were prepared with details of resources, stakeholders and possible AMR hotspots (Fig. 27). The socio-demographic characteristics of the selected sites were collected from primary and secondary sources and this data will be the basis for planning the future survey. Focused Group Discussion (FGD) was conducted in selected sites and various issues like knowledge on animal diseases, treatment practices, antimicrobial use and AMR were discussed and documented.



Garchuk (Low risk) NGTC (Medium risk) Silagranth (High risk)

Fig. 27: Transect map representing possible AMR hot spots with various risk levels

IPC: ANSCNIVEDISOL201800100091 Project ID:OXX03929

CDC Project: Countrywide Surveillance for Anthrax in Livestock and Mastitis in Cattle for Protecting and Improving Health Globally: Building and Strengthening Public Health Impact, Systems, Capacity

BR Shome, R Shome, G Govindaraj, P Krishnamoorthy, M Nagalingam and R Yogisharadhya (Mastitis component)
D Hemadri, SB Shivachandra, MM Chanda and J Hiremath (Anthrax component)

Mastitis:

Out of 180 dairy farmers surveyed in Assam, 97% were aware of mastitis and only 14% were aware about subclinical mastitis. The detection of sub clinical mastitis by CMT for the surveyed five study sites in Assam ranged from 35-66%. A total of 587 milk samples from cows, 49 hand swabs and 43 nasal swabs from animal handlers were collected and processed in the laboratory. On screening 538 milk samples for antibiotic residues by spore-based test (a qualitative test), 156 samples (29%) showed presence of antibiotic residues. These contaminated samples were further processed for quantitative detection by charm ROSA test, for six antibiotics only. Out of 156 samples, 103 samples (66%) were found containing one or

more of the six antibiotics. Out of 96 Gram positive isolates tested from Assam, high antibiotic resistance was observed against ampicillin (64%) and penicillin (48%). Out of 32 Gram negative isolates tested, high antibiotic resistance was observed against ampicillin (90%), amoxicillin clavulanate (20%) and tetracycline (7%). Phenotypic confirmatory test for extended-spectrum β-lactamase (ESBL)/ AmpC β-lactamase (AmpC) producing gram negative isolates comprised of 13% and 3%, respectively.

Out of 211 dairy farmers surveyed in Karnataka, 98% were aware of mastitis and only 11.3% were aware about subclinical mastitis. The detection level of mastitis in Karnataka ranged from 43-64% by CMT. A total of 382 milk samples from cows, 109 each of animal handlers' hand swabs and nasal swabs, 27 milking machine swabs were collected and processed in the laboratory. On screening the milk samples by spore-based test, 92 samples (24.21%) showed presence of antibiotic residues. Out of 92 positive samples, 79 samples (86%) were found containing one or more of six antibiotics. Out of 372 Gram positive isolates tested, high antibiotic resistance was observed against ampicillin (57%) and penicillin (55%). Out of 232 Gram negative isolates tested, high antibiotic resistance was observed against ampicillin (54%), amoxicillin clavulanate (35%) and tetracycline (12%). Phenotypic confirmatory test for extended-spectrum β-lactamase (ESBL)/ AmpC β-lactamase (AmpC)/Metallo β-lactamase (MBL) producing gram negative isolates comprised of 40%, 23% and 4.4%, respectively. The Genotypic identification of Gram-positive and Gram-negative isolates obtained from samples collected in Assam and Karnataka is depicted in table 10.

Table 10: Details of isolates obtained from samples collected in Assam and Karnataka

Categories	Assam2	Karnataka
Gram Positive isolates	148 (62% from milk samples, 14% from animal handlers' hand swab and 20% from animal handlers' nasal swab)	455 (53% from milk samples, 5% from milking machine swab, 22% from animal handlers' hand swab and 20% from animal handlers' nasal swab)
multiplex-PCR results	*S. epidermidis* (33%), *S. aureus* (11%), *S. sciuri* (11%), *S. haemolyticus* (8%), *S. chromogenes* (3%), and other CoNS (34%).	*S. aureus* (25%), *S. epidermidis* (25%), *S. chromogenes* (10%), *S. sciuri* (3%), *S. haemolyticus* (2%), *S. hominis* (0.4%), *S. saprophyticus* (0.2%), *Enterococcus faecalis* (0.2%) and other CoNS (34%).
mecA positive isolates	33 (12% from milk samples, 2% from animal handlers' hand swab and 8% from animal handlers' nasal swab).	52 (4.4% from milk, 0.43% from milking machine swab, 3% from Animal handlers' hand swab and 3.5% from Animal handlers' nasal swab)
Gram Negative isolates	43 (70% from milk, 28% from animal handlers' hand swab, 2% from animal handlers' nasal swab).	268 (58% from milk, 5% from milking machine swab 25% from animal handlers' hand swab, 11% from animal handlers' nasal swab).
E. coli and *Klebsiella* species specific PCR	*Klebsiella pneumonia* (16%), *K. oxytoca* (5%), *Klebsiella* sp. (56%) and other Gram-negative bacteria (23%).	*Klebsiella pneumonia* (3%), *Klebsiella sp.* (23%), *E. coli* (14%) and other Gram-negative bacteria (60%).

Anthrax:

During the year 2019, 50 clinical samples received/ collected from Odisha (n=29), Chhattisgarh (n=10), Gujarat (n=5) and Jharkhand (n=6) were screened for the presence of anthrax bacilli by PCR and isolation and of which one sample was found positive. A meeting of all the stakeholders to develop framework for anthrax surveillance, prevention and control was organized during 26-27th June 2019 at Bhubaneswar, Odisha. The idea of the meeting was to integrate the discrete anthrax control and prevention measures and put them under a framework, so that issues related to anthrax outbreaks could be addressed in holistic way by multiple stakeholders including health, animal husbandry, environment, wildlife and other institutions/ agencies. A total of 32 professionals representing both medical and veterinary departments, colleges, research institutes and center for disease control and prevention (CDC) have participated in the meeting. Technical discussions centered on the existing anthrax situation, surveillance mechanisms, and outbreak response and laboratory diagnostic capacity in the state of Odisha. There were also discussion on improving inter-sectoral collaboration on anthrax surveillance and control. It was decided during the meeting to provide a formal framework as well as guidelines in establishing surveillance, epi-lab strengthening and inter-sectoral communication. Surveillance activity in Koraput district was taken up during the year.

IPC:ANSCNIVEDICOP201701200090 Project ID:OXX04123

MRC-UK Project: Optimising Forest Benefits whilst Minimising Impacts of Emerging Zoonotic Diseases: Co-developing an Interdisciplinary Tool for Forests in India

MM Chanda

During the period under report, tick samples were collected from Shivamogga (Karnataka) and Wayanad (Kerala) districts. Tick samples were collected from environment, rodents, cattle and cattle shed. Morphological and molecular identification of ticks was carried out. Of 1637 tick samples, major genus identified were *Haemaphysalis* spp, *Rhipicephalus* spp, *Amblyomma* spp and *Ixodes* spp (Fig. 28). RNA extraction was carried out from 847 samples. For questionnaire-based risk factor identification, 42 households were surveyed in Shivamogga district using the structured questionnaires. In addition, 11 households were surveyed at KFD positives villages.

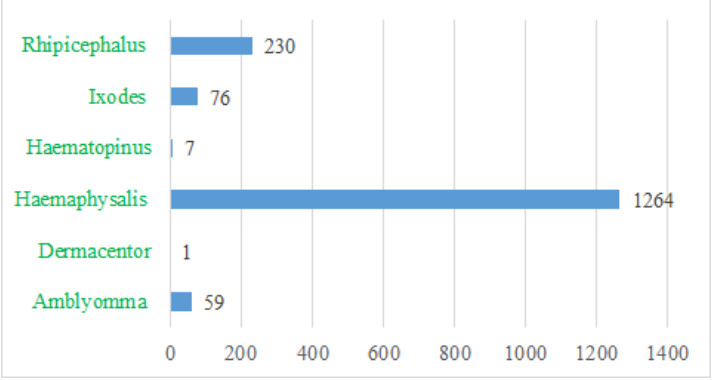


Fig. 28: Morphological identification of the tick samples collected from Shivamogga and Wayanad

RKVY-RAFTAAR Agri-Business Incubator (ABI)

SB Shivachandra, GB Manjunatha Reddy and R Yogishardhya

NIVEDI Agri-Business Incubation Centre (NaaViC) for animal husbandry and veterinary services, was established in February, 2019, under the financial assistance from RKVY-RAFTAAR Scheme of Department of Agriculture, Cooperation and Farmers Welfare (DAC&FW) under Ministry of Agriculture and Farmers Welfare, Government of India, with an objective to promote entrepreneurship in agriculture and allied sector. Under the programme, initiative to set up NaaViC office and incubation space entrepreneurs were taken up and established within the existing infrastructure of ICAR-NIVEDI. Two flagship programmes were launched under the scheme, Agripreneurship orientation programme; NEO (Nurturing Entrepreneurs through Orientation) and Startup agribusiness incubation programme; NEST (Nurturing Entrepreneurs through Sustainable Technologies). The first call for agripreneurship program was launched on 3rd July 2019, and a total of 208 applications were received under NEO (n=94) and NEST (n=114) programme. After multi-level screening and evaluation of business proposals by R-ABI implementation committee (RIC), a total of 12 proposals under NEO and 13 proposals under NEST were selected for two months long residency training programme. Upon completion of residency programme, a final pitch day was organized and a total of six and nine proposals were recommended for grant-in-aid under NEO and NEST programmes, respectively. Second call for agripreneurship program was launched on 1st November 2019 and proposals are currently under screening. In order to promote the NaaViC, various programmes such as boot camps/awareness programmes (15) in various veterinary/agriculture/fisheries institutes and networking with research institutes (40) was done. Further, news letter, leaflet, posters, handouts on NaaViC activities were brought out. Online social media platforms such as facebook, twitter, linkedin etc., were also used to disseminate the information about the activities of NaaViC.

Inauguration of NaaViC, Agri-Business Incubation Centre at ICAR-NIVEDI

Mera Gaon Mere Gaurav (MGMG)

During the period reported upon, MGMG programme was implemented in the identified villages in Bangalore rural district, Karnataka. The important activities undertaken under this programme includes general village visit by scientists, interaction with farmers and interaction with school children and teachers. During the interface meeting, the important livestock diseases and farm management practices to mitigate the disease incidence were highlighted. Further, in various MGMG villages, awareness on single use plastic and swachhata activities were created through video screening, banner display, and by organizing quiz competition to school children. Awareness on the importance of maintaining personal hygiene were also highlighted to the school children.

Swachh Bharath Abhiyan

Swachhta Pakhwada action plan and guidelines issued by the council are performed as per the instructions by ICAR-NIVEDI very enthusiastically with zeal. During 2019, two *Swachhta Pakhwara* were observed (11th September to 2nd October 2019 and 16 to 31st December 2019). *Swachhta* pledge was administered to all the staff of ICAR-NIVEDI. As part of *Swachhta Hi Seva* from 11th September to 2nd October 2019, committees were constituted to list the possible alternatives to single use plastic items in different laboratories. To create awareness among NIVEDI staff and school children about plastic waste management, pamphlets were prepared in English and translated in Hindi and Kannada for distribution in schools and villages. Further, MGMG team of ICAR-NIVEDI visited Government Primary School, Nagadasanhalli village and created awareness on avoiding use of single use plastics and Swachh Bharat activities. Also appraised school children about how Mahatma Gandhiji was particular about *Swachhta* around homes and environment.

As part of *Swachhta Pakhwara* 16 to 31st December 2019 S*wachhta* pledge was administered to all the staff of ICAR-NIVEDI and regular cleaning of the office, stores and labs were carried out. Degradable and non-degradable wastes are segregated and disposed. As part of e-office goal, all purchase (391 orders, with overall rating of 4.36) has been made through GeM and ICAR-NIVEDI have been flagged as a red buyer. Further, weeding out of old records was carried out. A lecture on waste management practices followed in NIVEDI was delivered by Dr. Jagadish Hiremath, Senior Scientist, ICAR-NIVEDI. He has presented the scenario of waste management practices followed in Bengaluru and narrated the I and WE theory exist in the mind of people, which, if changed from "I" to "WE", i.e. treating broader brotherhood and common welfare of the people, then the better waste management will be achieved in a sustainable way.

Kisan Diwas was celebrated on 23rd December 2019 commemorating the birth anniversary of the Late Chaudary Charan Singh, Former Prime Minister of India. The highlight of the program was that the animal disease diagnostic and forewarning services available with the institute were communicated to the farming community in Kannada language. The Director also briefed about the various schemes and programs of Government of India related to the farmers. He also emphasized on the GoI efforts in doubling the farmer's income 2020.

Swachhta Hi Seva (11th September – 2nd October 2019)- Creating awareness about Single use plastic

Scheduled Caste Sub-Plan (SCSP): 2019

SCSP programme was implemented in villages of Kolar district of Karnataka. The major activities were distribution of insecticide sprayers, milking machines and chaff cutter to the farmers. Additionally, screening of serum samples from livestocks of SC beneficiaries for diseases of economic importance was also carried out. Part of the programme was also implemented through six centers of AICRP on ADMAS.

The programme was also implemented in Veeradimmanahalli village, Challakere Taluk, Chithradurga district during 2019. ICAR-NIVEDI team in consulatation with Assistant Director, KSWDCL, local Veterinary Officer and Gram Panchayat members prepared a detailed project report for implementation. Around 62 SC farmers from Veeradimmanahalli village were selected as beneficieries.

Biosafety Laboratory Facility

ICAR-NIVEDI has state of art containment facility which is biosafety level 2++ category. It supports major research activities of the institute. Being a unique facility in the country, annually number of people visit laboratory for various purposes (Table 11). The biosafety unit of the institute is instrumental in operation and maintenance of the laboratory. The expertise gained in the area of laboratory operation and maintenance, laboratory biosafety and biosecurity practices over the years has also been offered in the form of advice, exposure visits to the laboratory, technical inputs, budget etc., required to establish and run new facility at state and national levels. The capacity building/trainings in the area of laboratory biosafety and biosecurity are been carried out regularly at institute, state, national and international level. The notable training in 2019 was SAARC Regional Training on "*Laboratory Biosafety and Biosecurity for Handling Transboundary Animal Diseases and Zoonotic Emerging Pathogens*" in which 13 participants representing six SAARC member countries participated (Fig. 29).

A team from Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala visited BSL2++ laboratory at ICAR-NIVEDI to get necessary inputs to plan the construction of biocontainment facility in Kerala. The esteemed members of RAC, IMC and IBSC visited the BSL2++ during reporting year and provided their valuable suggestions. The faculty trainees from Institute of Animal Health and Veterinary Biologicals (IAH&VB), Hebbal, Bengaluru visited the laboratory facility and had orientation lecture on agent classification (Fig. 30). NCDC sponsored 16 trainees from both medical and veterinary health profession

were exposed to various aspects of BSL2++ laboratory. A team of fisheries scientists from ICAR-CIFA also visited to observe the biosafety practices at BSL2++ laboratory. The quarterly, six monthly and annual maintenance works with ETP, RO, HVAC, BMS and Chiller were carried out as per the recommended schedules.

Table 11: Number and nature of visitors visited BSL2++ during 2019

Visitors	Number
National Visitors	247
International visitors	12
Service Engineers	46
New research professional	33

Fig. 29: Sensitisation of trainees from SAARC countries about plan and safety requirements for BSL2++

Fig. 30: Exposure visit of faculty trainees from IAH&VB, Bengaluru

Publications

Peer Reviewed Journals

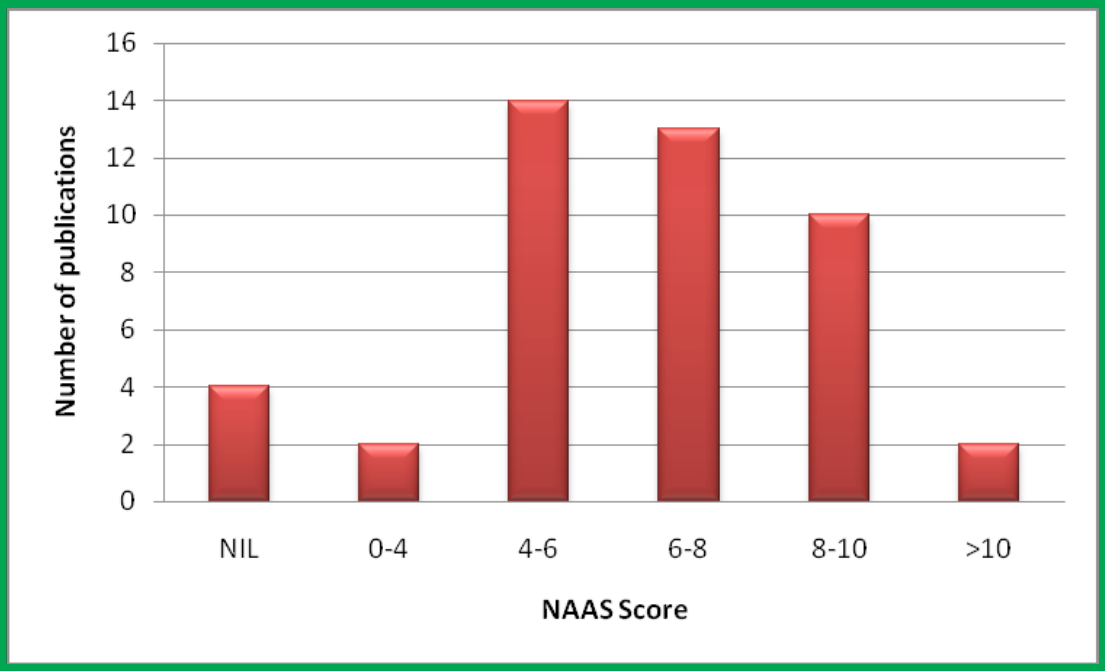
Sl. No	Publications	NAAS score
	Institute research publications	
1.	Anusha A, Thirumalesh SRA, Kumari SS, Kumar KV, Roy P and Balamurugan V. (2019). Seroprevalence and distribution of serogroup-specific pathogenic *Leptospira* antibodies in cattle and buffaloes in the state of Andhra Pradesh, India. Veterinary World. 12: 1212-1217. http://krishi.icar.gov.in/jspui/handle/123456789/35405	5.71
2.	Balamurugan V, Bibitha V, Muthuchelvan D, Sowjanya SK, Vinod KK, Suresh KP, Govindaraj G, Sunder J, Hemadri D and Roy P. (2019). Cross-sectional seroprevalence study of peste des petits ruminants in Andaman and Nicobar Islands, India. Small Ruminant Research. 178: 111-116. http://krishi.icar.gov.in/jspui/handle/123456789/35385	6.97
3.	Balamurugan V, Govindaraj G, Sowjanya KS, Nagalingam M, Tapase J, Manjunatha Reddy GB and Rahman H. (2019). Score-card method for assessing the severity of peste des petits ruminants in sheep and goats. Virus Disease. 30: 574-578. http://krishi.icar.gov.in/jspui/handle/123456789/35406.	5.90
4.	Govindaraj G, Roy G, Mohanty BS, Balamurugan V, Pandey AK, Sharma V, Patel A, Mehra M, Pandey SK and Roy P. (2019). Evaluation of effectiveness of mass vaccination campaign against peste des petits ruminants in Chhattisgarh state, India. Transboundary and Emerging Disease. doi: 10.1111/tbed.13163. http://krishi.icar.gov.in/jspui/handle/123456789/19843	9.50
5.	Krishnamoorthy P, Ashwini M, Suresh KP, Siju SJ and Roy P. (2019). Prevalence of *Anaplasma* species in India and the World in dairy animals: A systematic review and meta-analysis. Research in Veterinary Science. 123: 159-170. http://krishi.icar.gov.in/jspui/handle/123456789/16697	7.62
6.	Krishnamoorthy P, Hamsapriya S, Ashwini M, Patil SS, Roy P and Suresh KP. (2019). Systematic review and meta-analysis of livestock associated-methicillin resistant *Staphylococcus aureus* (LA-MRSA) prevalence in animals in India. International Journal of Livestock Research. 9: 179-191. http://krishi.icar.gov.in/jspui/handle/123456789/17884	5.36
7.	Krishnamoorthy P, Kurli R, Patil SS, Roy P and Suresh KP. (2019). Trends and future prediction of livestock diseases outbreaks by periodic regression analysis. Indian Journal of Animal Sciences. 89: 369-376. http://krishi.icar.gov.in/jspui/handle/123456789/18778	6.28
8.	Mitra SD, Ganaie F, Velu KBD, Mani B, Vasudevan M, Shome R, Rahman H, Ghosh SK and Shome BR. (2019). Genome-wide analysis of mammary gland shows modulation of transcriptome landscape with alternative splice variants in *Staphylococcus aureus* mastitis in mice. Gene. 1442781. http://krishi.icar.gov.in/jspui/handle/123456789/35390	8.50
9.	Mohanty NN, Shivachandra SB, Biswas SK, Nagaraj V, Basheer TJ, Narendra BD, Yogisharadhya R and Hemadri D. (2019). An efficient production of hybrid recombinant protein comprising non-structural proteins (NS1 & NS3) of bluetongue virus in prokaryotic expression system. Protein Expression and Purification. 155: 15-20. http://krishi.icar.gov.in/jspui/handle/1234567 89/19869	7.34

10.	Phani Kashyap S, Hiremath J, Subramanyam S, Patil S, Roy P and Hemadri D. (2019). PCR-based Baseline survey indicates widespread prevalence of Porcine Reproductive and Respiratory Syndrome (PRRS) in India. Indian Journal of Comparative Microbiology, Immunology and Infectious Disease. 40: 99-102. http://krishi.icar.gov.in/jspui/handle/123456789/36896	4.49
11.	Sengupta PP, Rudramurthy GR, Ligi M, Siju SJ, Rahman H and Roy P. (2019). Development of an antigen ELISA using monoclonal antibodies against recombinant VSG for the detection of active infections of *Trypanosoma evansi* in animals. Veterinary Parasitology. 266: 63–66. http://krishi.icar.gov.in/jspui/handle/123456789/19877	8.42
12.	Shome R, Triveni K, Swati S, Ranjitha S, Krithiga N, Shome BR, Nagalingam M, Rahman H and Barbuddhe SB. (2019). Spatial seroprevalence of bovine brucellosis in India—A large random sampling survey. Comparative Immunology, Microbiology and Infectious Diseases. 65: 124-127. http://krishi.icar.gov.in/jspui/handle/123456789/35407	7.87
13.	Tewari R, Mitra SD, Ganaie F, Das S, Chakraborty A, Venugopal N, Shome R, Rahman H and Shome BR. (2019). Dissemination and characterisation of *Escherichia coli* producing extended-spectrum β-lactamases, AmpC β-lactamases and metallo-β-lactamases from livestock and poultry in Northeast India: A molecular surveillance approach. Journal of Global Antimicrobial Resistance. 17: 209-215. http://krishi.icar.gov.in/jspui/handle/123456789/19900	8.02
14.	Venugopal N, Mitra SD, Tewari R, Ganaie F, Shome R, Rahman H and Shome BR. (2019). Molecular detection and typing of methicillin-resistant *Staphylococcus aureus* and methicillin-resistant coagulase-negative *Staphylococci* isolated from cattle, animal handlers, and their environment from Karnataka, Southern Province of India. Veterinary World. 12: 1760-1768. http://krishi.icar.gov.in/jspui/handle/123456789/35404	5.71
	Collaborative research publications	
15.	Akshata SA, Suguna R, Satyanarayana ML, Narayanaswamy HD, Byregowda SM and Manjunatha Reddy GB. (2019). Effect of methotrexate induced oxidative stress in the liver of wistar albino rats. International Journal of Science, Environment and Technology. 8: 840-844. http://krishi.icar.gov.in/jspui/handle/123456789/35394	3.98
16.	Akshata SA, Suguna R, Satyanarayana ML, Narayanaswamy HD, Byregowda SM and Manjunatha Reddy GB. (2019). Effect of zinc oxide nanoparticles (ZnO NP) on antioxidant status of methotrexate (MTX) induced toxicity in wistar albino rats. International Journal of Current Microbiology and Applied Sciences. 8: 169-178. doi: https://doi.org/10.20546/ijcmas.2019.810.017. http://krishi.icar.gov.in/jspui/handle/123456789/35395	5.38
17.	Chamuah JK, Siju SJ, Lalchamliani and Borkotoky D. (2019). Cystic echinococcosis: Current scenario and future prospective. International Journal of Current Microbiology and Applied Sciences. 8:1546-1551. http://krishi.icar.gov.in/jspui/handle/123456789/35399	5.38
18.	Chamuah JK, Borkotoky D, Amenti, Khate K, Siju SJ, Lalchamliani, Raina OK, Khan MH and Mitra A. (2019). Molecular characterization and histopathological studies on *Fasciola gigantica* in Mithun (*Bos frontalis*). Indian Journal of Animal Research. https://doi.org/10.18805/ijar.B-3856. http://krishi.icar.gov.in/jspui/handle/123456789/35400	6.20
19.	Chanda MM, Carpenter S, Prasad G, Sedda L, Henrys PA, Gajendragad MR and Purse BV. (2019). Livestock host composition rather than land use or climate explains spatial patterns in bluetongue disease in South India. Scientific Reports. 9: 4229. http://krishi.icar.gov.in/jspui/handle/ 123456789/19868	10.12

20.	De A, Das TK, Chand K, Debnath BC, Dey S, Hemadri D, Barman NN, Chaudhary JK, Muthuchelvan D, Saxena A, Tewari N, Chauhan A, Lohumi A and Biswas SK. (2019). Seroprevalence of bluetongue and presence of viral antigen and type-specific neutralizing antibodies in goats in Tripura, a state at Indo-Bangladesh border of northeastern India. Tropical Animal Health and Production. 51: 261-265. http://krishi.icar.gov.in/jspui/handle/123456789/19835	6.98
21.	Hoque J, Ghosh S, Krishnamoorthy P and Haldar J. (2019). Charge-switchable polymeric coating kills bacteria and prevents biofilm formation *in vivo*. ACS Applied Materials and Interfaces, 11: 39150-39162. http://krishi.icar.gov.in/jspui/handle/123456789/23108	14.10
22.	Jacquot M, Rao PP, Yadav S, Nomikou K, Maan S, Jyothi YK, Reddy N, Putty K, Hemadri D, Singh KP, Maan NS, Hegde NR, Mertens P and Biek R. (2019). Contrasting selective patterns across the segmented genome of bluetongue virus in a global reassortment hot spot. Virus Evolution, 5: vez027. http://krishi.icar.gov.in/jspui/handle/123456789/36865	-
23.	Kalleshamurthy T, Yaranna C, Shekar R, Natesan K, Sahay S, Shome BR, Rahman H, Barbuddhe SK, Barman NN, Das SK and Shome R. (2019). Fluorescence polarization assay: Diagnostic evaluation for porcine brucellosis. Journal of Microbiological Methods. 156: 46-51. http://krishi.icar.gov.in/jspui/handle/123456789/19848	7.70
24.	Krishnamoorthy P, Satyanarayana ML, Shome BR and Roy P. (2019). Immunophenotyping and cytokine gene expression in experimental intra-mammary infection with staphylococcal species in mice. Indian Journal of Animal Sciences, 89: 479-484. http://krishi.icar.gov.in/jspui/handle/123456789/19822	6.28
25.	Lavanya KV, Puttalakshmamma GC, Dhanalakshmi H, Ananda KJ, Mohan HV, Yathish HM and Manjunatha Reddy GB. (2019). Prevalence and molecular phylogenetic analysis of *Babesia vogeli* from dogs in Karnataka. Indian Journal of Veterinary Pathology. 43: 104-108. http://krishi.icar.gov.in/jspui/handle/123456789/35396	5.48
26.	Lavanya KV, Puttalakshmamma GC, Yogisharadhya R, Mohan HV, Lakkundi JN and Manjunatha Reddy GB. (2019). Development of Cytochrome b based PCR and epidemiology of *B. gibsoni* in dogs. Journal of Experimental Biology and Agricultural Sciences. 7: 411-417. http://krishi.icar.gov.in/jspui/handle/123456789/35397	5.07
27.	Lindahl JF, Vrentas CE, Deka RP, Hazarika RA, Rahman H, Bambal RG, Bedi JS, Bhattacharya C, Chaduhuri P, Fairoze NM, Gandhi RS, Gill JPS, Gupta NK, Kumar M, Londhe S, Rahi M, Sharman PK, Shome R, Singh R, Srinivas K and Swain BB. (2019). Brucellosis in India: results of a collaborative workshop to define One Health priorities. Tropical Animal Health and Production. https://doi.org/10.1007/s11250-019-02029-3. http://krishi.icar.gov.in/jspui/handle/ 123456789/35389	6.98
28.	Manjunatha Reddy GB, Singh R, Singh KP, Sharma AK, Vineetha S, Saminathan M and Sajjanar B. (2019). Molecular epidemiological analysis of wild animal rabies isolates from India. Veterinary World. 12: 352-357. http://krishi.icar.gov.in/jspui/handle/123456789/19851	5.71
29.	Nagarajan G, Pourouchottamane R, Manjunatha Reddy GB, Yogisharadhya R, Sumana K, Rajapandi S, Murali G, Thirumaran SMK, Mallick PK and Rajendiran AS. (2019). Molecular characterization of Orf virus isolates from Kodai hills, Tamil Nadu, India. Veterinary World. 12: 1022-1027. http://krishi.icar.gov.in/jspui/handle/123456789/35398	5.71

30.	Nongkhlaw SS, Suganthi RU, Ghosh J, Malik PK, Awachat VB, Krishnamoorthy P and Pal DT. (2019). Antioxidant capcity, lipid oxidation status and expression of specific selenoprotein mRNA in Longissimus dorsi muscle in lambs (*Ovis aries*) supplemented with supranutritional selenium. Indian Journal of Animal Sciences. 89: 983-991. http://krishi.icar.gov.in/jspui/handle/123456789/ 23109.	6.28
31.	Oso AO, Suganthi RU, Manjunatha Reddy GB, Malik PK, Thirumalaisamy G, Awachat VB, Selvaraju S, Arangasamy A and Bhatta R. (2019). Effect of dietary supplementation with phytogenic blend on growth performance, apparent ileal digestibility of nutrients, intestinal morphology, and cecal microflora of broiler chickens. Poultry Science. 191. https://doi.org/10.3382/ps/pez191. http://krishi.icar.gov.in/jspui/handle/123456789/35387	8.22
32.	Patil SS, Suresh KP, Amachawadi RG, Meekins DA, Richt DA, Mondal M, Hiremath J, Hemadri D and Roy P. (2019). Genome sequence of classical swine fever virus NIVEDI-165, Subtype 1.1, a field virus strain isolated from the southern part of India. Microbiology Resource Announcements. 21: e00295-19. http://krishi.icar.gov.in/jspui/handle/123456789/35391	-
33.	Saha C, Kothapalli P, Patil V, Manjunatha Reddy GB, Kaveri SV and Bayry J. (2019). Intravenous immunoglobulin suppresses the polarization of both classically and alternatively activated macrophages. Human Vaccines and Immunotherapeutics. https://doi.org/10.1080/21645515.2019.1602434. http://krishi.icar.gov.in/jspui/handle/123456789/35388	9.643
34.	Saikia GK, Konch P, Boro A, Shome R, Rahman H and Das SK. (2019). Seroprevalence of caprine brucellosis in organised farms of Assam, India. Journal of Entomology and Zoology Studies. 7: 21-25. http://krishi.icar.gov.in/jspui/handle/123456789/35403	-
35.	Shantaveer SB, D'Souza PE, Mamatha GS, Yathish HM and Siju SJ. (2019). Molecular epidemiology and phylogenetic analysis of *Theileria* species in sheep. Indian Journal of Small Ruminants. 25: 192-198. http://krishi.icar.gov.in/jspui/handle/123456789/35401	5.25
36.	Shome R, Deka RP, Ligi M, Grace D and Lindahl JF. (2019). *Coxiella* seroprevalence and risk factors in large ruminants in Bihar and Assam, India. Acta Tropica. 194: 41-46. http://krishi.icar.gov.in/jspui/handle/123456789/19881	8.51
37.	Shome R, Deka RP, Swati S, Grace D and Lindahl JF. (2019). Seroprevalence of hemorrhagic septicemia in dairy cows in Assam, India. Infection Ecology & Epidemiology. 9: 1. 1604064. http://krishi.icar.gov.in/jspui/handle/123456789/35402	8.55
38.	Subramanyam V, Hemadri D, Kashyap SP, Hiremath J, Barman NN, Ralte EL, Patil SS, Suresh KP and Rahaman H. (2019). Detection of torque tenosus virus infection in Indian pigs. Veterinary World, 12: 1467-1471. http://krishi.icar.gov.in/jspui/handle/123456789/36866	5.71
39.	Sudhakar SB, Mishra N, Kalaiyarasu S, Jhade SK, Hemadri D, Sood R, Bal GC, Nayak MK, Pradhan SK and Singh VP. (2020). Lumpy skin disease (LSD) outbreaks in cattle in Odisha state, India in August 2019: Epidemiological features and molecular studies. Transboundary Emerging Diseases. doi: 10.1111/tbed.13579. http://krishi.icar.gov.in/jspui/handle/123456789/36812	9.50
40.	Suganthi RU, Ghosh J, Malik PK, Awachat VB, Krishnamoorthy P, Pal DT and Nongkhlaw SS. (2019). Effect of dietary organic selenium (Se) on immune response, hepatic antioxidant status, selenoprotein gene expression and meat oxidative stability in lambs. Journal of Animal and Feed Sciences. 28: 138-148. http://krishi.icar.gov.in/jspui/handle/123456789/21437	6.90

41.	Sumathi BR, Veeregowda BM, Byregowda SM, Rathnamma D, Isloor S, Shome R and Narayanaswamy HD. (2019). Molecular characterization of *Brucellamelitensis*fieldisolates by Bruce- Ladder multiplex PCR. International Journal of Current Microbiology and Applied Science. 8: 585-590. http://krishi.icar.gov.in/jspui/handle/123456789/19885	5.38
42.	Suresh KP, Patil SS, Hamsapriya S, Shinduja R, Roy P and Amachawadi RG. (2019). Prevalence of extended-spectrum beta-lactamase producing bacteria from animal origin: A systematic review and meta-analysis report from India. PLoS ONE. 14: e0221771. http://krishi.icar.gov.in/jspui/handle/123456789/35386	8.77
43.	Vinod RK, Prashanth L and Suresh KP. (2019). Prediction of acute myocardial infarction outcome: A record-based cohort study. International Journal of Multidisciplinary Research and Development. 6: 01-4. http://krishi.icar.gov.in/jspui/handle/123456789/35393	3.0
44.	Walia K, Sharma M, Vijay S and Shome BR. (2019). Understanding policy dilemmas around antibiotic use in food animals & offering potential solutions. Indian Journal of Medical Research. 149: 107-18. http://krishi.icar.gov.in/jspui/handle/123456789/36813	7.51
45.	Yogisharadhya R, Mohanty NN, Chacko N, Mondal M, Chanda MM and Shivachandra SB. (2019). Sequence and structural analysis of OmpW protein of *Pasteurella multocida* strains reveal evolutionary conservation among members of Pasteurellaceae along with its homologues. Gene Reports. 14: 36-44. http://krishi.icar.gov.in/jspui/handle/123456789/19903.	-



Publications during 2019 with NAAS score

Presentation in conference/ symposium/ workshop/ seminars/ other fora

1. Chandrasekhar A, Siju SJ, Sengupta PP, Chandu AGS, Samshad S and Yogisharadhya R. (2019). Epidemiological surveillance of transmission foci of fasciolosis. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.224

2. Chandu AGS, Sengupta PP, Siju SJ, Samshad S, Ramesh P, Sudhagar S and Chandrasekhar A. (2019). Genetic variability in variable surface glycoprotein gene among different isolates of *Trypanosoma evansi.* In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary Univers.ity, Tirupati during 28-30th January, 2019. Pp.236.

3. Dheeraj R, Rashmi R. Kurli, Mohan Kumar GS, Sengupta PP, Siju SJ and Suresh KP. (2019). Spatial risk analysis of gastrointestinal parasitic disease-Haemonchosis in Rajasthan, India. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.218.

4. Krishnamoorthy P, Sudhagar S, Siju SJ, Suresh KP and Shome BR. (2019). Spatial and temporal distribution analysis of dairy cattle ticks in Karnataka State, India. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019.

5. Krishnamoorthy P, Sudhagar S, Siju SJ, Suresh KP and Shome BR. (2019). Spatial and Temporal distribution analysis of dairy cattle ticks in Kerala State, India. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019.

6. Samshad S, Siju SJ, Sengupta PP, Ramesh P, Chandu AGS, Sudhagar S, Chandrasekhar A, Yogisharadhya R, Phani K and Chanda MM. (2019). Cloning and expression of low molecular weight antigens of *Taenia solium* cysticercosis for detecting of porcine cysticercosis. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.111.

7. Sengupta PP, Chandu AGS, Siju SJ, Borthakur SK, Patra GK, Samshad S, Sudhagar S and Angadi C. (2019). Sero-Prevalence of *Trypanosoma evansi* infection in cattle by enzyme immunosorbent assay using recombinant variable surface glycoprotein. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.114.

8. Shinduja R, Shruthi CR, Rashmi RK, Dheeraj R, Suresh KP. (2019). A systematic review and Meta-analysis on prevalence of parasitic disease in NER, India. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019.

9. Siju SJ, Sengupta PP, Ramesh P, Samshad S, Chandu AGS, Sudhagar S, Chandrasekhar A, Yogisharadhya R, Phani K, Chamuah J and Chanda MM. (2019). Genetic characterization and phylogenetic analysis of *Taenia solium* cysticercus based on mitochondrial and ribosomal DNA regions. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.110.

10. Sudhagar S, Chandrasekhar A, Siju SJ, Sengupta PP, Chandu AGS, Yogisharadhya R and Samshad S. (2019). Analysis of genetic variability by ISSR markers in Lymanea spp. Snails. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.237.

11. Yogisharadhya R, Siju SJ, Sengupta PP, Chandrasekhar A, Sudhagar S, Chandu AGS and Samshad S. (2019). Molecular characterization of Lymnaid snails by targeting ribosomal and mitochondrial DNA markers. In XXVIII National Congress of Veterinary Parasitology and National Symposium held at Sri Venkateswara Veterinary University, Tirupati during 28-30th January, 2019. Pp.111.

12. Balamurugan V. (2019). Comprehensive approaches for laboratory diagnosis of leptospirosis in animals and human; Indian perspectives. In XXXII Annual Convention of Indian Association of Veterinary Microbiologists, Immunologists and Specialists in Infectious Diseases (IAVMI) held at Department of Veterinary Microbiology, Bihar Animal Sciences University, Patna, Bihar during 4-6th February, 2019. Pp.67-68

13. Balamurugan V, Varghese B, Muthuchelvan D, Sowjanya Kumari S, Vinod Kumar K, Suresh KP, Govindaraj G and Hemadri D. (2019). Current status of seroprevalence of Peste des Petitis Ruminants (PPR) in sheep and goat in southern peninsular India. In XXXII Annual Convention of Indian Association of Veterinary Microbiologist, Immunologists and Specialists in Infectious Diseases (IAVMI) held at Bihar Animal Science University, Patna during 4 -6th February, 2019.

14. Govindaraj G, Veena, R, Manjunatha Reddy GB, Yogisharadhya R, Naveen Kumar GS and Balamurugan V. (2019). Identification of socio-economic and other risk factors associated with sheep and goats pox outbreaks in Karnataka. In XXXII Annual Convention of Indian Association of Veterinary Microbiologist, Immunologists and Specialists in Infectious Diseases (IAVMI) held at Bihar Animal Science University, Patna during 4 -6th February, 2019. Pp. 80

15. Mohanty NN, Hemadri D, Shetty N, Sugunan S, Yegaventi N, Subramanium V, Biswas S, Chanda MM, Suresh KP, Ramakrishnan MA, Hosamni M and Shivachandra SB. (2019). Development of NS1-NS3 based ELISA for the detection of antibodies to bluetongue virus. In XXXII Annual Convention of Indian Association of Veterinary Microbiologist, Immunologists and Specialists in Infectious Diseases (IAVMI) held at Bihar Animal Science University, Patna during 4-6th February, 2019. Pp. 76

16. Gupta R, Kumar D, Mohan RP, Chanda MM, Shivachandra S, Hemadri D, Duria M and Singh S. (2019). Outbreak investigation of anthrax- upper Kutinga village, Koraput district, Odisha, India, July- August 2018. In One Health India Conference held at Department of Biotechnology, New Delhi during 18-19th February, 2019.

17. Maji S, Netravathi M, Nagarathna S, Veenakumari HB, Balamurugan V and Kumari P. (2019). Neuroleptospirosis-A paradigm for One Healt' in India. In One Health India Conference held at Department of Biotechnology, New Delhi during 18-19th February, 2019

18. Tewari R, Das SM, Ganaie F, Jodhao S, Mishra G, Shome R, Venugopal NC, Dey TK, Rahman H and Shome BR. (2019). Draft genome sequence of multidrug-resistant *E. Coli* NIVEDI-P44, isolated from a chicken fecal sample in North east India. In One Health India Conference held at Department of Biotechnology, New Delhi during 18-19th February, 2019. Pp. 56-57.

19. Tewari R, Das SM, Ganaie F, Venugopal NC, Shome R and Shome BR. (2019). Dissemination and characterization of ESBL, AmpC and MBL producing *E. Coli* from livestock & poultry in Northeastern India: A molecular surveillance approach. In One Health India Conference held at Department of Biotechnology, New Delhi during 18-19th February, 2019. Pp. 57-58.

20. Dheeraj R, Rashmi K, Patil SS and Suresh KP. (2019). Spatial risk modeling of *Haemorrhagic septicaemia* in Maharashtra state, India. In XIV Agricultural Science Congress held at NASC, Pusa, New Delhi during 20-23rd February, 2019. Pp. 337

21. Kurli RR, Dheeraj R, Siju SJ, Krishnamoorthy P, Hemadri, D and Suresh KP. (2019). Suitability risk analysis of Bluetongue in Karnataka, a southern state of India. In XIV Agricultural Science Congress held at New Delhi during 20-23rd February, 2019.

22. Alamuri A, Thirumalesh SRA, Sowjanya Kumari S, Vinod Kumar K and Balamurugan V. (2019). Seroepidemiology of leptospirosis in cattle and buffaloes in Andhra Pradesh by using microscopic agglutination test. In XVI Annual Symposium & National Conference of IAVPHS held at Nagpur during 26-27th February 2019. Pp. M130.

23. Balamurugan. V. (2019). Current Status of Bovine leptospirosis in endemic states of India. In XVI Annual Symposium & National Conference of IAVPHS held at Nagpur during 26-27th February 2019. Pp. M 7

24. Balamurugan V, Alamuri A, Sowjanya Kumari S, Bharath V, Vinod Kumar K. and Nagalingam M. (2019). Expression of recombinant OMP-surface adhesion protein of pathogenic Leptospira in *E. coli* system and its potential use as diagnostic antigen for serodiagnosis of bovine leptospirosis. In XVI Annual Symposium & National Conference of IAVPHS held at Nagpur during 26-27th February 2019. Pp. M205.

25. Krishnamoorthy P, Karunanidi K, Suresh KP and Shome BR. (2019). Spatial and temporal epidemiological analysis of livestock diseases (2012-17) in Tamil Nadu state. In: National conference on Challenges and opportunities for tackling veterinary public health issues at the human, animal and environment interface held at In XVI Annual Symposium & National Conference of IAVPHS held at Nagpur during 26-27th February 2019. Pp. M193.

26. Moon SL, Sonekar CP, Likhite AV, Gilchie VN, Chaudhari SP, Alamuri A and Balamurugan V. (2019). Concurrent infection of brucellosis, leptospirosis, Q fever among cattle. In XVI Annual Symposium & National Conference of IAVPHS held at Nagpur during 26-27th February 2019. Pp.M127.

27. Nagalingam M, Thaslim J, Balamurugan V, Shome R, Manjunathareddy GB, Rajendran J, Vishnu US, Roy P, Rahman H, Shome BR and Gandham RK. (2019). Expression of *Brucella abortus* multi-epitope recombinant protein in *E.coli* system. In XVI Annual Symposium & National Conference of IAVPHS held at Nagpur Veterinary College, Nagpur during 26-27th February, 2019. Pp. M206

28. Sridevi R, Govindaraj G and Rahman H. (2019). KAP Levels of Poultry Farmer on Bird Flu-A post outbreak assessment. In In: XVI Annual Symposium & National Conference of IAVPHS held at Nagpur during 26-27th February 2019.

29. Shome R, Skariah S, Rathore Y, Kavana DR, Triveni K, Suresh KP, Hemadri D, Shome BR, Barman NN, Das SK and Rahman H. (2019). Record of brucellosis serosurveillance in North Eastern India during 2014-2018. In International Seminar on Animal agriculture for doubling the farmer's income: technology, policy and strategy options held at College of Veterinary Science Assam Agriculture University, Khanapara, Guwahati during 27-28th February, 2019.

30. Balamurugan V, Sowjanya Kumari S, Alamuri A, Bharat V and Nagalingam M. (2019). Development of multi antigenic recombinant Outer membrane proteins of pathogenic *Leptospira* based diagnostics for serodiagnosis of bovine leptospirosis. In 7th Pan Commonwealth Veterinary Conference held at ICAR-NIANP during 3-7th March 2019.

31. Hiremath J, Awati S, Mannapur SB, Bhavana GB, Bhat R, Manjunatha Reddy GB, Patil SS, Chanda MM, Hemadri D and Rahman H. (2019). Evaluation of field level FMD vaccine efficacy and factors effecting the vaccine effectiveness. In 7th Pan Commonwealth Veterinary Conference held at ICAR-NIANP during 3-7th March 2019. Pp. 208.

32. Kurli RR, Dheeraj R, Kiran Kumar S, Suresh KP and Hemadri D. (2019). Impact of climate on disease dynamics of anthrax and forecasting disease outbreak in Karnataka. In 7th Pan Commonwealth Veterinary Conference 2019 held at ICAR- NIANP, Bengaluru during 3-7th March, 2019.

33. Shruthi CR, Darshan HV, Shinduja R, Dheeraj R, Kurli RR and Suresh KP. (2019). A spatial risk analysis and prediction modelling of Foot and Mouth Disease outbreaks in Karnataka, India. In 7th Pan Commonwealth Veterinary Conference 2019 held at ICAR- NIANP, Bengaluru during 3-7th March, 2019.

34. Veeregowda BM, Sumathi BR, Shome R, Isloor S, Leena G and Rathnamma D. (2019). Epidemiology of brucellosis in small ruminants in India. In 7th Pan Commonwealth Veterinary Conference 2019 held at ICAR- NIANP, Bengaluru during 3-7th March, 2019. Pp. D 383.

35. Lindahl JF, Deka RP, Shome R, Leahy E, Ulf M and Grace D. (2019). Infectious diseases in Indian ruminants as potential causes of reduced productivity. In Agricultural Research for Development Conference, Agri4D 2019 held at SLU, Uppsala during 25-26th September 2019.

36. Krishnamoorthy P. (2019). Meta-analysis: A study tool for new research synthesis for estimating livestock diseases prevalence. In National symposium on Advances in veterinary pathology in fostering one health, food security and environmental protection held at College of Veterinary Science and Animal Husbandry, Aizawl during 6-8th November 2019. Pp. 155-165.

37. Manjunatha Reddy GB, Singh R, Singh KP, Saminathan M and Basavaraj S. (2019). Role of lipopolysaccharide in pathogenesis of rabies virus in mouse model. In National symposium on Advances in veterinary pathology in fostering one health, food security and environmental protection held at College of Veterinary Science and Animal Husbandry, Aizawl during 6-8th November 2019. Pp. 227.

38. Saminathan M, Singh KP, Vineeta S, Madhulina M, Biswas SK, Manjunatha Reddy GB, Chauhan HC, Milton AAP, Ramakrishnan MA and Gupta VK. (2019). Establishment and characterization of type-I interferon blocked mouse model for bluetongue virus infection. In National symposium on Advances in veterinary pathology in fostering one health, food security and environmental protection held at College of Veterinary Science and Animal Husbandry, Aizawl during 6-8th November 2019. Pp. 197-198

39. Saminathan M, Singh KP, Vineeta S, Madhulina M, Biswas SK, Manjunatha Reddy GB, Milton AAP, Ramakrishnan MA and Gupta VK. (2019). Evidence for transplacental transmission of wild type Indian bluetongue virus serotype 1 in IFNAR1 blocked mice during early and mid-gestation. In National symposium on Advances in veterinary pathology in fostering one health, food security and environmental protection held at College of Veterinary Science and Animal Husbandry, Aizawl during 6-8th November 2019. Pp. 122-123.

40. Govindaraj G, Das B, Ahmed SR, Cole J, Moran D, Shanabhoga M B, Holmes M and Shome BR. (2019). Farmers opinion on antimicrobial use and strategies adopted to treat animals: An FGD Approach. In National Seminar on AMR in Indian Fisheries: Measures of mitigation held at ICAR-Central Institute of Fisheries Technology, Cochin during 7-8th November, 2019. Pp. 123-124.

41. Sivaraman G, Shome BR, Holmes M, Hamza M and Sajeev S. (2019). Incidence of Methicillin-resistant *Staphylococci* in fish samples from North East region of India and its Antimicrobial resistance pattern. In National Seminar on AMR in Indian Fisheries: Measures of mitigation held at ICAR-Central Institute of Fisheries Technology, Cochin during 7-8th November, 2019.

42. Sivaraman G, Shome BR, Holmes M, Sajeev S and Hamza M. (2019)**.** A comprehensive study antimicrobial resistant Enterobacteriaceae from fish samples collected from Guwahati, Assam. In National Seminar on AMR in Indian Fisheries: Measures of mitigation held at ICAR-Central Institute of Fisheries Technology, Cochin during 7-8th November, 2019.

43. Balamurugan V, Dheeraj R, Rashmi Kurli, Vinod Kumar K, Suresh KP, Govindaraj G and Roy P.(2019). Epidemiology of Peste des petits ruminants in small ruminants and its control programme in India. In PPR GREN meeting held at Nairobi, Kenya during 13-15th November, 2019.

44. Chandu AGS, Sengupta PP, Siju SJ, Sudhagar S, Pavithra BS, Rangaraj R and Parimal Roy. (2019). Detection of *T.evansi* infection in North Eastern states of India by targeting Variable Surface Glycoprotein gene In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019. Pp.107.

45. Hiremath J, Chanda MM, Kashyap P, Patil SS, Hemadri D and Roy P. (2019). Status of PRRS in South India and Risk factors associated with the disease in North-East India. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November 2019. Pp. 51

46. Nagalingam M**,** Shravya S, Kanchan D, Balamurugan V, Shome R, Manjunatha Reddy GB, Sridevi R,. Shome BR and Roy P. (2019). Detection of *Brucella* organism in sheep milk by PCR and comparison with *Brucella* antibodies in the serum by ELISA. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019.

47. Pavithra BS, Rangaraj R, Siju SJ, Sengupta PP, Sudhagar S, Chandu AGS and Roy P. (2019). Epidemiological surveillance of transmission foci of fasciolosis. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019. Pp.181.

48. Rangaraj R, Sudhagar S, Siju SJ, Sengupta PP, Pavithra BS, Chandu AGS, and Roy P. (2019). Cloning, expression and characterization of TS14 and TSOL10 proteins of *T. solium* for diagnosis of porcine cysticercosis. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019. Pp.124.

49. Sengupta PP, Pavithra BS, Siju SJ, Sudhagar S, Chandu AGS, Rangaraj R and Roy P. (2019). Cloning, expression and characterization of Cathepsin B2 of *Fasciola gigantica* for early diagnosis of bovine fasciolosis. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019. Pp.108.

50. Siju SJ, Sudhagar S, Sengupta PP, Rangaraj R, Pavithra BS, Chandu AGS, and Roy P. (2019). Cloning, expression and characterization of 8 KDA family of proteins of *T.solium* for diagnosis of porcine cysticercosis. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019. Pp.106.

51. Sridevi R, Deore P, Lavanya V, Bharath M, Nagalingam M, Balamurugan V, Krishnamoorthy P and Roy P. (2019). Molecular diagnosis of Pasteurellales among Sheep and Goats of Karnataka. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019.

52. Sudhagar S, Siju SJ, Sengupta PP, Chandu AGS, Rangaraj R, Pavithra BS and Roy P. (2019). Molecular characterization of *Taenia solium* cysticercus based on mitochondrial and ribosomal DNA regions. In International conference on current scenario and future strategies of disease control for augmenting livestock and poultry productivity under changing climatic conditions held at VCRI, TANUVAS, Namakkal during 20-22nd November, 2019. Pp.71.

53. Kathirvelan C, Krishnamoorthy P, Banupriya S and Tyagi AK. (2019). Production of functional ghee (butter oil) with enriched conjugated linoleic acid and its anti-carcinogenic potency in rats. In 9th International conference of LASA on laboratory animals in biomedical research- the way forward held at Indian Institute of Science Education and Research, Pune during 21-23rd November 2019. Pp. 54.

54. Krishnamoorthy P, Shome BR and Roy P. (2019). Pathology of major mastitis pathogens in experimentally infected mice mastitis model. In 9th International conference of LASA on laboratory animals in biomedical research- the way forward held at Indian Institute of Science Education and Research, Pune during 21-23rd November 2019. Pp. 49.

55. Kashyap P, Hiremath J, Vinutha S, Chanda MM, Patil SS, Roy P and Hemadri D. (2019). Development of recombinant nucleocapsid protein-based indirect ELISA for detection of anti-PRRSV antibodies**.** In 11th PSI annual meeting and International conference on proteomics for system integrated bio-Omics, One Health and Food Safety held at ICAR-NDRI during 2-4th December 2019. Pp. 91.

56. Hiremath J. (2019). Biosafety Regulation in India. In National Workshop on Biosafety and Biosecurity in Animal Science Research and Development held at ICAR-IVRI, Izatnagar, UP on 3rd December, 2019.

57. Oso OA, Suganthi RU, Manjunatha Reddy GB, Malik PK and Awachat VB. (2019). Histological findings in broiler tissues supplemented with a phytogenic blend as alternative to antibiotic growth promoter. In International conference on animal nutrition 2019 held at West Bengal University of Animal and Fishery Sciences during 17-19th December, 2019.

Manuals / Book chapter

Manuals

1. Balamurugan V, Govindaraj G, Nagalingam M, Siju SJ, Kumar V and Alamuri A. (2019). Risk factors and economic impact analysis of Zoonotic diseases. Published by Director, ICAR-NIVEDI, Bengaluru.

2. Balamurugan V, Kumar V, Alamuri A and Nagalingam M. (2019). Hands-on Training in Laboratory Diagnosis of Leptospirosis. Published by Director, ICAR-NIVEDI, Bengaluru.

3. Chanda MM, Hiremath J, Sridevi R, Siju SJ and Patil SS. (2019). Field Veterinary Epidemiology. Published by Director, ICAR-NIVEDI, Bengaluru.

4. Chanda MM, Lindahl J, Cook A, Siju SJ and Shome R. (2019). Introduction to Analytical Veterinary Epidemiology. Published by Director, ICAR-NIVEDI, Bengaluru.

5. Hiremath J, Manjunatha Reddy GB, Samanta AK, Bokhtiar SM and Roy P. (2019). Laboratory Biosafety and Biosecurity for Handling Transboundary Animal Diseases and Zoonotic Emerging Pathogens. Published by Director, ICAR-NIVEDI, Bengaluru.

6. Sengupta PP, Nagalingam M and Siju SJ. (2019). An update of molecular and advanced approaches for the diagnosis of parasitic diseases in animals. Published by Director, ICAR-NIVEDI, Bengaluru.

7. Suresh KP, Patil SS, Roy P, Mohapatra JK, Saravanan S and Singh RK. (2019). Sampling plan for sero-surveillance and sero-monitoring of Foot and Mouth Disease in India under FMDCP (Vol I: Sero-surveillance and Vol II: sero-monitoring). Published by ICAR-NIVEDI, Bengaluru. Pp 191(Vol I) & 133 (Vol II).

8. Walia K, Shome BR et al. (2019). Standard operating procedures in bacteriology in veterinary sector on 'Antimicrobial Resistance Surveillance and Research'. Pp. 1-119

Book Chapters

1. Balamurugan V, Govindaraj G and Roy P. (2019). Peste des Petits Ruminants virus. In Emerging and Transboundary Animal Viruses, Edited by Malik YS, Singh RK and Yadav MP. Springer Publications. ISBN 978-981-15-0401-3. Pp. 315-343

Technical Bulletins / Booklets / Leaflets

1. Balamurugan V, Vinod Kumar K, Alamuri A, Sowjanya Kumari S and Nagalingam M. (2019). Leptospirosis (Rat Fever). NIVEDI/ Tech. Bulletin/2019. Published by Director, ICAR-NIVEDI, Bengaluru.

2. Balamurugan V, Vinod Kumar K, Sowjanya Kumari S, Varghese B, Govindaraj G and Suresh KP. (2019). Peste des Petits Ruminants (PPR) (Goat Plague). NIVEDI/Tech. Bulletin/2019. Published by Director, ICAR-NIVEDI, Bengaluru.

3. Balamurugan V, Vinod Kumar K, Suresh KP and Govindaraj G. (2019). Sampling plan for Monitoring & Surveillance of Peste des Petits Ruminants (PPR). NIVEDI/Tech. Bulletin/2019. Published by Director, ICAR-NIVEDI, Bengaluru.

4. Kiran Kumar S, Suresh KP, Balamurugan V, Vinod Kumar K and Govindaraj G. (2019). Development of Web Application for National Database on PPR-Control Programme, (NDPPRCP). NIVEDI/ Tech. Bulletin / 2019. Published by Director, ICAR-NIVEDI, Bengaluru.

5. Krupa KN, Kumari S, Krishnamoorthy P, Shome R and Shome BR. (2019). Antimicrobial Resistance (AMR): Potential Impact on Public Health –Trilingual (English, Hindi and Assamese) (ICAR- NIVEDI/ Leaflet/1,2 &4 /2019).

6. Krupa KN, Surabhi Kumari, Krishnamoorthy P, Shome R and Shome BR. (2019). Mastitis in cows: Basic Management Strategies- Trilingual (English, Hindi and Assamese) (ICAR- NIVEDI/Leaflet/ 5,6 & 8 /2019).

7. Shivachandra SB, Chanda MM, Hiremath J and Hemadri D. (2019). Pocket guide on: Anthrax in Animals. Booklet, 2nd Edition, Pp 1-50. Published by Director, ICAR-NIVEDI, Bengaluru.

Popular Article

1. Suresh KP, Hemadri D, Kurli R, Dheeraj R and Roy P. (2019). Application of artificial intelligence for livestock disease prediction. Indian Farming. 69: 60-62.

Capacity Building/Human Resource Development

Training/Refresher Course/Summer/ Winter School/Seminars/Conferences/ Symposia/Workshops/Krishi Mela/Fairs Organized

Sl. No.	Name of Seminar/Workshop/Training	Venue	Date
1	Training: An update of molecular and advanced approaches for the diagnosis of parasitic diseases in animals	ICAR-NIVEDI	02-11th January, 2019
2	Laboratory based surveillance of AMR in human health and veterinary sectors	FAO-ICAR/NIVEDI	09th January, 2019
3	Training: Awareness Programme and User's Training Programme on CeRA	ICAR-NIVEDI	17th January, 2019
4	Meeting: ICAR-ICMR -FAO	ICAR-NIVEDI	18th January, 2019
5	Training: Field Veterinary Epidemiology	ICAR- NIVEDI	11-15th February, 2019
6	Training: Field Veterinary Epidemiology	ICAR- NIVEDI	12-16th March, 2019
7	Meeting: Indo-UK project on AMR Kick off meeting.	Hotel Kalyaniz, Guwahati, Assam	21-23rd March, 2019
8	Awareness cum sensitization of NEO and NEST programs under NaaViC	ICAR-NIVEDI	09th July, 2019
9	Awareness cum sensitization of NEO and NEST programs under NaaViC	ICAR-IVRI Bengaluru	11th July, 2019
10	Training: Research Methodology and Biostatistics	ICAR- NIVEDI	13-14th July, 2019
11	Awareness cum sensitization of NEO and NEST programs under NaaViC	Veterinary College, KVAFSU, Bengaluru	15th July, 2019
12	Awareness cum sensitization of NEO and NEST programs under NaaViC	IBAB and BBC, Bengaluru	18th July, 2019
13	Awareness cum sensitization of NEO and NEST programs under NaaViC	CSIR-CIMAP, Bengaluru	19th July, 2019
14	Awareness cum sensitization of NEO and NEST programs under NaaViC	Veterinary College, KVAFSU, Hassan	22nd July, 2019
15	Awareness cum sensitization of NEO and NEST programs under NaaViC	Fisheries College, KVAFSU, Mangalore	23rd July, 2019

Sl. No.	Name of Seminar/Workshop/Training	Venue	Date
16	Awareness cum sensitization of NEO and NEST programs under NaaViC	Veterinary College, KVAFSU, Shimoga	24th July, 2019
17	Awareness cum sensitization of NEO and NEST programs under NaaViC	JNCSAR, Bengaluru	24th July, 2019
18	Training: Social Science Training Program under Indo-UK Project on AMR	Hireballa, Karnataka	1st August 2019
19	Training: Laboratory biosafety and biosecurity for handling transboundary animal diseases and zoonotic emerging pathogens	ICAR-NIVEDI	19-24th August, 2019
20	Meeting: Project Investigator's meet of Indo-UK project on AMR	Gauhati University Campus, Guwahati, Assam.	22-24th August, 2019
21	Workshop: Technology commercialization by Agriinnovate India limited (AgIn)	ICAR-NIVEDI	27th August 2019
22	Meeting: R-ABI Implementation Committee (RIC)	ICAR-NIVEDI	04th September, 2019
23	Meeting: R-ABI Implementation Committee (RIC)	ICAR-NIVEDI	27th September, 2019
24	Training: Hands-on Training in Laboratory Diagnosis of Leptospirosis	ICAR-NIVEDI	14-18th October, 2019
25	Agripreneurship Orientation and Residency Programme	ICAR-NIVEDI	18th October-18th December, 2019
26	Awareness cum sensitization of NEO and NEST programs under NaaViC	Indian Institute of Plantation Management (IIPM), Bengaluru	10th November, 2019
27	Awareness cum sensitization of NEO and NEST programs under NaaViC	Jyothy Institute of Technology, Bengaluru	14th November, 2019
28	Awareness cum sensitization of NEO and NEST programs under NaaViC	Dayanand Institute of Technology, Bengaluru	15th November, 2019
29	Awareness cum sensitization of NEO and NEST programs under NaaViC	Reva University, Bengaluru	16th November, 2019
30	Awareness cum sensitization of NEO and NEST programs under NaaViC	Karnataka University, Dharwad	18th November, 2019

Sl. No.	Name of Seminar/Workshop/Training	Venue	Date
31	Awareness cum sensitization of NEO and NEST programs under NaaViC	Sampoorna Agriculture College, Maddur, Mandya	23rd November, 2019
32	World AMR Awareness Week 2019	Bengaluru, Karnataka	18 -24th November, 2019
33	Meeting: Annual Review meet of Indo-UK project on AMR	Hotel Kalyaniz, Guwahati, Assam	28- 30th November, 2019
34	RIC Meeting and Pitch Day for evaluation of business proposals	ICAR-NIVEDI	18th December, 2019
35	Training: Risk factors and economic impact analysis of zoonotic diseases	ICAR-NIVEDI	18-20th December, 2019
36	Awareness cum sensitization of NEO and NEST programs under NaaViC	Indian Institute of Plantation Management (IIPM), Bengaluru	10th November, 2019
37	Awareness cum sensitization of NEO and NEST programs under NaaViC	Jyothy Institute of Technology, Bengaluru	14th November, 2019
38	Awareness cum sensitization of NEO and NEST programs under NaaViC	Dayanand Institute of Technology, Bengaluru	15th November, 2019
39	Awareness cum sensitization of NEO and NEST programs under NaaViC	Reva University, Bengaluru	16th November, 2019
40	Awareness cum sensitization of NEO and NEST programs under NaaViC	Karnataka University, Dharwad	18th November, 2019
41	Awareness cum sensitization of NEO and NEST programs under NaaViC	Sampoorna Agriculture College, Maddur, Mandya	23rd November, 2019
42	World AMR Awareness Week 2019	Bengaluru, Karnataka	18 -24th November, 2019
43	Meeting: Annual Review meet of Indo-UK project on AMR	Hotel Kalyaniz, Guwahati, Assam	28- 30th November, 2019
44	RIC Meeting and Pitch Day for evaluation of business proposals	ICAR-NIVEDI	18th December, 2019
45	Training: Risk factors and economic impact analysis of zoonotic diseases	ICAR-NIVEDI	18-20th December, 2019

Foreign visits

Dr. V.Balamurugan, Principal Scientist, participated in the second *Peste des petits ruminants* - Global Research and Expertise Network (PPR GREN) meeting held at ILRI, Nairobi, Kenya during13 – 15th November, 2019

Dr. V.Balamurugan, Principal Scientist, participated in the SAARC regional Training on 'Molecular Diagnosis and Laboratory Surveillance of PPR' held at BLRI, Slavar, Dhaka, Bangladesh, sponsored by SAARC Agricultural Centre (SAC), Dhaka

Dr. G Govindaraj, Senior Scientist, ICAR-NIVEDI visited International Livestock Research Institute (ILRI), Nairobi, Kenya during October 22 -26th 2019 as a part of Science Exchange visit between ICAR and ILRI

Capacity Building / Human Resource Development

Training/ Refresher Course/Summer/Winter School/ Seminars/ Conferences/ Symposia/ Workshops/Meeting/Krishi Mela/Fair Programmes participated

Sl.No	Name of Seminar/ Workshop/ Training	Venue	Date	Attended by
1	Pashu Mela	Sindhanuru, Raichur	4-8th January, 2019	Dr. S. S. Patil Dr.Yogisharadhya R
2	Meeting: DST- Scientific Infrastructure Sharing Maintenance and Networks	cCAMP, Bengaluru, Karnataka	10th January, 2019	Dr. S.B. Shivachandra
3	Workshop: One Health Table Top Exercise for Effective Response to Zoonotic Disease Outbreaks (CDC)	ITC Windsor, Bengaluru	21-23rd January, 2019	Dr. M. M. Chanda
4	Training: E Office	IASRI, New Delhi	23-24th January, 2019	Sh.V Raghuraman Sh.A Vijaya Kumar
5	National Horticultural Fair (NHF)	ICAR-IIHR Bengaluru	23-25th January, 2019	Dr. Govindaraj G Dr. Sridevi R Dr. Manjunatha Reddy GB Dr. Siju SJ Dr. Yogisharadhya R Dr. A. Prajapati
6	Conference: NCVP 2019	CVSc, Tirupati, Andhra Pradesh	28-30th January, 2019	Dr. P.P.Sengupta Dr. P. Krishnamoorthy Dr. Yogisharadhya R
7	Field Exposure Visit	ICAR-NIANP, Bengaluru	29-30th January, 2019	Shri. B. Hanumantharaju, Shri. M.K.Ramu Mr.Umesh H S
8	Conference: Bio Economy India Conclave	IISc, Bengaluru, Karnataka	31st January, 2019	Dr. S.B. Shivachandra
9	Conference: 19th Indian Veterinary Congress and 26th Annual Conference of IAAVR	Veterinary College, WBUAFS, Kolkata	1-2nd February, 2019	Dr. R.Shome

10	XXXII Annual Convention of Indian Association of Veterinary Microbiologists, Immunologists and Specialists in Infectious Diseases	Bihar Animal Sciences University, Patna	4-6th February, 2019	Dr. D. Hemadri Dr. V. Balamurugan Dr. G. Govindaraj
11	SAMARTH - Innovation and Incubation Induction Workshop	ICAR-IARI, New Delhi	11-13th February, 2019	Dr. G. B. Manjunathareddy Dr. Yogisharadhya R
12	Conference: One-Health India Conference 2019	New Delhi	18-19th February, 2019	Dr. B. R. Shome, Dr. R.Shome Dr. M.M. Chanda Dr. M. Nagalingam
13	14th Agricultural Science Congress	IARI, New Delhi	20-23rd February, 2019	Dr. G. Govindaraj Dr. M.M. Chanda
14	Symposium: XVI National Symposium of IAVPHS	Nagpur Veterinary College, Nagpur	26-27th February, 2019	Dr. P. Krishnamoorthy Dr. Balamurugan V Dr. Nagalingam M
15	Seminar: International Seminar on Animal Agriculture for Doubling the Farmer's Income: Technology, Policy and Strategy Options.	Veterinary College, AAU, Guwahati	27-28th February, 2019	Dr. R. Shome
16	Conference: 7th Pan Commonwealth Veterinary Conference	ICAR-NIANP Bengaluru	3-7th March, 2019	Dr. Balamurugan V Dr. K.P. Suresh Dr. SB Shivachandra Dr. J Hiremath Dr. G. B. Manjunatha Reddy Dr. Yogisharadhya R
17	IDSP Southern States Regional Review meeting workshop	Bengaluru	29th March, 2019	Dr.V.Balamurugan
18	Workshop: Innovation & Incubation Induction program, a Phase-2 SAMARTH programme	ICAR-IARI, New Delhi.	8-9th May, 2019	Dr. S.B. Shivachandra Dr. R. Yogisharadhya
19	Meeting: NASF Project Evaluation Meeting	ICAR, NASC Complex, New Delhi	10th May, 2019	Dr. S.B. Shivachandra
20	MDP on Leadership Development	ICAR-NAARM, Hyderabad	11-22nd June, 2019	Dr. P.P.Sengupta

21	Training: Management Development Programme on 'Business Plan Development and Accelerating FPOs/FPCs'	ICAR-NAARM, Hyderabad, Telangana	13th to 18th June, 2019	Dr. S.B. Shivachandra
22	Workshop on the Role of Veterinarians in augmenting the farmer's income for rural prosperity organized by Karnataka Veterinary Association (KVA)	UAS, Bengaluru	20-21st July, 2019	Dr S S Patil
23	Training: SAARC regional Training on Molecular Diagnosis and Laboratory Surveillance of PPR	BLRI, Savar DHAKA, Bangladesh	21-26th July, 2019	Dr.V. Balamurugan
24	Indo-UK Project on AMR: Social Science Training Program	NDRI, Bengaluru	29th July- 2nd August, 2019	Dr. B. R. Shome Dr. G. Govindaraj
25	Mid-term review meeting of ICAR-ILRI projects	ILRI, New Delhi	25th August, 2019	Dr. V.Balamurugan
26	FAO funded ICMR-ICAR Antimicrobial resistance surveillance hands on workshop	CMC Vellore	9-11th September, 2019	Dr. B. R. Shome Dr. P. Krishnamoorthy
27	Pashu Arogya Mela 2019	Pandit Deen Dayal Upadhyaya Pashu Chikitsa Vigyan University, Mathura, UP	11-12th September, 2019	Dr. M. Nagalingam Dr. Yogisharaddhya
28	2nd Annual review meeting of INFFAR held at Kolkata	Kolkata	19th September, 2019	Dr. B. R. Shome
29	Workshop and Annual review meeting of ZTMU/ITMU	NASC, New Delhi	4-5th October, 2019	Dr. M. Nagalingam
30	Seminar:National Seminar on AMR in Indian Fisheries: Measures of mitigation	ICAR-CIFT, Cochin	07-08th November, 2019	Dr. G. Govindaraj Dr. M. Nagalingam Dr. A. Prajapati
31	Workshop: RTI training for PIOs	Institute of Secretariat Training and Management (ISTM), New Delhi	17-18th November, 2019	Dr.R.Sridevi

32	Veterinary Pathology Congress-2019	Vety College Mizoram	6-8th November, 2019	Dr. P. Krishnamoorthy Dr. GBM Reddy
33	Second *Peste des petits ruminants* - Global Research and Expertise Network (PPR GREN) meeting	ILRI, Nairobi, Kenya	13-15th November, 2019	Dr.V.Balamurugan
34	International Conference on Current Scenario and Future Strategies of Disease Control for Augmenting Livestock and Poultry Productivity under Changing Climatic Scenario	Vety. College, Namakkal	20-22nd November, 2019	Dr. P.P. Sengupta Dr. J. Hiremath Dr. R. Sridevi Dr. M. Nagalingam Dr. Siju Susan Jacob
35	International workshop on One health	Manipal	21st November, 2019	Dr.V.Balamurugan
36	Workshop: ABI Review and Planning Workshop	ICAR-IARI, New Delhi	18-20th Nov, 2019	Dr. S.B. Shivachandra Dr. R. Yogisharadhya
37	Awareness programme for farmers and in schools as a part of World Antibiotic Awareness Week 2018	Madapanalli (Milk producer's society)	23rd November, 2019	Dr. B. R. Shome
38	Conference:89th Annual Session of National Academy of Sciences India (NASI) and Symposium	ICAR-NAARM, Hyderabad, Telangana	21-23rd December, 2019	Dr. S.B. Shivachandra

Award / Fellowship / Recognition

1. ICAR-NIVEDI received Swachhata Pakhwada Award-2018 of ICAR.
2. Dr. G. Govindaraj, Senior Scientist, ICAR-NIVEDI received Hari Om Ashram Trust Award 2018 of ICAR.
3. Dr. P.P.Sengupta, Principal Scientist has been awarded Fellow by National Academy of Agricultural Sciences, New Delhi.
4. Dr. R. Shome, Principal Scientist, awarded IAAVR Fellow during 2019.
5. ICAR-NIVEDI received appreciation certificate from Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR for implementing ICAR Research data management guideline and uploading all the publications and technologies in KRISHI portal.
6. Dr. S.S. Patil, Principal Scientist bestowed with "Nakul Award-2019 (Best Veterinarian Award)" by Karnataka Veterinary Association, Government of Karnataka on 21st July, 2019.
7. Best Research Paper Presentation award in International Conference on Current Scenario and Future Strategies of Disease Control for Augmenting Livestock and Poultry Productivity under Changing Climatic Scenario at Vety. College, Namakkal during 20-22nd November, 2019 (Hiremath et al.,2019).

8. Best Research Paper Presentation award in International Conference on Current Scenario and Future Strategies of Disease Control for Augmenting Livestock and Poultry Productivity under Changing Climatic Scenario at Vety. College, Namakkal during 20-22nd November, 2019 (Pavithra et al.,2019).

9. Best Research Paper Presentation award in International Conference on Current Scenario and Future Strategies of Disease Control for Augmenting Livestock and Poultry Productivity under Changing Climatic Scenario at Vety. College, Namakkal during 20-22nd November, 2019 (Sudhagar et al.,2019).

10. Best poster award in PCVC-2019 held at ICAR-NIANP, Bengaluru during 3-7th March, 2019 (Yogisharadhya et al., 2019).

11. Best poster presentation award in National congress of Veterinary Parasitology held at CoVS, Tirupati during 28-30th January, 2019 (Dheeraj et al., 2019).

12. Best oral presentation award in National congress of Veterinary Parasitology held at CoVS, Tirupati during 28-30th January, 2019 (Shamshad et al., 2019).

Miscellaneous

Research Advisory Committee (RAC)

Name and Address	Position
Dr. C. Balachandran, VC, TANUVAS, Chennai-600 051, Tamil Nadu	Chairman
Dr. Parimal Roy, Director	Member
Prof. Gaya Prasad, VC, SVPUAT, Meerut- 250110, Uttar Pradesh	Member
Dr. K. Kumanan, Prof. & Head, Dept. of Bioinformatics, MVC, TANUVAS, Chennai-600 051, Tamil Nadu	Member
Dr. K. Prabhudas, Former Director, PD_ADMAS, Hyderabad- 500 016, Telengana	Member
Dr. Manoj V Murhekar, Director & Scientist G, ICMR-NIE, Chennai-600 077, Tamil Nadu	Member
Dr. V.V.S. Suryanarayana, Retd. Principal Scientist, ICAR-IVRI, Visakhapatnam-530040, Andra Pradesh	Member
Dr. Manoj Raje, Chief Scientist, CSIR-IMT, Chandigarh-160 036	Member
Dr. Ashok Kumar, ADG (AH), ICAR, Krishi Bhavan, New Delhi-110 001	Member
Shri Mallappa Gowda, Progressive farmer,Saraswathipuram, Mysuru-570009, Karnataka	Member
Shri Ashok Allapur, Progressive farmer, Sindhagi,-586128, Vijayapura, Karnataka	Member
Dr. V. Balamurugan, Principal Scientist	Member
Shri Ashok Allapur, Progressive farmer, Sindhagi,-586128, Vijayapura, Karnataka	Member
Dr. V. Balamurugan, Principal Scientist	Member Secretary

XI RAC meeting held on 2nd March, 2019

Institute Management Committee (IMC)

Name and Address	Position
Dr. Parimal Roy, Director	Chairman
Dr. Ashok Kumar, ADG (AH), ICAR, New Delhi	Member
Dr. B.C. Ghosh, Principal Scientist, ICAR-NDRI, Bengaluru	Member
Dr. A.K. Samanta, Principal Scientist, ICAR-NIANP, Bengaluru	Member
Dr. B. P. Srinivasa, Principal Scientist, ICAR-IVRI, Bengaluru	Member
Dr. P. K. Rout, Principal Scientist, CIRG, Makhdoom	Member
Sh. Mallappa Gowda, Mysore	Member
Sh. Ashok Allapur, Vijayapura	Member
Sh. Vijaya Kumar, AF& AO	Member
Sh. Raghuraman V, AO	Member Secretary

Institute Management Committee (IMC) meeting held on 8th May, 2019 at ICAR-NIVEDI, Bengaluru

PME cell

Name and Address	Position
Dr. P. P. Sengupta, Principal Scientist	Nodal officer
Dr. V. Balamurugan, Principal Scientist	Co-Nodal officer
Dr. G. Govindaraj, Senior Scientist	Co-Nodal officer
Dr. M. Nagalingam, Scientist	Co-Nodal officer
Dr. Siju Susan Jacob, Scientist	Co-Nodal officer
Dr. A. Prajapati, Senior Technical Officer	Co-Nodal officer

Intellectual Technology Management Committee (ITMC)

Name and Address	Position
Dr. Parimal Roy, Director	Chairman
Dr. Divakar Hemadri, Principal Scientist	Member
Dr. K. P. Suresh, Principal Scientist	Member
Dr. P. P. Sengupta, Principal Scientist	Member
Dr. B. P. Sreenivasa, Principal Scientist, ICAR-IVRI, Bengaluru	Member
Dr. G. Govindaraj, Senior Scientist	Member
Dr. M. Nagalingam, Scientist	Member Secretary

Institute Technology Management Committee (ITMC) meetings were conducted on 29th July and 23rd November, 2019

Institutional Animal Ethics Committee (IAEC)

Name and Address	Position
Dr. Parimal Roy, Director	Chairman
Dr. R. K. Shakthi Devan, Syngene International Limited, Bengaluru	CPCSEA Nominee
Dr. Jagadeesh S, Professor , Department of veterinary pharmacology and toxicology, Veterinary College, Bengaluru	Link Nominee
Dr. Shivakumar, Head, Technical & Labs, Provimi Animal Nutrition India Ltd, Bengaluru	Scientist from outside the institute
Dr. R. G. Prakash, Senior Technical Officer, JNCASR, Jakkur, Bengaluru	Socially Aware Nominee
Dr. B. R. Shome, Principal Scientist	Biological Scientist
Dr. V. Balamurugan, Principal Scientist	Scientist of different discipline
Dr. Siju Susan Jacob, Scientist	Veterinarian
Dr. P. Krishnamoorthy, Senior Scientist	Member Secretary

14th Institutional Animal Ethics Committee (IAEC) meeting of ICAR-NIVEDI held on 10th June, 2019

Women's cell

Name and Address	Position
Dr. Rajeswari Shome, Principal Scientist	Chairperson
Dr. R. Sridevi, Scientist	Member
Dr. G. Govindaraj, Senior Scientist	Member
Dr. V. Raghuraman, Administrative Officer	Member
Dr. Siju Susan Jacob, Scientist	Member Secretary

IBSC Committee

Name and Address	Position
Dr. Parimal Roy, Director, ICAR-NIVEDI, Bengaluru	Chairman, IBSC
Dr. Suresh H Basagoudanavar, Sr. Scientist, ICAR-IVRI, Bengaluru	DBT Nominee
Dr. N. Ravi Sundaresan, Asst. Professor, Deptt. of Microbiology and Cell Biology, IISc, Bengaluru	Outside Expert
Dr. Sankey Srinivas, Chief Medical Officer, ICAR-IVRI, Bengaluru	Biosafety Officer
Dr. Divakar Hemadri, Pr. Scientist, ICAR-NIVEDI, Bengaluru	Internal Members
Dr. G. B. Manjunatha Reddy, Scientist, ICAR-NIVEDI, Bengaluru	
Dr. M. Nagalingam, Scientist, ICAR-NIVEDI, Bengaluru	
Dr. Jagadish Hiremath, Sr. Scientist, ICAR-NIVEDI, Bengaluru	Member Secretary

7th IBSC meeting of ICAR-NIVEDI held on 12th July, 2019

Hindi Implementation Committee

Name and Address	Position
Dr. Parimal Roy, Director	Chairman
Dr. Divakar Hemadri, Principal Scientist	Co-Chairman
Dr. Rajeswari Shome, Principal Scientist	Member
Dr. Manjunatha Reddy, Scientist	Member
Sh. A.Vijay Kumar, AF&AO	Member
Dr. Awadhesh Prajapati, Senior Technical Officer	Member secretary

DISTINGUISHED VISITORS

1. Dr. Joykrushna Jena, DDG (Fisheries Science & Animal Science), ICAR, New Delhi
2. Dr. Praveen Malik, Animal Husbandry Commissioner, DAHD, New Delhi
3. Shri. Atul Chaturvedi, Secretary (AHD), DAHD, New Delhi
4. Dr. C. Balachandran, Vice Chancellor, TANUVAS, Chennai
5. Dr. Gaya Prasad, Vice Chancellor, Sardar Vallabhai Patel University of Agriculture and Technology, Meerut
6. Dr. H.D. Narayanaswamy, Vice-Chancellor, KVAFSU, Bidar
7. Dr. Y. Haribabu, Vice-Chancellor, SVVU, Tirupati
8. Dr. M.R. Saseendranath, Vice-Chancellor, KVASU, Pookode
9. Dr. Manoj V Murhekar, Director and Scientist G, National Institute of Epidemiology (ICMR), Chennai
10. Dr. Rajesh Bhatia, Regional Consultant, FAO, India
11. Dr. A.K. Samanta, Senior Program Specialist (Livestock), SAARC Agriculture Centre (SAC), Dhaka, Bangladesh
12. Dr. Ashok Kumar, ADG (AH), ICAR, New Delhi
13. Dr. Meghna Desai, Country Director, CDC
14. Ms. Laura Shelby, Deputy Director, CDC
15. Dr. R. Rajasekahar, Founder Director, ICAR-NIVEDI
16. Dr. Srinivas Reddy, Director, KSNDMC, Bengaluru
17. Dr. Raghavendra Bhatta, Director, ICAR-NIANP, Bengaluru
18. Dr. M.J. Chandre Gowda, Director, ICAR-ATARI, Bengaluru
19. Dr. Byregowda, Director, IAH&VB, Bengaluru
20. Dr. Simmi Tiwari, Deputy Director, NCDC, New Delhi
21. Dr. Ajit Shewale, Assistant Director, NCDC, New Delhi
22. Dr. Umesh Alavadi, USAID Consultant, USA
23. Dr. L. D. Kithsiri, Director, Public Health Veterinary Service, Sri Lanka
24. Dr. Aniket Sanyal, Joint Director, IVRI Campus, Bengaluru
25. Dr. N. K. Shukla, Deputy Director, Livestock Development Department, Chhattisgarh
26. Dr. Sanjay Pawar, Senior Livestock Development Officer, DIS, Pune
27. Dr. K. Kumanan, Professor and Head, ARIS cell, Madras Veterinary College, Chennai
28. Dr. Utpal S. Tatu, Professor, Department of Biochemistry, IISc, Bengaluru
29. Dr. P. Marimuthu, Prof. & Head, Department of Biostatistics, NIMHANS, Bengaluru.
30. Dr. V. V. S. Suryanarayana, Retd. Principal Scientist, ICAR-IVRI, Bengaluru

31. Dr. Manoj Raje, Chief Scientist, CSIR-Institute of Microbial Technology, Chandigarh
32. Dr. Anjali A. Karande, Professor, Department of Biochemistry, IISc, Bengaluru
33. Dr. R. Raghavan, Former Prof. & Head, Veterinary College, Bengaluru.
34. Dr. K.V. Halagappa, Additional Director (Development), DAH&VS, Govt. of Karnataka
35. Dr. T. S. Manju, Additional Director (Livestock Health), DAH&VS, Govt. of Karnataka
36. Dr. Sajjan Shetty, Additional Director, DoH&FWS, Government of Karnataka
37. Dr. Latha S, Deputy Director, State Surveillance Unit, Karnataka
38. Dr. Jyoti Misri, Principal Scientist (Animal Health), ICAR, New Delhi
39. Dr. Kamini Walia, Scientist F, ICMR, New Delhi
40. Dr. Sudha Mysore, CEO, Agrinnovate India, New Delhi
41. Dr. K.P. Ramesha, Station Head, SRS NDRI, Bengaluru
42. Dr. Mohan Papanna, Public Health Specialist, CDC, India

STAFF POSITION (2019)

Name	Designation
Dr. Parimal Roy	Director (RMP)
Scientific Staff	
Dr. B.R.Shome	Principal Scientist
Dr. (Mrs) R.Shome	Principal Scientist
Dr. D. Hemadri	Principal Scientist
Dr. P.P. Sengupta	Principal Scientist
Dr. K.P. Suresh	Principal Scientist
Dr.V. Balamurugan	Principal Scientist
Dr. S.S. Patil	Principal Scientist
Dr. Sathish B Shivachandra	Principal Scientist
Dr. G. Govindaraj	Senior Scientist
Dr. Jagadish Hiremath	Senior Scientist
Dr. P. Krishnamoorthy	Senior Scientist
Dr. (Mrs.). R. Sridevi	Scientist
Dr. Md. Muddassar Chanda	Scientist
Dr. M. Nagalingam	Scientist

Dr. G. B. Manjunatha Reddy	Scientist
Dr. Narayanan G	Scientist
Dr. (Mrs.) Siju Susan Jacob	Scientist
Dr. C. S. Sathish Gowda	Scientist
Technical Staff	
Dr. R.Yogisharadhya	Senior Technical Officer
Dr. Awadesh Prajapati	Senior Technical Officer
Administrative Staff	
Sh. V. Raghuraman	Administrative Officer
Sh. Rajeevalochana	Assistant Administrative Officer
Sh. A.Vijay Kumar	Assistant Finance & Accounts Officer
Sh. N. Narayanaswamy	Assistant
Smt. A. Saranya	Stenographer Grade-III
Mr. K.Vijayraj	Stenographer Grade-III
Smt. G. C. Sridevi	Lower Division Clerk
Sh. Gangadhareshwara L	Lower Division Clerk
Skilled Supporting Staff	
Sh. M. K. Ramu	Skilled Support Staff
Sh. B. Hanumantharaju	Skilled Support Staff
Mr. H. S. Umesh	Skilled Support Staff

Joined/transferred/promoted

1. Dr. C. S. Sathish Gowda, Scientist (Agricultural Economics) transferred from ICAR-Indian Agricultural Research Institute, New Delhi and joined ICAR-NIVEDI on 18th November, 2019.
2. Dr. Narayanan G, Scientist (Agricultural Extension) transferred from ICAR- Directorate of Groundnut Research, Junagadh, Gujarat and joined ICAR-NIVEDI on 25th November, 2019.
3. Dr. Siju Susan Jacob, Scientist promoted from Level 10 (Grade pay Rs. 6,000/-) to Level 11 (Grade pay Rs. 7,000/-) under CAS w. e.f. 1st January, 2019.

BUDGET

Revised Estimate and Expenditure of ICAR- NIVEDI (2019-20)

(in lakh rupees)

Major Heads	Plan	
	Revised Estimate	Expenditure
Grants for creation of capital assets (Capital)		
Works	0.00	0.00
Equipments	113.95	93.54
Information Technology	4.53	4.30
Library Books & Journals	0.00	0.00
Vehicles & Vessels	0.00	0.00
Furniture & Fixture	4.52	4.18
Grant in Aid-Salaries (Revenue)		
Establishment Expenses (Salaries)	647.06	646.59
Grants in Aid –General (Revenue)		
Travelling Allowances	18.75	18.74
Research & Operational Expenses	170.89	170.90
Administrative Expenses	286.70	286.69
Miscellaneous Expenses	12.21	11.64
AICRP on ADMAS	126.45	126.45
SCSP	33.00	33.00
Grand Total	**1418.06**	**1396.03**

Revenue Receipts (2019-20)

(in lakh rupees)

Description	Amount
Licence Fee	1.92
Interest earned from loans & advances	0.00
Interest earned from short term deposits	37.38
Interest earned from Training	0.69
Income generated from sale of kits	5.74
Miscellaneous receipts	28.53
Total	**74.26**

NIVEDI Activities

Awards/Recognitions

ICAR-NIVEDI received Swachhata Pakhwada Award-2018 (Third Prize) from Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR during ICAR Foundation day celebrations on 16th July, 2019

Dr.S.S. Patil, Principal Scientist bestowed with 'Nakul Award-2019 (Best Veterinarian Award)' by Karnataka Veterinary Association, Government of Karnataka on 21st July, 2019.

Dr. G Govindaraj, Senior Scientist, ICAR-NIVEDI received Hari Om Ashram Trust Award 2018 of ICAR from Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR during ICAR Foundation day celebrations on 16th July, 2019

Dr. Rajeswari Shome received Fellow of National Association of Veterinary Sciences (NAVS) -2019 at 18th Annual Convocation cum Scientific Convention on Futuristic Technologies in Animal Health and Production held during December 26-27th , 2019 at Gandhinagar, Gujarat

ICAR-NIVEDI received appreciation certificate from Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE and DG, ICAR for implementing ICAR Research data management guidelines and uploading all the publications and technologies in KRISHI portal during 4th Nodal Officers workshop held at NASC, New Delhi on 10th December, 2019

Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR released the Bluetongue forewarning mobile app developed for district level forewarning in Karnataka state during the inaugural function of 7thAnnual review workshop of NICRA project held at NASC, New Delhi on 17th December, 2019

Institutional activities

The launching of "Pradhan Mantri Kisan Samman Nidhi (PMKISAN)" scheme by Hon'ble Prime Minister of India Shri Narendra Modi was webcasted to farmers at ICAR-NIVEDI on 24th February, 2019

The 19th Institute Foundation day of ICAR-NIVEDI was celebrated on 1st July, 2019

The 70th Republic day was celebrated at ICAR-NIVEDI on 26th January, 2019

ICAR-NIVEDI observed National Productivity Week during 12-18th February, 2019

ICAR-NIVEDI celebrated the International Women's Day on 8th March, 2019

ICAR-NIVEDI organized Annual health check-up for the staff members on 19th March, 2019

The second Surveillance Audit of ISO 9001: 2015 was conducted at ICAR-NIVEDI on 30th May, 2019

ICAR-NIVEDI celebrated the International Yoga day on 21st June, 2019

ICAR-NIVEDI celebrated 150th Birth Anniversary of Mahatma Gandhiji on 2nd October 2019

Director administered National Unity day pledge to the staff members on 31st October, 2019

Vigilance awareness week was celebrated at ICAR-NIVEDI during 28th October to 2nd November, 2019

ICAR-NIVEDI participated in the ICAR Southb Zone sports tournament organized by ICAR Central Institute for Fisheries Technology, Cochin held during 4-8th November, 2019

Kannada Rajyotsava was celebrated at ICAR-NIVEDI on 15th November, 2019

ICAR-NIVEDI celebrated Kisan Diwas on 23rd December, 2019

Celebration of 70th anniversary of adoption of constitution of India: Educating about Fundamental Duties 51-A to the farmers of Madakur Village of Hessarghatta Hobli, Bengaluru 23rd December, 2019

Distinguished Visitors

Dr. Joykrushna Jena, DDG (AS), ICAR visited ICAR-NIVEDI on 20th May, 2019

Shri Atul Chaturvedi, Secretary, DAHD, New Delhi visited ICAR-NIVEDI on 7th October, 2019

Exhibitions

ICAR-NIVEDI participated in the exhibition organized during 14th Agricultural Science Congress held at IARI, New Delhi during 20-23rd February, 2019

ICAR-NIVEDI participated in Pashu Arogya Mela 2019 held during 11-12th September, 2019 at Mathura

ICAR- NIVEDI participated Krishi Mela held at ICAR-IIHR, Bengaluru during 23-25th January, 2019

Meetings

13th Institute Research Committee (IRC) meeting of ICAR-NIVEDI was held on 26th April, 2019

Mid-term Institute Research Committee (IRC) meeting of ICAR-NIVEDI was held on 10th December, 2019

27th Annual Review meeting of All India Coordinated Research Project on Animal Diseases Monitoring and Surveillance (AICRP on ADMAS) was held at ICAR-NIVEDI during 1-2nd December, 2019

ICAR-NIVEDI organised the FAO-ICMR-ICAR project review meeting on Antimicrobial resistance surveillance on 18th January, 2019

CDC project review was conducted at ICAR-NIVEDI on 19th August, 2019

Meeting with CDC (India) Country Director Dr. Meghna Desai, Ms Laura Shelby, Dr. Papanna Mohan, scientists and team members at ICAR-NIVEDI, Bengaluru to review progress of the project.

Meeting of Internal Evaluation Committee for validation of seromonitoring and serosurveillance of FMD and Brucellosis under National Animal Disease Control Programme held on 11th October 2019 at ICAR-NIVEDI, Bengaluru

Capacity building programmes

ICAR-NIVEDI organized ICAR short course on 'An update of molecular and advanced approaches for the diagnosis of parasitic diseases in animals' during 2-11th January, 2019

ICAR-NIVEDI organized an Awareness programme on J-GATE@CeRA for users by Mr.B.Ravishankar, Informatics India Limited, Bengaluru on 17th January, 2019

ICAR-NIVEDI organized 'Field Veterinary Epidemiology' training to the Veterinarians from Chhattisgarh state sponsored by Livestock Development Department, Government of Chhattisgarh held during 11-15th February and 12-16th March, 2019

ICAR-NIVEDI organized two days training programme on 'Research methodology and Biostatistics' during 13-14th July, 2019

SAARC Agricultural Centre, Bangladesh sponsored Regional Training programme on 'Laboratory biosafety and biosecurity for handling transboundary animal diseases and zoonotic emerging pathogens' was organized at ICAR-NIVEDI, Bengaluru during 19-24th August, 2019

ICAR-NIVEDI conducted sensitization workshop on Technology commercialization by Agrinnovate India Limited, New Delhi on 27th August, 2019

ICAR-NIVEDI organized training programme on 'Hands-on training in laboratory diagnosis of leptospirosis' sponsored by National Centre for Disease Control (NCDC), New Delhi during 14-18th October, 2019

ICAR sponsored training programme cum workshop on 'Risk factors and economic impact analysis of zoonotic diseases' was organized at ICAR-NIVEDI, Bengaluru during 18-20th December, 2019

Infrastructure

Training cum Farmers' Hostel

Laboratory Block

MAKE IN INDIA

Digital India
Power To Empower

स्वच्छ भारत
एक कदम स्वच्छता की ओर

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

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Published by

Director

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

Post Box No.6450, Ramagondanahalli, Yelahanka, Bengaluru-560064, Karnataka, India.
Ph: +91-80-23093110, 23093111, Fax: +91-80-23093222
Website: www.nivedi.res.in, Email: director.nivedi@icar.gov.in