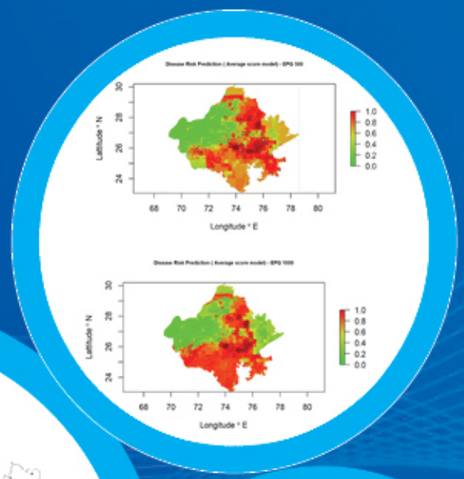
ANNUAL REPORT
2018-19



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ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (ICAR–NIVEDI)
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Annual Report
2018-19

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

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The Director and staff of ICAR-National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI) express their sincere gratitude to Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE and Director General, ICAR for his vision, constant guidance and generous support.

ICAR-NIVEDI family also thankful to Dr. J.K. Jena, Deputy Director General (Animal Science) (Acting) and Dr. Ashok Kumar, Assistant Director General (Animal Health) for cooperation, encouragement and support.

Our sincere thanks to the Directors and Heads of ICAR institutes located in Bengaluru and KVAFSU, Bidar, Karnataka for their co-operation and logistics support from time to time.

The institute conveys sincere thanks to all the principal investigators of AICRP on ADMAS and respective State Animal Husbandry Departments and Universities for their valuable inputs, suggestions and cooperation. I sincerely thank all the staff members of ICAR-NIVEDI for their timely support in executing various activities.

Jai Hind!

(Parimal Roy)
Director

EXECUTIVE SUMMARY

During 2018-19, the newly constructed Training cum Farmers Hostel and Laboratory Block was inaugurated by Hon'ble Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (ICAR) in the presence of DDG (AS) and ADG (AH) on 30th June 2018.

During the period reported upon, 'ADMaC mobile app' that provides information on various diseases in North Eastern states was developed and a 'Mobile app' that provides information on haemonchosis for Rajasthan has been initiated for the benefit of various stakeholders. A total of 54 kits (36 Brucellosis, 13 Infectious Bovine Rhinotracheitis kits and five *Leptospira* staining kit) were supplied to different stakeholders and generated a revenue of INR 7.74 lakh for the year 2018-19.

The monthly disease outbreaks occurrence in various states at district level were predicted two months in advance using combined outputs from Logistic Regression Model, Gradient Boosting and Random Forest Models and were categorized into six risk levels. A forecasting bulletin is prepared based on the above results and sent to all the State Animal Husbandry Department and DAHD, Government of India for initiating preventive action. Further, during this period, animal disease prediction for Karnataka state at the block level was pilot tested and the predicted results were communicated through auto-messaging to field veterinarians working in various blocks to undertake preventive measures in the villages under their jurisdiction.

During this period, the countrywide seroprevalence of Bluetongue and Brucellosis were estimated out of 25275 serum samples collected as per sampling plan. The results revealed Bluetongue seroprevalence of 58% and 43% in goats and sheep with higher prevalence in southern states. The Brucellosis seroprevalence was 5% and 11% in goats and sheep, respectively. Out of 8645 serum samples screened for PPR from eight states and two UT indicated highest population immunity was in Telangana (86.95%) followed by Maharashtra (73.23%), Andhra Pradesh (66.39%), Karnataka (64.30%), Chhattisgarh (51.6%). A total of 5480 bovine sera samples from various states tested for IBR antibody revealed an overall prevalence of 37.8% with highest prevalence in Mizoram (73.3%). Under OPZD project, the screening for Leptospirosis, Toxoplasmosis and Q fever revealed a positivity of 49%, 14% and 43%, respectively. The all India risk maps for Bluetongue and Anthrax with high accuracy (Kappa; 0.68, Sensitivity; 0.97, Specificity: 0.96) and validation statistics (Kappa; 0.63, Sensitivity; 0.9, Specificity: 0.87) have been developed. The severity of haemonchosis in Rajasthan based on Eggs Per Gram (EPG) were mapped.

A Fluorescence Polarisation Assay (FPA) developed for Brucellosis with high sensitivity and specificity having DIVA potential. The ELISA for sheep and goat pox and *T. solium* cysticercosis are in process of standardization. During 2018-19, the work on development of diagnostics for fasciolosis, Porcine Respiratory Disease Complex, Classical Swine Fever (CSF) and Leptospirosis has been initiated. Anti Microbial Resistance (AMR) evaluated across bovines, sheep, goat, poultry, pig and animal handlers (n=1526) in milk, fecal, nasal, rectal and hand swab samples and recorded isolates of 55 methicillin resistant and 87 ESBL producers. The economic loss assessment of sheep and goat pox in Karnataka revealed mean mortality loss of INR.3094 and INR.7889 per animal in sheep in less than one year old and more than one year old, whereas, in goats, it was INR.1067 and INR.2617 per animal, respectively.

During the period reported upon, the international collaborative projects from Medical Research Council, UK project on 'Minimizing the impacts of emerging zoonotic diseases'; DBT Indo-UK project on 'Does AMR in livestock contribute to AMR in people NE India an interdisciplinary study' and FAO project on 'Integrated surveillance of AMR in food providing animals, food of animal origin and their environment' and ICAR-ILRI project on 'Economic impact of priority diseases in India' were initiated.

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 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 disease sand 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 are regularly reported in most of the states with varying intensity. Since, there is no control programme for HS in India, understanding the spatial and temporal patterns of outbreaks using statistical models forms the basis for developing appropriate prevention and control strategy. Different statistical methods were employed to identify the spatial and temporal patterns of HS outbreaks. In general, decreasing trend in numbers of outbreaks were observed (Fig. 1), with seasonality detected in all the zones. HS outbreaks reporting indicated occurrence of the disease independently in different states.

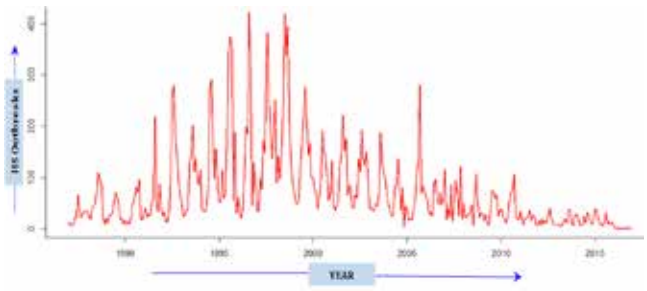


Fig. 1: Trend line of HS outbreaks in India from 1987 to 2016

During the period reported upon, 218 suspected clinical specimens such as blood, nasal swabs and tissue samples (heart, liver, spleen, bone marrow) from sheep/ goat/ cattle/ buffaloes/ pigs from Karnataka, Odisha, Andhra Pradesh, Assam state were screened for presence of *P. multocida* by conventional methods as well as PM specific PCR assay. A total of 56 samples were found positive for *P. multocida* in PM-PCR assay (~460 bp product). Further, 20 pure bacterial cultures of *P. multocida* were obtained following mice inoculation and standard bacteriological methods. A majority of Capsular Type A isolates were recovered from different hosts. Additionally, genomic DNA of pure cultures (n=20) of *P. multocida* isolates were subjected to PCR amplification of fimbriae (ptfA). Furthermore, OMPs of reference vaccine strain; *P. multocida* B:2, strain P52, were extracted as per the standard Lauryl-sarcosine method. Further, selected recombinant proteins (rNanB/ rNanH, OmpW/L) were over-expressed in prokaryotic system and purified using affinity chromatography. All the proteins will be used for standardization of immune-diagnostics for HS.

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 103 samples suspected for sheep and goat pox were collected and screened. During outbreak investigation, various clinical signs and post-mortem lesions recorded were characteristic of sheep and goat pox. The morbid tissues were subjected for histopathology and the microscopic lesions of oedema, thickening of alveolar septa, mononuclear cell infiltration, congestion and various degrees of vascular hemorrhages, necrosis were recorded in the lungs. Further, the Capripox virus was isolated from the clinical samples (scabs, skin, lungs and swabs) with cytopathic effects such as rounding of cells, clumping and detachment of Verocells. The molecular confirmation for Capripox virus was carried out by partial P32 gene based PCR resulting 72 of the samples positive. The representative samples were sequenced for full length P32 gene. The phylogenetic analysis revealed 94.6 to 100% homology with all the other Indian Capripox virus isolates at nucleotide as well as amino acid levels. Amplification for ORF74, ORF117 and ORF122 were standardized. Cloning and over expression of ORF117 was carried out and was confirmed by colony PCR, RE digestion and PAGE. The immune reactivity was tested in rabbit immunization and also with field positive serum samples.

IPC:ANSCNIVEDISIL201700400082 Project ID: IXX13196

Epidemiological Surveillance of Transmission Foci of Fasciolosis

Siju SJ, PP Sengupta, R Yogisharadhya and A Prajapati

Fasciolosis in ruminants is caused by the *Fasciola gigantica* (liver fluke) in India and is transmitted by lymnaeid snails. A total of 27 water bodies covering 6 districts (Bengaluru, Bengaluru rural, Mandya, Ramanagara, Tumakuru and Mysuru) of Karnataka were screened for the presence of *Lymneae* snails and 208 snails were collected from 24 water bodies. Water samples analyzed for 12 parameters and high nitrate content found to favour the presence of snails. The morphological characterization of collected snails revealed shell width to length ratio as significant parameter ranging from 0.2-0.6 confirming the genus as *Radix* (*Lymnaea*). Further, molecular characterization based on ribosomal and mitochondrial regions was carried out and ITS-2 and COX1 found to be suitable for molecular taxonomy of *Radix* sp. The phylogenetic analysis revealed that the snails collected from Karnataka were forming a separate clade with *Radix* sp. and was not grouping with *R. auricularia* (Fig. 2). It is well established that *F. gignatica* infection in India is transmitted by *R. auricularia*. The present study revealed the possibilities of different *Radix* species that might be playing role in transmission of fasciolosis in Karnataka.

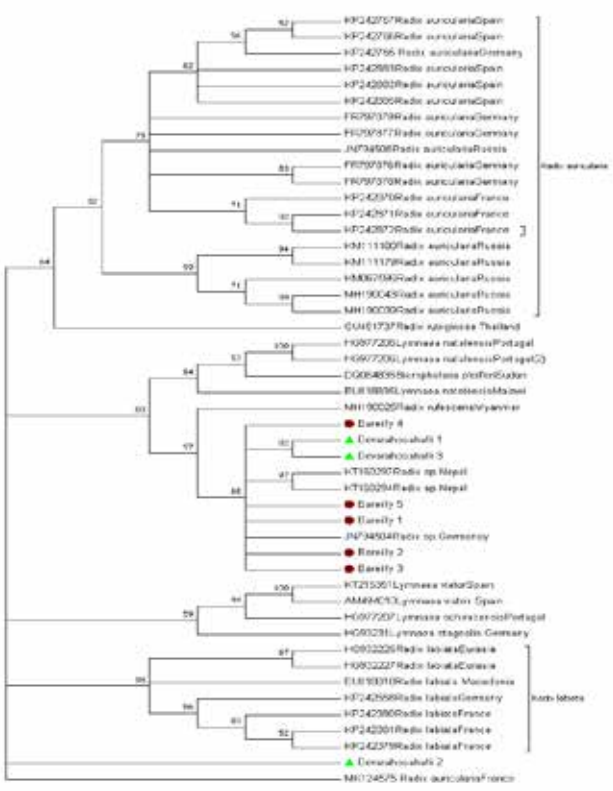


Fig. 2: Phylogenetic tree of *Radix* Spp. based on Cytochrome Oxidase 1 gene

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 Sespiratory Syndrome (PRRS) outbreaks were reported from north eastern states of India since 2013. To identify the spatial, temporal and animal risk factors, PRRS outbreak data from 2013 to 2018 was collected from Mizoram and analyzed using three different models. Identification of spatial risk factors was carried out using non-linear discriminant analysis (NLDA). Among the 20 spatial variables, maximum night time land surface temperature was significantly (100 bootstraps) associated with PRRS outbreaks (Kappa-0.87, Sensitivity-0.99 and Specificity-0.99). The temporal analysis using time series model revealed seasonal pattern with highest number of outbreaks during winter season. Among the animal level risk factors, age and sex were significant by logit model (Table 1). Further, the outbreak clusters were dependent in time and space implying a common source of infection (Fig. 3). In conclusion, land surface temperature, age and sex were the important risk factors for PRRS outbreaks.

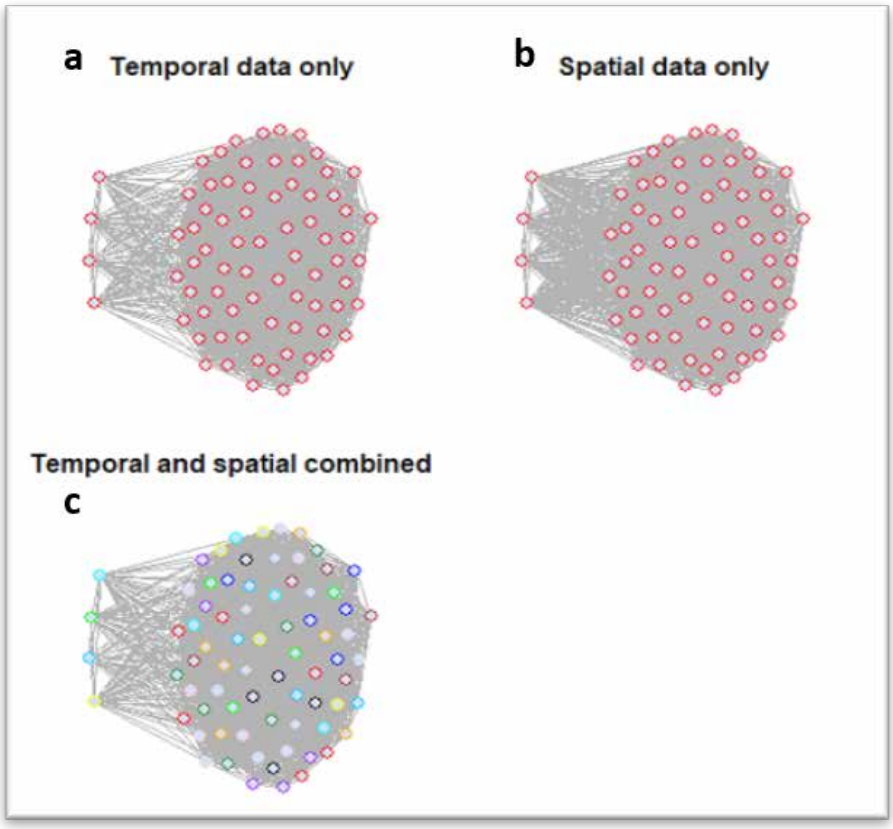


Fig. 3: Spatio-temporal dependency of PRRS outbreaks: The temporal graph (a), spatial graph (b) and combined spatial-temporal graph (c).

Table 1 : Host risk factors of PRRS

Host factors	Odds ratio	95% CI	P-Value
Sex (Female)	1.210	1.022, 1.433	0.027
Age (0-6 Vs 7-12)	2.806	2.308, 3.411	0.000
Age (0-6 Vs 12 and above)	3.371	2.609, 4.356	0.000

IPC:ANSCNIVEDISIL201500500068 Project ID: IXX12238

Development of Geographic Information System (GIS) enabled Early Warning System for Avian Influenza (AI) infection using Remote Sensing (RS)

KP Suresh, MM Chanda, R Sridevi and S Nagarajan

To understand the spatial distribution of Avian Influenza (AI) and the possible association between demographic and environmental variables, spatial epidemiological analysis was carried out. The results revealed AI outbreaks is non-random and observed in four distinct clusters as measured by Moran Index (Fig. 4&5). The details of cluster statistics is provided in Table 2.

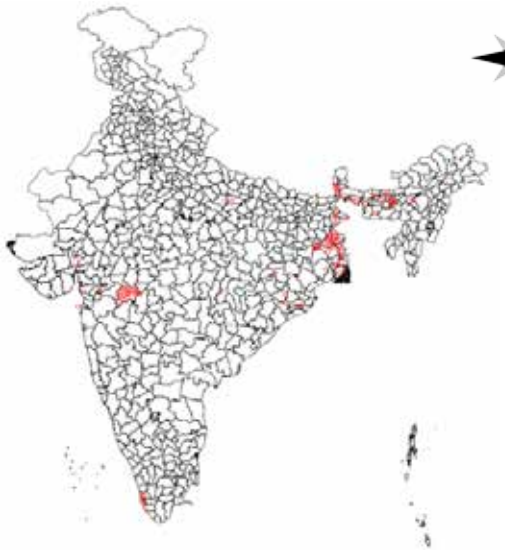


Fig. 4: Avian Influenza outbreak map

Fig. 5: AI outbreak clusters

Table 2 : Avian influenza disease cluster statistic

Clusters / Variables	1	2	3	4
Regions/states	Kerala	North East	Maharashtra state bordering Gujarat and Madhya pradesh	West Bengal
Z value	297.91	334.98	406.74	406.77
p-value	<0.01	<0.01	<0.01	<0.01
Moran I statistics	0.991	0.991	0.993	0.994
Expectation	-4.39E-05	-3.46E-05	-2.37E-05	-2.37E-05
Variance	1.11E-05	8.76E-06	5.97E-06	5.97E-06
No of Outbreaks	8	40	36	59

IPC: ANSCNIVEDISIL201500200065 Project ID:IXX12420

Disease Severity Pattern and Risk Factors Identification for PPR in Sheep and Goats in India

V Balamurugan, G Govindaraj, GB Manjunatha Reddy and R Yogisharadhya

The epidemiological risk factors that influence the incidence of PPR in Madhya Pradesh were identified based on the primary survey data using univariate and multivariate techniques. The education level, farm size, rearing pattern and vaccination awareness levels were the significant socio-economic factors for PPR occurrence in the Madhya Pradesh state.

Identification of Ecological Risk Factors for Occurrence of Anthrax in India

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

The objectives of the project were to develop risk map for occurrence of anthrax in India, temporal factors responsible for occurrence of anthrax and identification of village level risk factors. During the period under report, temporal models to analyse anthrax outbreaks in Andhra Pradesh and West Bengal were tested. The prediction on the training data and on the test data for West Bengal was performed (Fig. 6a and 6b). Spatio-temporal variability was detected for Anthrax outbreaks in Karnataka and Andhra Pradesh. The outbreak data was analyzed to identify the risk factors for inter-annual district level variability in anthrax outbreaks using statistical models for Karnataka, Andhra Pradesh and West Bengal. In spite of availability of efficacious vaccine, factors responsible for re-occurrence of anthrax outbreaks at village level are not known. Preliminary analysis using agent based models to identify important ecological risk factors for occurrence of anthrax at village level was performed. Further, all India risk map for anthrax showed high accuracy (Kappa; 0.68, Sensitivity; 0.97, Specificity: 0.96) and validation (Kappa; 0.63, Sensitivity; 0.9, Specificity: 0.87) statistics. Overall, lagged effect of temperature and rainfall were identified as important risk factors at district and state level and human population, irrigated croplands, literacy and slope were associated with anthrax at village level.

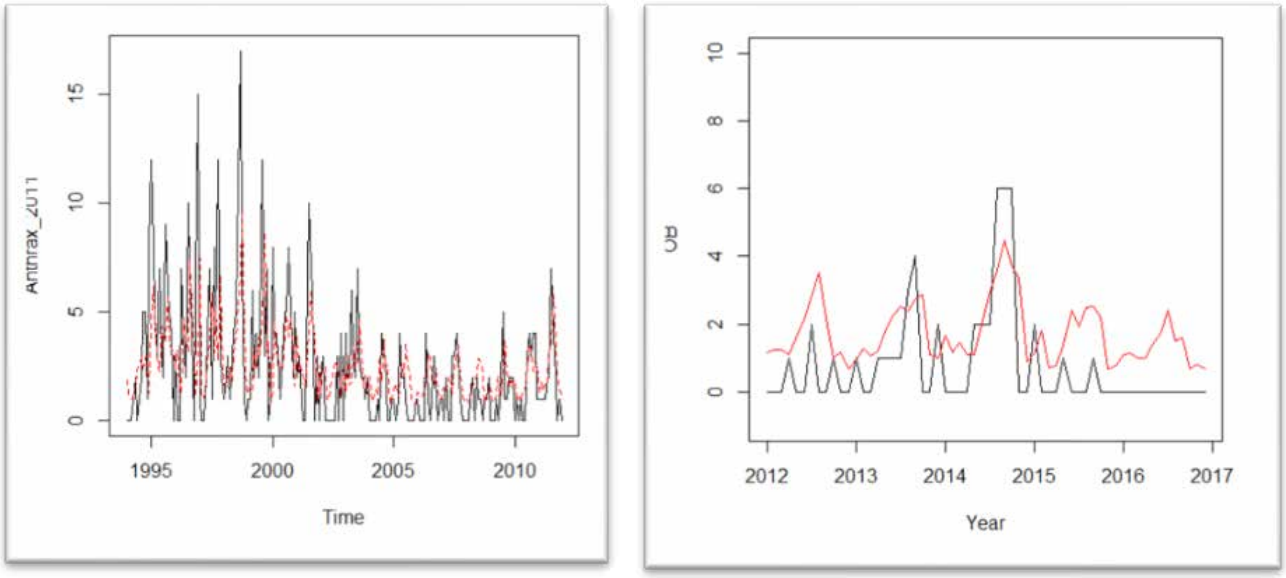


Fig. 6: (a) Model fit on the training data, black line is observed outbreaks and dotted red line is fit of the model (b) Model fit on the test data, black line is observed outbreaks and red line is fit of the model

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 R Yogisharadhya

To understand the prevalence and carrier status of *Pasteurella multocida* among sheep and goats in endemic areas of Karnataka, 105 samples were collected from small ruminants with apparently healthy and disease animals from high (Koppal), medium (Chikkaballapur) and low HS endemic (Ramnagara and Tumakuru) areas of Karnataka (Fig.7). The suspected *Pasteurella* colonies were subjected for molecular characterization, of which seven were *Pasteurella multocida.* Capsular typing revealed five isolates were capsular type A and none of the isolates were capsular type B. A pilot survey was conducted to test the developed survey tool to understand management, health and bio security aspects. Based on conventional and molecular confirmation, all the *Pasteurella multocida* isolates were from diseased sheep.

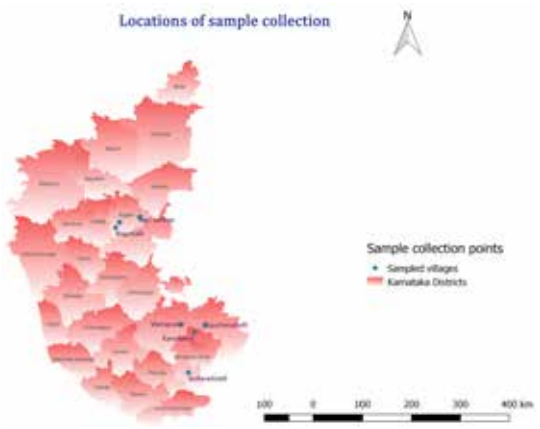


Fig.7: Spatial map depicting sampled villages

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 aims to estimate the seroprevalence of *Brucella ovis* in sheep and identification of risk attributes of ovine brucellosis. A survey schedule was prepared for determining the major risk attributes of ovine brucellosis and pilot tested in sheep flocks of Kadanoor village, Doddaballapur Taluk, Karnataka. A total of 94 serum and 32 milk samples were collected from Tumkur District, Karnataka as per the pre defined sampling plan. The serum samples were tested for *Brucella* antibodies by Rose Bengal Plate Test (RBPT) and indirect ELISA of which six and 14 samples were positive respectivley. Extraction of DNA from sheep milk was standardized and three milk samples out of 32 were positive by *Brucella* genus specific PCR (Fig. 8). During the field visits, advisory to the farmers, awareness creation among medical and paramedical staff about the zoonotic nature of brucellosis were carried out.

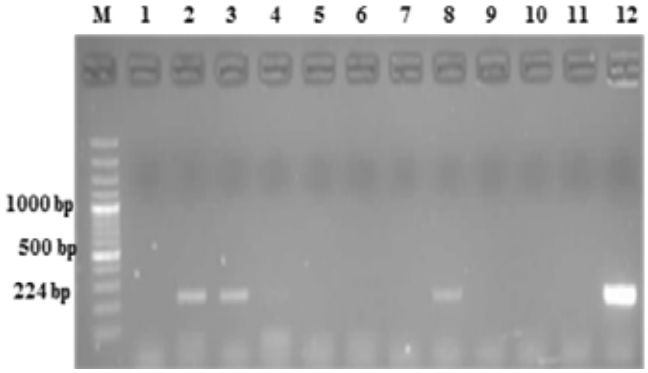


Fig. 8: Brucella genus specific PCR from sheep milk Lane M: 100 bp DNA marker; Lane 1 : Non template control (NTC); Lane 12 : *B. melitensis* 16M DNA; Lane 2, 3 and 8: PCR band showing positive samples; Lane 4 to 7 and Lane 9 to 11: Negative samples.

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 highly contagious and economically important disease of pigs. Currently indigenous kits are not available for CSFV antibodies detection. Hence, the project was undertaken to develop an assay for detection of antibodies using recombinant Erns protein. During 2018-19, RT-PCR amplified product of Erns (207 bp) was cloned into pET32a vector, transformed and expressed in *E.coli* BL21 cells which yielded 28 kDa protein and has reacted with hyperimmune sera in indirect ELISA (Fig. 9).

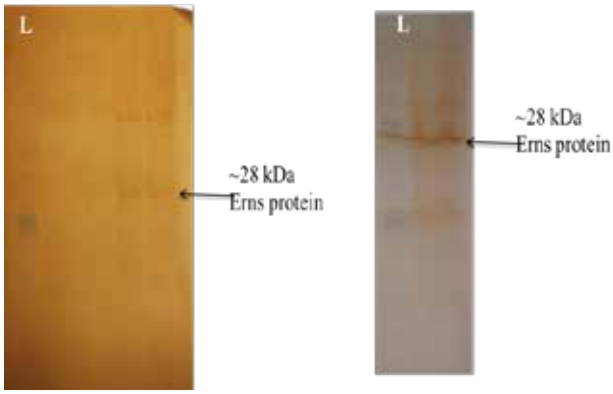


Fig. 9: Detection of Erns expressed protein (28 KDa) using positive pooled sera and hyperimmune sera

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 envisages to develop an expert system for cattle disease diagnosis using the knowledge of practicing veterinarians from different states of India. A questionnaire was developed to collect the scores for symptom/signs of thirteen diseases of cattle. A total of 140 questionnaire data was collected from Veterinarians in different states in India (Table 3). The Aiken's Value will be used for ranking the signs/ symptoms of each of the thirteen cattle disease and based on weighted matrix will be prepared.

Table 3: Details of states and number of Veterinarians from whom data was collected

State	No. of Veterinarians
Assam	15
Chhattisgarh	33
Karnataka	28
Kerala	24
AICRP on ADMAS centres	14
Puducherry	5
Tamil Nadu	21
Total	**140**

IPC:ANSCNIVEDICIP201800900099 Project ID: IXX14760

Indian Network for Fisheries and Animal Antimicrobial Resistance (INFAAR)

BR Shome, R Shome and P Krishnamoorthy

Sixty samples (23 cow milk, 9 buffalo milk, 12 poultry cloacal swabs, 14 sheep/goat rectal swabs and 2 pig rectal swabs) were collected along with relevant information through data sheet from farmers in Chikkaballapur district, Karnataka during January 2019. The survey data was processed and bacterial isolation was carried out. The isolates were identified by biochemical and molecular methods. 36 isolates were identified as *E.coli.* Out of 24 *Staphylococcus* sp, six were *Staphylococcus aureus* and 18 were CoNS isolates comprising eight *S. sciuri,* eight *S. epidermidis* and two unidentified CoNS. Antibiogram was performed for all the isolates. 13.88% and 16.66% of *E.coli* isolates were found ESBL and ACBL producers respectively by double disc synergy test. 27.77% of *Staphylococcus* (CoNS) isolates were positive for methicillin resistance by mecA PCR. The results of the pilot survey revealed the presence of AMR (ESBL, ACBL and MRSA) in different samples collected from various species of animals and poultry in the study area.

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 and R Yogisharadhaya

A primary survey was undertaken during 2018-19 to assess the loss due to sheep and goat pox in Karnataka. A total of 353 sheep and goat farms were surveyed using multistage random sampling procedure (Fig.10). The primary survey was undertaken in four districts viz Chitradurga, Bellary, Ramanagara and Chikkamagaluru. The deterministic mathematical models were developed to assess various mortality and morbidity loss incurred by farmers in the pox affected farms. The survey results revealed significant difference in pox incidence across farm size and species. Further, the disease incidence was observed more in sheep than goats during 2018-19. In sheep, the estimated mean mortality loss per animal was Rs.3094 and Rs.7889 in less than one year old and more than one year old animals, whereas, in goats it was Rs.1067 and Rs.2617, respectively. The financial loss was high in the pox affected farms implying the need for implementing preventive measures to maintain the overall animal health and to protect livelihood of farmers.

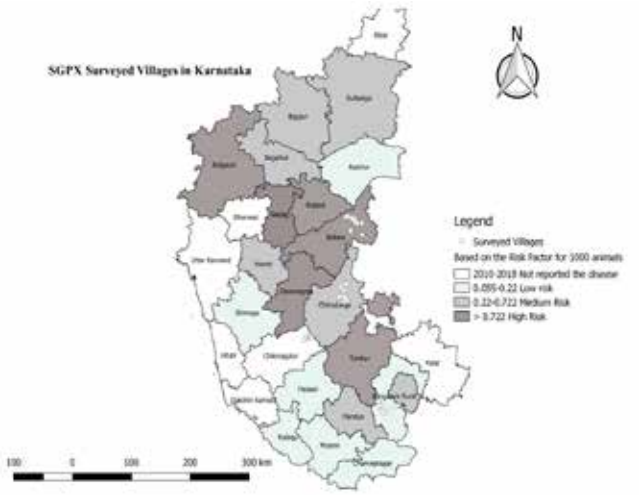


Fig.10: Map represents districts and villages surveyed in Karnataka

INSITUTE SERVICE PROJECTS

IPC:ANSCNIVEDISIL201100100020 Project ID: IXX08329

National Animal Disease Referral Expert System (NADRES)

KP Suresh, D Hemadri, SS Patil, M Nagalingam and Siju SJ

The monthly livestock disease forewarning bulletin is prepared using NADRES database. The bulletin provides likely occurrence of 13 economically important livestock diseases two months in advance at the district level. The disease outbreaks are being predicted by combining outputs from Generalised Linear Model (Logistic Regression), Gradient Boosting and Random Forest models and the probability of disease outbreak was categorized in 6 risk levels such as No risk (NR), Very low risk (VLR), Low risk (LR), Moderate risk (MR), High risk (HR) and Very high risk (VHR). During the period under report, NADRES underwent a sea change in its internal structure and physical design (Fig.11). Auto-messaging option has been created to send the reminders in the form of text messages to AICRP on ADMAS centers for submission of outbreak reports. Additionally, message are sent on preventive measures to be taken up against predicted disease outbreaks at block level in Karnataka.

Fig.11: Screen shot of NADRES website.

IPC:ANSCNIVEDISIL201100300022 Project ID: IXX08279

Maintenance and Updating of Livestock Serum Repository

D Hemadri, KP Suresh and SS Patil

ICAR-NIVEDI maintains a Livestock Serum Repository and presently, it contains more than 1 lakh catalogued serum samples, collected since 2011. A total of 25275 random serum samples from AICRP on ADMAS centers were received, cataloged and screened for bluetongue, brucellosis and PPR (Fig.12). The preliminary results for bluetongue indicated prevalence of 58.4% and 43% in goats and sheep respectively whereas for brucellosis it was about 5% and 11% in goats and sheep, respectively. The analysis of serum samples screened against PPR indicated the requirement for improvement in PPR vaccination programme as less than desired level of herd immunity is prevalent across the country.

After the screening the results are entered into a database and aliquots from above samples labelled, and stored for future use. Thus the well maintained serum repository caters not only to the need of livestock disease monitoring but also to any retrospective study for the survey of a specific pathogen, detection of a new pathogen (the identification of which was not possible due to non-availability of suitable scientific technique), for retrospective screening of antibodies against a particular pathogen and assay validation etc.

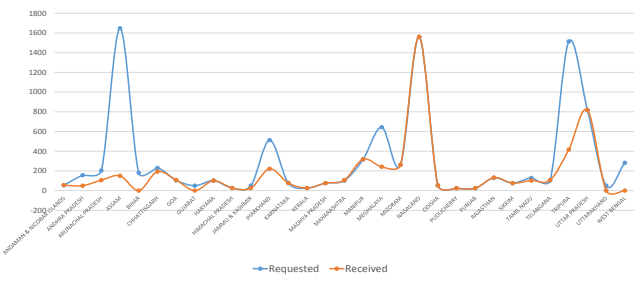


Fig. 12: Number of serum samples received against the target from different AICRP on ADMAS centres

IPC:ANSCNIVEDISIL201300200045 Project ID: IXX10708

Sero-epidemiology of Brucellosis

R Shome, BR Shome and M Nagalingam

During the reporting period, the serum samples from sheep and goats were tested for seroprevalence of brucellosis. A total of 23784 random serum samples {sheep -7950 and goat-15834} received from 29 AICRP on ADMAS centers were screened for brucellosis by sheep & goats iELISA kit and seroprevalence of 11.5% (915/7950) and 5.4% (858/15834) was recorded for sheep and goats, respectively (Fig. 13). Highest seroprevalence in sheep was recorded in Karnataka 25.35 %{325/1282} and Gujarat 20.12% {256/1272} whereas in goats, more than 10% was recorded in seven states (Maharashtra, Uttar Pradesh, Gujarat, Haryana, Andhra Pradesh and Karnataka). The sero negativity was recorded in samples sourced from Mizoram, Bihar, West Bengal, Andaman Nicobar, Goa and Kerala. Further, during 2018-19, 36 *Brucella* diagnostic kits were supplied to various stakeholders. The in-house developed bovine protein G iELISA Brucella kit performance was found to be satisfactory in comparison to cELISA (commercial).

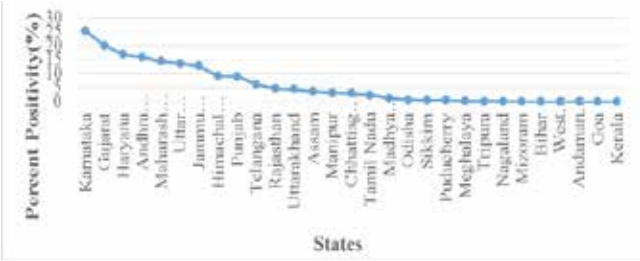


Fig. 13: Seropositivity for brucellosis in small ruminants during 2018-19

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 and virus isolation in different states of India were undertaken. A total of 5480 bovine sera samples were tested for the presence of IBR antibody using the NIVEDI's Avidin -Biotin ELISA and the prevalence was found to be 37.81 % (Table 4). The highest prevalence rate of (73.33%) was observed in Mizoram and the lowest prevalence was found to be 5.71% in Sikkim. A total of 13 IBR AB ELISA kits were supplied to different clients in India.

Table 4: Seropositivity of IBR in different states of India screened during 2018-19

Sl. No	State	Total samples tested	Total positive	Percent positivity
1	Assam	272	83	30.51
2	Andhra Pradesh	301	135	44.85
3	Bihar	191	123	55.50
4	Chhattisgarh	30	5	16.67

Sl. No	State	Total samples tested	Total positive	Percent positivity
5	Goa	59	18	30.51
6	Gujarat	496	132	26.61
7	Haryana	138	18	13.04
8	Himachal Pradesh	183	64	34.97
9	Jammu & Kashmir	204	93	45.59
10	Karnataka	77	47	61.04
11	Madhya Pradesh	549	198	36.06
12	Maharashtra	1619	629	38.85
13	Manipur	159	82	51.57
14	Meghalaya	246	80	32.52
15	Mizoram	30	22	73.33
16	Nagaland	216	60	27.78
17	Odisha	19	4	21.05
18	Puducherry	92	13	14.13
19	Punjab	189	102	53.97
20	Sikkim	35	2	5.71
21	Telangana	109	57	52.29
22	Tripura	240	103	42.92
23	West Bengal	26	2	7.69
	Total	**5480**	**2072**	**37.81**

IPC:ANSCNIVEDISIL201800300093 Project ID: IXX14475

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

V Balamurugan

A total of 8645 serum samples from eight states and two UT were screened for PPRV antibodies by IVRI-PPR competitive ELISA kit (Fig.14). The highest population immunity was observed in Telangana (86.95%) followed by Maharashtra (73.23%), Andhra Pradesh (66.39%), Karnataka (64.30%), Chhattisgarh

(51.6%), whereas the seroprevalence of 49.1%, 47.49%, 23.85%, 11.44% and 1.28 % was recorded in Puducherry, Tamil Nadu, Goa, Kerala and Andaman and Nicobar Islands, respectively.

Fig. 14: States and UT's covered during 2018-19 for PPR seroscreening

EXTERNALLY FUNDED PROJECTS

ICAR Project: All India Network Programme on Bluetongue

D Hemadri, MM Chanda and KP Suresh

Bluetongue (BT) is an infectious, insect borne viral disease of ruminants. The disease is characterized by high fever, hyperaemia, oedema, ulcers in oral cavity and reddening of coronary bands. Sheep are affected more often than goats, cattle and other ruminants. Bluetongue has been reported from most of the tropical and subtropical regions of the world. Over the years, BT has become endemic in India and a great impact of this is seen in the livestock sector.

During the period under report, the risk regions of BT in the country were identified. Countrywide serosurveillance for bluetongue in small ruminants was carried out. A total of 17350 goat and 8221 sheep serum samples collected from 27 states and 2 union territories were screened for anti BTV antibodies using indigenously developed NS1-NS3 recombinant protein based indirect ELISA. The results indicated higher level of antibody prevalence in goats (58%) than sheep (43%) (Fig.15). Higher level of prevalence in sheep in the southern states indicates that bluetongue is an important disease in that region.

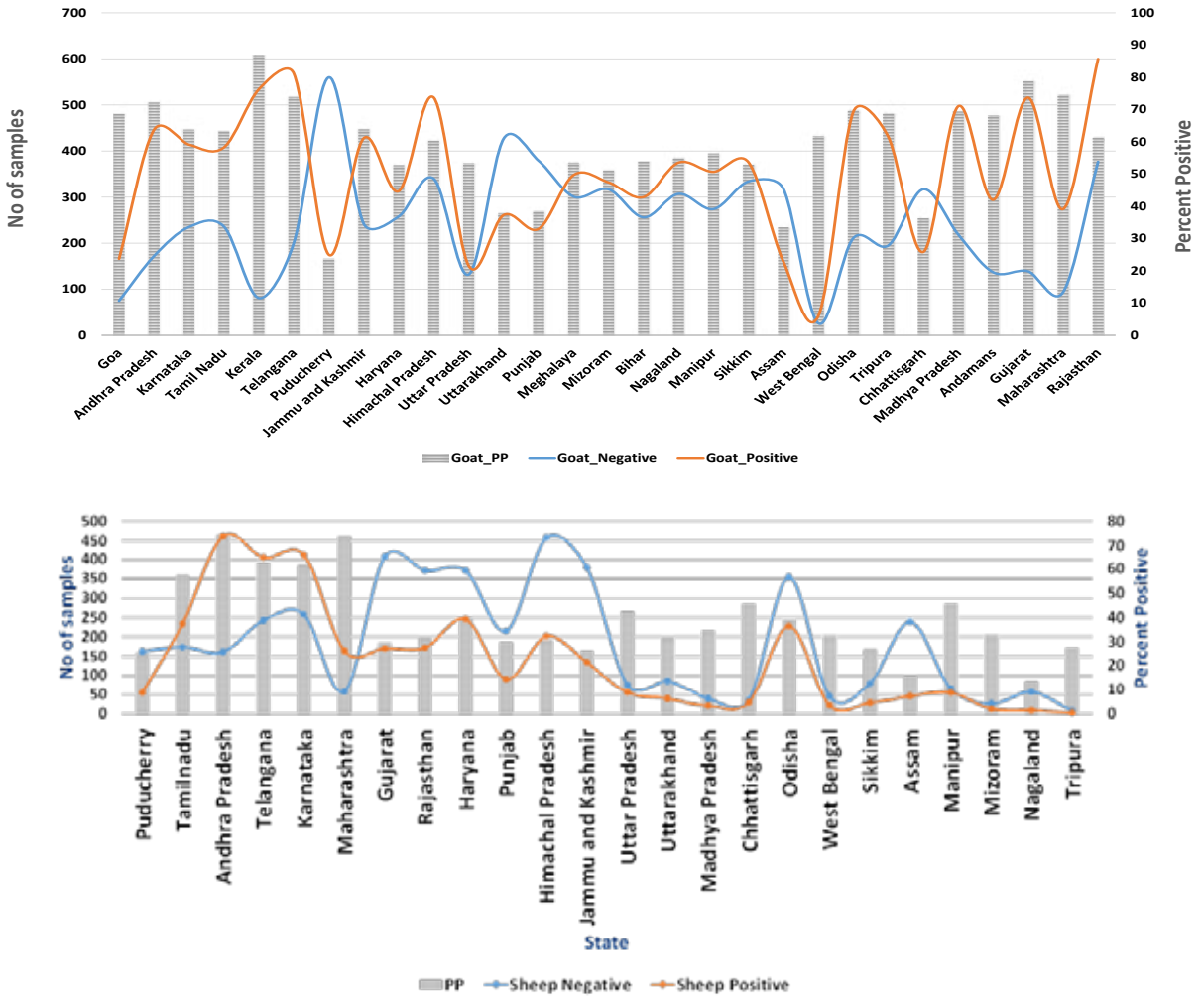


Fig.15: Statewise percent positivity of BT in goat and sheep samples

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

V Balamurugan, PP Sengupta, R Sridevi, G Govindaraj and MM Chanda

During 2018-19, ICAR-NIVEDI was directed to work on Leptospirosis, Toxoplasmosis and Q fever. A total of 2674 serum samples from animals {Cattle (n=895) , Buffaloes (n=142), Sheep (n= 396), Goats (n=879), Horse (n=9), Dog (n=18)} and Humans {(PUO cases (n=120); reproductive problem cases (n=78); neurological cases (n=137)} were tested for leptospirosis by Microscopic Agglutination Test (MAT), of which 1156 animals {Cattle (n=648), Buffaloes (n=92), Sheep (n=184), Goats (n=218), Horse (n=4), Dog (n=10)} and 165 human {(PUO cases (n=49), reproductive problem cases (n=29); neurological cases (n=87)} samples showed positive reactivity for *Leptospira* serogroup specific antibodies when using 18 reference pathogenic *Leptospira* panel of antigens. The details of animal samples tested for Leptospirosis in different states is summarized in Table 5.

Table 5: Details of animal/human samples screened for Leptospirosis during 2018-19

States/Districts/ Places	Species	No. of samples tested by MAT	No. of samples reacted in MAT
Maharashtra	Cattle	390	132
	Buffalo	134	88
	Goat	110	50
	Dog	18	10
Karnataka	Sheep	254	97
	Goat	231	76
Andhra Pradesh	Cattle	268	187
	Sheep	142	87
	Goat	143	92
Telangana	Cattle	222	156
Chhattisgarh	Cattle	8	3
	Buffalo	8	4
Kerala	Goat	395	166
Madhya Pradesh	Cattle	7	4
Tamil Nadu	Equine	9	4
Maharashtra	Human	198	78
Karnataka	Human	137	87
Total		2674(Animals- 2339; Humans-335)	1321(Animals-1156; Humans-165)

A total of 198 human serum samples with a history of PUO and abortions and other reproductive disorders were screened for toxoplasmosis using *Toxoplasma gondii* IgG & IgM ELISA of which 27 samples were positive for *T. gondii* antibodies with 13.63% (27/198) positivity. A total of 325 serum samples collected from cattle with history of abortion and reproductive disorders from dairy farms were screened for Q fever using antibody detection commercial ELISA kit of which 42.7% (139/325) samples were found positive for *C.burnetii* antibodies.

IPC:ANSCNIVEDICOP201600800077 Project ID:OXX03488

ICAR Project: All India Network Programme on GIP

PP Sengupta, KP Suresh, Siju SJ and M Pratheepa

Haemonchosis caused by *Haemonchus contortus* is a highly pathogenic and economically important gastrointestinal parasitic (GIP) disease of small ruminants. The disease is highly prevalent in tropical countries especially India, where temperature, moisture and relative humidity favors the survival of free living larval stages. During the reporting period, three severity maps were developed based on Egg Per Gram (EPG) counts of *Haemonchus contortus* (500-1000 and >1000) to identify risk areas of haemonchosis in Rajasthan (Fig.16). Further, suitability map for haemonchosis was developed by correlating incidence of haemonchosis in Rajasthan with remote sensing data. Spatial epidemiological analysis was done to determine possible disease clustering. Developing of Mobile Application was initiated which will be useful to the farmers, vets and other stake holders to receive the alerts in advance. This app will provide information about Rajasthan state and its livestock details along with environmental parameters.

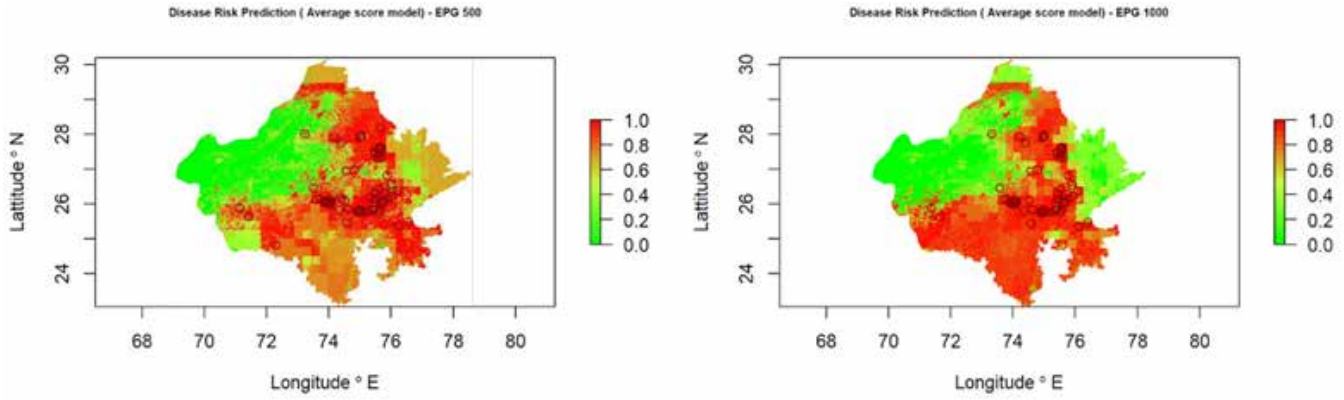


Fig.16: Risk Maps for different EPGs (EPG greater than 500 and 1000)

IPC:ANSCNIVEDICOP201500100064 Project ID: OXX03915

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

Climate variability influences the population dynamics and distribution of vectors which ultimately affect the VBDs transmission. In order to identify genus of ticks that transmit haemoprotozoans, ticks were collected

from 10 agroclimatic zones of Karnataka and Kerala. Morphological identification followed by PCR revealed the genus of the ticks as *Haemaphysalis* sp., *Hyalomma* sp. and *Rhiphicephalus* sp. In addition, risk maps were developed for Bluetongue for Karnataka and Tamil Nadu using climatic (Remote Sensing) and anthrpogenic variables. The Random forest was found to be the best fit model for developing Bluetongue risk maps. Suitability map for Bluetongue was developed using the climatic variables. Month wise vector (*Culicoides*) population and Bluetongue disease outbreaks were correlated to know the hotspots and spread of risk areas.

IPC: ANSCNIVEDISOP201700900087 Project code:OXX04084

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

PP Sengupta, Siju SJ and R Yogisharadhya

Fasciolosis caused by *Fasciola gigantica* is one of the most economically important livestock diseases. In this project, metacercariae were harvested from snails on polythene sheets and were hatched to Newly Excysted Juveniles (NEJs). Total RNA was isolated from NEJs and cDNA was synthesized. PCR for amplification of Cathepsin B gene was standardized and the product was cloned and expressed in prokaryotic system. Further, the recombinant protein was purified by Ni-NTA affinity chromatography and was dialyzed against PBS (Fig.17). Hyperimmune sera (HIS) were raised against native (purified excretory secretory antigen of adult *Fasciola gigantica*) and recombinant cathepsins in rabbits. The reactivity of the recombinant protein was confirmed with HIS by Western blotting.

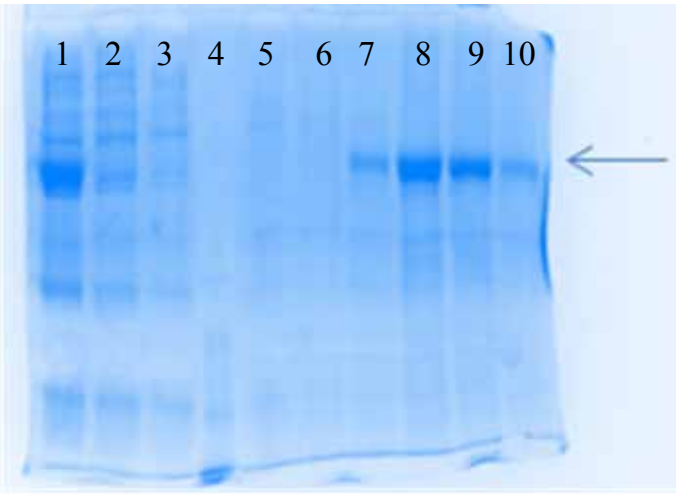


Fig. 17: Purified recombinant cathepsin B protein

IPC:ANSCNIVEDISOP201701000088 Project ID: OXX04086

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

SS Patil, SB Shivachandra, Jagadish Hiremath and KP Suresh

Classical swine fever is a highly contagious disease of pigs. The project was planned for detection of CSFV antigen in suspected pig samples. During 2018-19, BC-AD portion of E2 protein of CSFV was amplified (500 bp), cloned in pET32a vector and expressed in *E.coli* BL21 cells. The recombinant protein was purified and identified by anti HIS antibodies as shown below (Fig. 18)

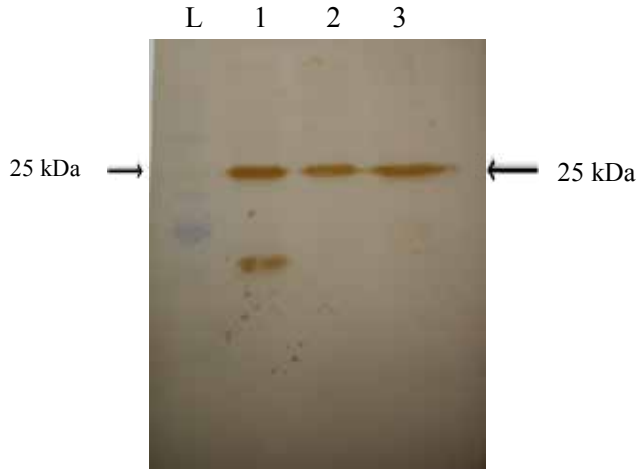


Fig.18: Anti HIS based western blot for detection of expressed BC-AD domain of E2 protein of CSFV. L-Pre-stained ladder, Lanes 1,2,3-Expressed and purified protein.

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

Porcine Respiratory Disease Complex is caused by combination of viral agents majorly Porcine Circo Virus-2 (PCV2), Classical Swine Fever Virus (CSFV) and Porcine Parvo Virus-2 (PPV2). The project aims to develop cost effective multiplex sero-diagnostic assay to detect antibodies against CSF, PPV2, and PCV2. The major achievements include expression, purification and confirmation of PCV2 recombinant capsid protein (Fig.19).

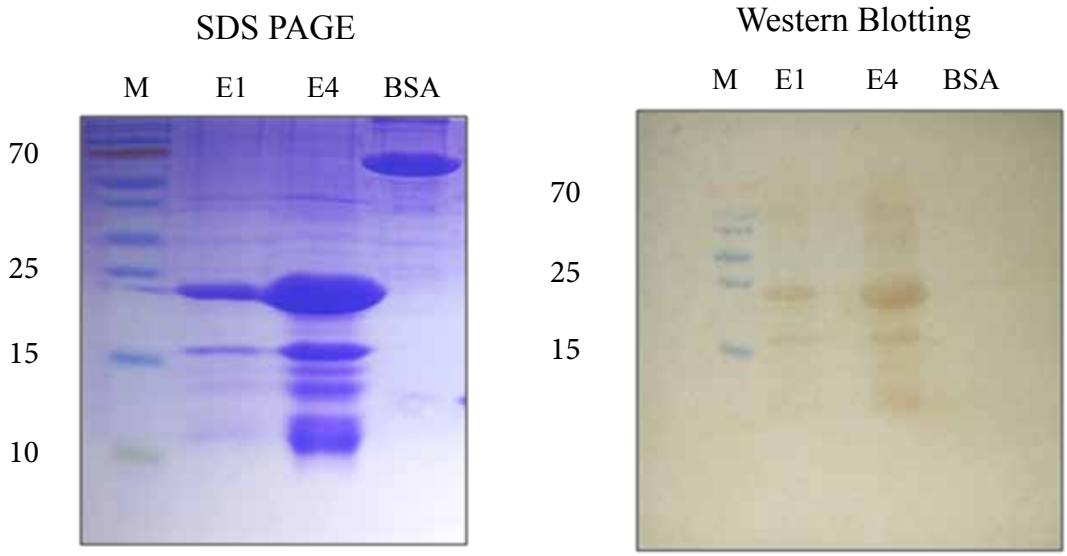


Fig.19: Anti-His Western Blotting for recombinant PCV2 capsid Protein: M-Marker (70-10KDa), E1- Elution Fraction 1, E4-Elution Fraction 4, BSA (negative control). Expected size of PCV (E1 & E4) : 23KDa

DADF Project: Brucellosis Control Program

R Shome, M Nagalingam and P Roy

During the period, a total of 1168 serum samples received for brucellosis post-vaccination sero monitoring from Madhya Pradesh (65), Karnataka(205), Telangana (395), Rajasthan(277) and Chhattisgarh (226) and pre-vaccinated serum samples from Chhattisgarh (574) were screened by RBPT, ELISA and FPA. The highest vaccination coverage was recorded in Telangana (82.53%) followed by Madhya Pradesh (58.46%) and Chhattisgarh (45.13%) (Fig. 20). A total of 462 serum samples collected from brucellosis suspected organized farms of which 405 were bovine samples (Goa = 55, Karnataka = 295 and Haryana -55) and 57 were human samples from Gujarat. All the samples were screened for brucellosis by multiple tests (iELISA, FPA, RBPT and commercial ELISA Kit for bovine samples and RBPT and SAT for human samples). Highest seropositivity in bovines was recorded from Haryana (65.45%) followed by Goa (56.36%) and seropositivity in humans was 19.29%. The package of practices were provided to the farm owners to minimize the risk of disease transmission (Table 6).

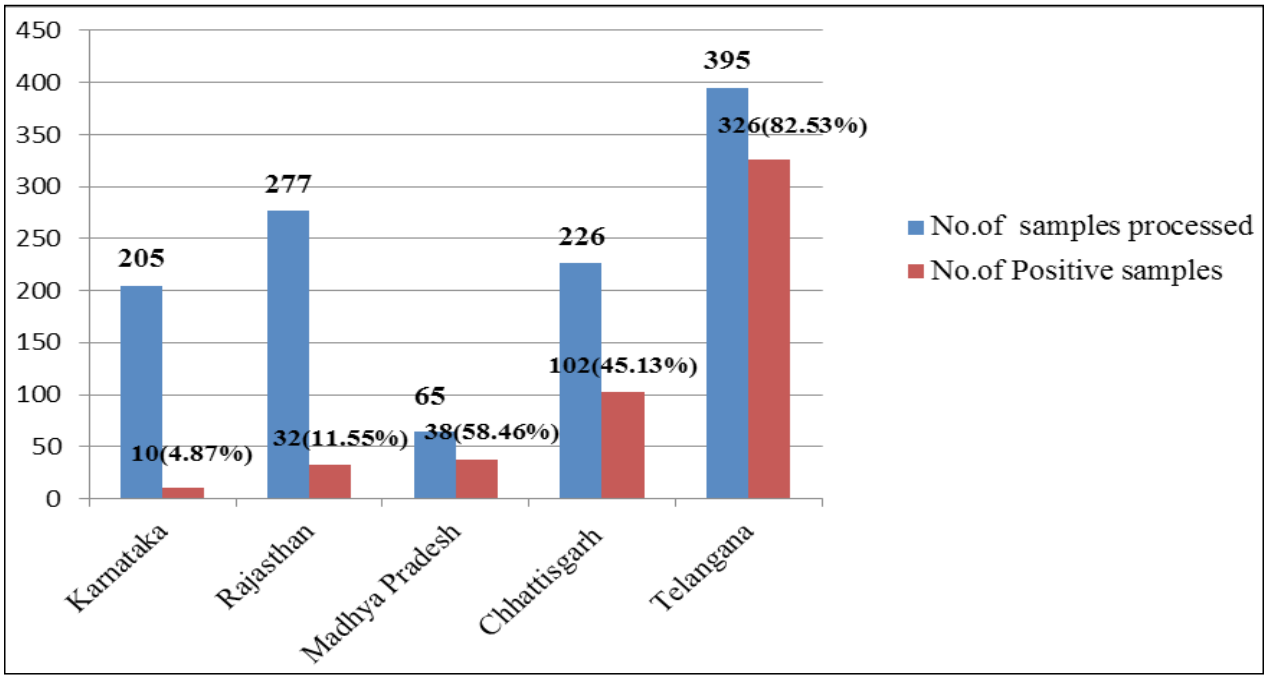


Fig.20: *B.abortus* S19 post vaccinated serum samples screened during 2018-19

Table 6: Details of brucellosis suspected serum samples screened during 2018-19

State	Species	No. of samples	No. of brucellosis positives	Percent positivity (%)
Goa	bovine	55	31	56.4
Gujarat	human	57	11	19.3
Karnataka	bovine	295	56	19.0
Haryana	bovine	55	36	65.5

IPC: ANSCNIVEDISOL201800200092 Project ID: OXX04261

DADF 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

The sampling plan for collection of pre- and post-vaccination serum samples from sheep and goats for various states (Andhra Pradesh, Chhattisgarh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Himachal Pradesh, Rajasthan and Telangana) for PPR sero-monitoring under PPR-CP programme of DAHD, GOI were developed. Further, SOP for sampling plan and collection of samples for monitoring and surveillance of PPR was prepared. Training modules were prepared for field veterinarians for surveillance and sero-monitoring of PPR during control and eradication programme. Developed a web application for National Database on PPR-Control Programme (NDPPRCP) with different features. Further, to assess the vaccination impact a survey schedule was prepared and 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.

IPC:ANSCNIVEDICOP201300900052 Project ID: OXX02581

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

KP Suresh and GB Manjunatha Reddy

National level database on aquatic animal disease is developed and deployed at NBFGR server. This end to end application is dynamic, flexible and user friendly. There are 28 centers having access to the database and each center has three logins for data entry operator, verifier and validator. Epidemiological analysis and aquatic disease maps has been generated. Around 10,604 baseline, 7,399 biological data, 860 disease outbreaks data and 811 hatcheries data information flowed into application since last two years. The issues related to server and application were rectified. Further, the data analysis on biological samples and disease outbreaks data is underway.

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 envisage to express the recombinant proteins of pathogenic *Leptospira* in prokaryotic expression system to develop serodiagnostics (Latex agglutination test-LAT/ELISA) for bovine and human leptospirosis. The genes of the target proteins (Lsa21, LipL41, LipL21) were amplified, cloned, expressed and characterized. Prepared latex beads with recombinant proteins and assessed its reactivity in Latex Agglutination Test (LAT), initially with panel of positive and negative serum followed by hyper immune serum and subsequently with field serum samples. The diagnostic sensitivity and specificity of LAT was assessed in comparison with Microscopic Agglutination Test (MAT). The LAT kit is under evaluation for detection of antibodies against *Leptospira* for diagnosis of bovine 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

Antimicrobials are used widely to prevent, treat disease and for growth promotion in food animals. Despite several international recommendations, harmonized surveillance for antimicrobial resistance under veterinary sector has still not been established in India. Evaluation of AST/AMR capacity was initiated for eight identified Veterinary laboratories working on AMR in collaboration with ICMR and ICAR. The assessment was performed across different regions of India (North-1, South-3, East-1, North East-2 and West-1). Laboratory visits and assessments were performed by using FAO-Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance Systems (FAO-ATLASS) laboratory module containing 40 questions. ICMR and ICAR representatives visited the laboratories of ICAR-NIVEDI, Bengaluru, ICAR-RCNEH, Barapani, CAU, Aizawal, GADVASU, Ludhiana, ICAR-IVRI, Kolkata, RIVER, Puducherry, SDAU, Dantiwada and NRCM, Hyderabad and assessed.

In the first phase of the study, it was found that lack of financial autonomy for AMR activities, automated method for AST/MIC interpretation and absence of adequate quality assurance across the Veterinary laboratories working on AMR. Hence, consultation meeting was organized between scientists from both ICMR and ICAR and other experts in the subject to create a harmonized methodology for antimicrobial susceptibility testing in veterinary sector. Integrated Standard Operating Procedure (SOPs) for bacteriology under veterinary sector was prepared in association with AMR veterinary laboratory partners and ICMR stakeholders. The protocol was standardized as per national, Indian Network for Fisheries and Animal Antimicrobial Resistance (INFAAR) and international standards such as Clinical Laboratory Standard Institute (CLSI) guidelines, The British Society for Antimicrobial Chemotherapy, European Committee on Antimicrobial Susceptibility Testing (EUCAST) including Veterinary Committee on Antimicrobial Susceptibility Testing (vetCAST) protocols. The present work enhances the study of antimicrobial resistance in veterinary sector and improves efficiency of AMR surveillance activities in view of One Health spectrum across India.

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

Taenia solium cysticercosis is a potentially eradicable disease with a position in the list of neglected tropical diseases. Human is the only definitive host for this parasite whereas both human and pig can act as intermediate hosts. During the reporting period, cysticercus infected pork samples were collected from pig slaughter house and PCR was standardized for amplification of Ag1, Ag1V1, Ag2 and Ag2V1 genes (coding for low molecular weight antigens) which were subsequently cloned and recombinant proteins expressed in prokaryotic system with size ranging from10-15 kDa. Crude antigens from the *T. solium* cysts were isolated (scolex antigen, whole cyst antigen, excretory secretory antigen and cyst

fluid antigen) and hyperimmune sera (HIS) was raised in rabbit against native as well as recombinant proteins. The titre of the HIS was checked by indirect ELISA. The reactivity of the recombinant proteins was confirmed with HIS by western blotting and documented.

IPC: ANSCNIVEDISOL201800700097 Project ID: OXX04490

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

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

The project aims to estimate the effect of amplifying host factors on sero-prevalence of JE in endemic areas during peak transmission period and to characterize the humoral and cell mediated immune response in correlation to detection of viral RNA in sero-positive pigs over period of multiple transmission cycles. During the period reported upon, the JE endemic district/village were selected based on time series data (2013-18) on Acute Encephalitis Syndrome (AES), JE cases in human and animals. The envelope (E2) gene based PCR was standardized for detection of JE virus.

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

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

A total of 103 (60 fecal + 35 nasal + 4 human handler + 4 Environmental) samples were collected from different Livestock (Pig, Goat, Buffalo, Cattle), Poultry (chicken, duck & swan) from different organized & unorganized farms in Assam (Table 7).

Table 7: Details of Samples collected from different regions of Assam

Particulars	Total samples
Village 1- Panikhaiti (Poultry)	5
Village 2- Morigaon (Poultry & Cattle)	15
Village 3-Jagiroad (Duck)	5
Byrnihat (Goat Research Station)	35
Hekra (Livestock Research Station) (Pig, Buffalo, Swan)	35
Human handler (Buffalo)- Hand swabs	4
Environmental samples- Floor swabs (Buffalo)	4
Total	**103**

53 isolates of *Staphylococcus* sp were identified from nasal samples. One isolate being *mecA* positive was characterized to be *S. aureus* Type V. A total of 78 Gram negative isolates were identified from fecal samples and 32 isolates were positive for ESBL/ MBL and AmpC genes. The Gram negative isolates comprised of *E. coli* (22), *Shigella* (04), *Klebsiella pneumoniae* (03) and other Gram negative bacteria (03). Further, Plasmid replicon typing of resistant *E.coli* revealed 59% (13/22) of isolates harbouring plasmids of *FIC,P,Y ,I1,N & L/M* replicons. MLST analysis of 22 resistant isolates of *E.coli* revealed 8 different sequence types (ST) such as ST-1727, ST-1079, ST-58, ST-746, ST-206, ST-617, ST-512 and ST-78(Fig. 21). To conclude, there was less prevalence of Methicillin resistance noted in the *Staphylococcus* isolates in the livestock population.

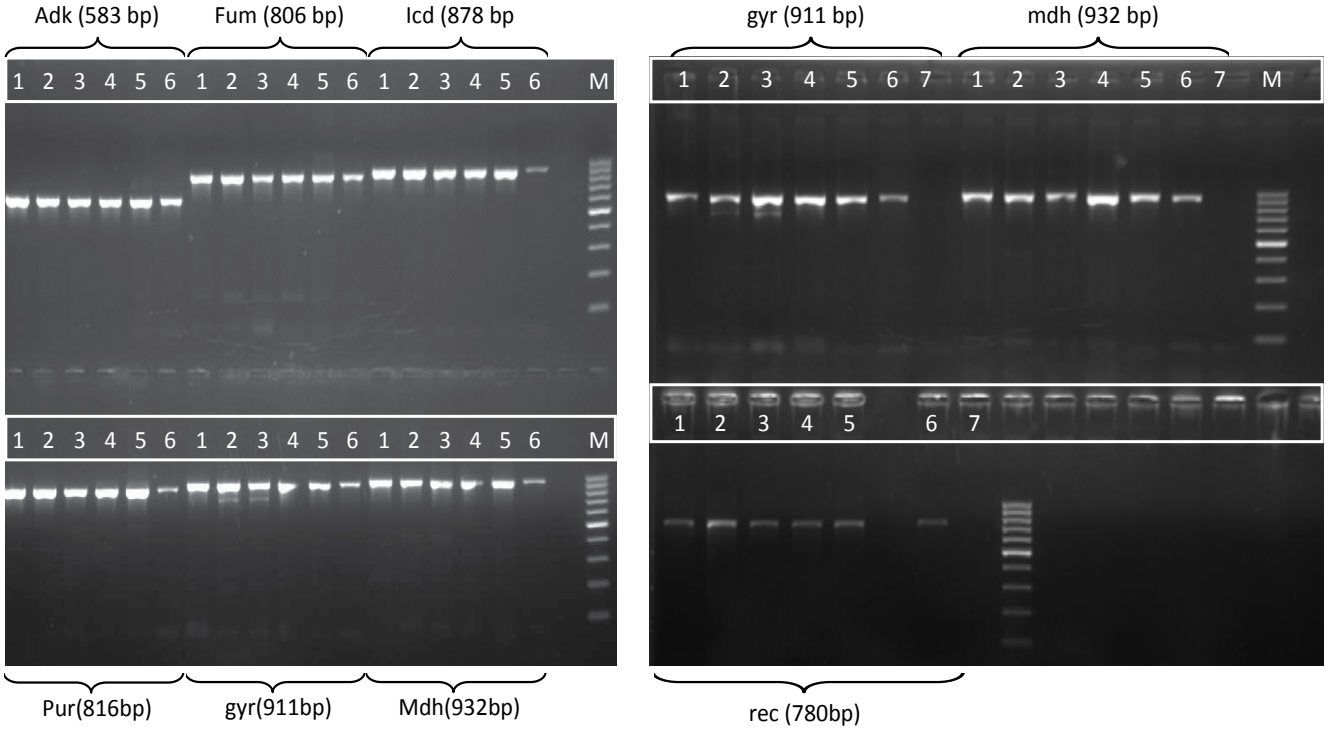


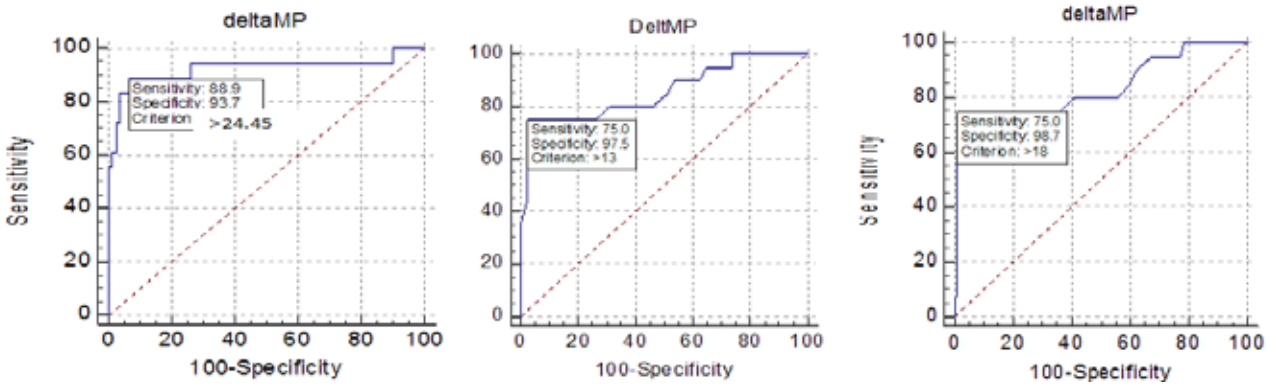
Fig.21: Representative image showing isolates positive for various MLST genes.

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

Fluorescence Polarization Assay (FPA) for the diagnosis of brucellosis has been developed and evaluated. The diagnostic sensitivity and specificity of test was 88.89% and 93.75%; 75% and 97.5%; 75% and 98.75% in cattle, sheep and goat and pig, respectively (Fig. 22). There was 100% agreement between the indigenously standardized FPA and commercial FPA kit and the assay also showed DIVA potential. Monoclonal antibody based competitive ELISA (cELISA) for the diagnosis of brucellosis has been developed with a sensitivity and specificity of 94% and 96%. The assay was evaluated and validated at intra and inter laboratory level. Serosurveillance of brucellosis was undertaken in 5854 livestock samples (Bovine=1546, small ruminants=3448, swine=678 and yak=182) from eight North-Eastern states. The highest seroprevalence was recorded in Assam (5.15%) followed by Nagaland (2.73%) and Manipur (1.98%).



Cattle Sheep and Goat Pig

Fig. 22: ROC curves for FPA in different livestock species

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 number of 695 samples (blood, serum, nasal swab and tissue) were screened for CSFV from NE states, of which, 74% (515) were positive. Out of 365 samples received from other states of India (Karnataka, Maharashtra, Goa, Telangana, Kerala, Punjab, Madhya Pradesh and Odisha) 42% (153) were found positive. The phylogenetic analysis of partial NS5B gene of CSFV isolates (n=3) from Mizoram grouped in genotype 1.1 of the Indian isolates indicating the continued dominance of subgroup 1.1 strains in the country. The partial ORF7 gene sequencing results (n=48) revealed circulation of genotype II of PRRSV in India. A total of 24 samples (4 blood, 12 serum and 8 tissue) from Mizoram were subjected to virus isolation of which 16 were found positive by RT-PCR. Out of 461 pig serum samples screened from Mizoram (261) and Tripura (200), 38 and 10 were found positive for PRRSV antibodies, respectively. A total of 26 clinical samples and 293 serum samples were received from Manipur and Mizoram of which 11 clinical and 105 serum samples were positive for TTV infection. In the rest of India (Chhattisgarh, Goa and Maharashtra), 74 samples were screened, of which 28 were positive for TTV infection.

IPC:ANSCNIVEDISOL201400400057 Project ID: OXX03162

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

Risk map for Classical Swine Fever has been developed (Fig.23). Spatial epidemiological analysis was carried out to identify the disease clusters. The transmission potential of a disease is measured by basic reproduction rate (R0). It was observed that the R0 was more than 1 for all the study years except for 2005 indicating the spread of infection in the population.

For the better understanding of changes in risk pattern in future scenario (2019-2023), the Risk maps were developed using the forecasted risk parameters using time series ARIMA model [2,0,1] for NER states. The mobile app (ADMaC) using Java technology (Android Studio) to provide first-hand information on clinical and gross changes of important infectious diseases of livestock for NER has been developed (Fig.24). The forewarning methodology adapted in the "mobile app" remains the same as NADRES monthly bulletin (ICAR-NIVEDI).

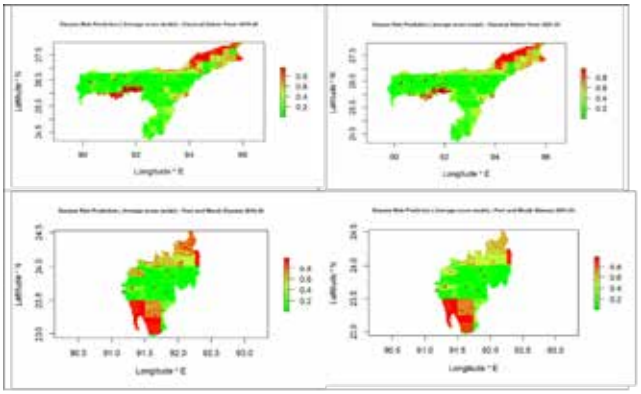


Fig. 23: CSF forecasted risk maps: Green indicates no or minor risk and red indicates high risk and dark red circles indicate outbreak locations.

Fig. 24: ADMaC Mobile application

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

A total of 1484 blood and serum samples from different species collected from NER of India were screened by Giemsa staining, serology and PCR. Cattle and buffalo samples were analyzed using a recombinant antigen based Indirect-ELISA. Whereas dog and goat samples were analyzed by standard Card Agglutination Test for *T.evansi* **(**CATT) assay. Serology revealed 21.14, 25.71, 23.88, 10.84 and 14.65 percent positivity in cattle, buffalo, goat and dog, respectively. Molecular technique (PCR) revealed 7.54, 12.85, 1.49 and 4.11 percent infection in cattle, buffalo, goat and dog, respectively. PCR positive samples were sequenced and analysis revealed existence of only one species i.e. *Trypanosoma evansi*. Phylogenetic tree were constructed from the VSG sequence of cattle and dog isolate using neighborhood-joining method to compare the genetic variation in the sequence of the organism (Fig.25). VSG gene sequence comparison of four Mizoram cattle isolates with that of published sequences available in GenBank revealed 86.3 to 97.7% homology at nucleotide level. Sequences of VSG gene of *T. evansi* isolate from dog collected were compared with Indian isolate (EF495337) revealed homology of 85.2 to 95.1%. Between Chinese isolate (AB259839) and Mizoram isolates homology of 84.9 to 94.6%. Our study concluded that trypanosomosis prevalent in NE India is with a low active/clinical infection similar to rest of India.

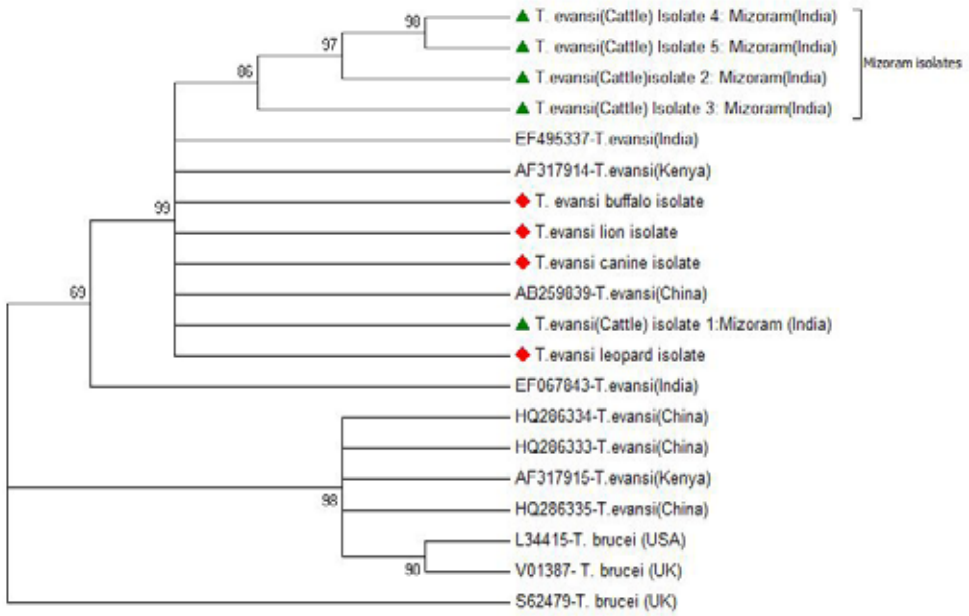


Fig. 25: VSG gene based phylogenetic tree of *T. evansi* (cattle isolates)

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 project is intended to understand the prevalence of economically important duck diseases to devise effective control strategy. The risk map for different disease of ducks in NER states is underway. The census data on duck population at village level is being compiled.

IPC: ANSCNIVEDICOP201800800098 Project ID: OXX04457

DBT-Project : 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, R Sridevi, R Yogisharadhya, V Balamurugan and R Shome

The project activities as per the defined work packages are under progress.The selection of potential isolates (with AMR properties) from existing collections from all the project partners is under progress for pilot sequencing as per work package (WP) 1 of the project proposal. Isolation and identification of *E.coli*, *Staphylococcus aureus* and *Klebsiella pneumonia* from cattle, pig, goat, poultry, food of animal origin

and animal handler samples are under progress. At ICAR-NIVEDI existing isolates has been identified for both Gram positive and Gram negative strains. A total of 110 *Staphylococcus* isolates were identified out of which 50 isolates were mecA positive, *Enterococcus* Spp. (n=5). Gram negative isolates were identified as *E. coli* (n=50) and *Klebsiella* Spp. (n=40). AST analysis and DNA isolation for whole genome sequencing will be initiated by 2nd week of May 2019. SOPs for sample collection and processing has been devised as per CLSI guidelines, 2017. A workshop was conducted at Guwahati during 21-23 March 2019 for project partners to discuss on various project activities. Four sites for sample collection and survey work were identified {North Guwahati (2 sites), Birubari (1 site) and Garchuk (1 site)}. Local support to help in executing project activities were identified. It was planned to initiate sample collection and social science survey during 3rd week of May 2019.

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 Yogisharadhaya (Mastitis component);
D Hemadri, SB Shivachandra, MM Chanda and J Hiremath (Anthrax component)

The KAP survey tool was developed and surveyed among the dairy farmers regarding mastitis and AMR. The KAP survey along with other samples collection was carried out in Assam and Karnataka (Table 8). The database was created out of 391 survey questionnaires using Epi-Info, CDC. Out of 694 milk samples (539 samples from Assam and 155 samples from Karnataka), 258 samples were found positive for antibiotic residue with an incidence of 33.95 % in Assam, 48.39 % in Karnataka. The Charm ROSA test detected the presence of β-lactam, chloramphenicol, streptomycin and enrofloxacin. Total 147 isolates from Assam and 231 isolates from Karnataka were identified as *Staphylococcus* spp. by genus specific PCR. Out of which, species specific multiplex PCR identified 91 isolates from Assam and 119 isolates from Karnataka viz., *S. epidermidis* (50), *S. aureus* (15), *S. chromogenes* (04), *S. sciuri* (14), *S. haemolyticus* (8) and Other CoNS (56) [Assam] and *S. epidermidis* (52), *S. aureus* (27), *S. chromogenes* (25), *S. sciuri* (13), *S. haemolyticus* (2) and other CoNS (112) [Karnataka] respectively. The mecA specific PCR identified 31 isolates (*S. epidermidis* (8), *S. aureus* (4), *S. chromogenes* (2), *S. sciuri* (1), Unidentified (16)) from Assam and 33 isolates (*S. epidermidis* (18), *S. aureus* (1), *S. sciuri* (1), *S. haemolyticus* (7), Unidentified (6)) from Karnataka. A total of 44 and 212 gram negative isolates were identified from Assam (*Klebsiella* (33), *E. coli* (2), unidentified (9)) and from Karnataka (*Klebsiella* (36), *E. coli* (63), unidentified (113) by PCR. Automated identification system identified 38 isolates from Assam as *Enterococcus faecalis* (8), *Staphylococcus simulans* (1), *S. warneri* (1), *S. hominis* (1), *S.caprae* (1), *S.xylosus* (1), *S.gallinarum* (1), *S.lentus* (3), *S.cohnii* (1), *S. aureus* (6), *S.haemolyticus* (3), *S. saprophyticus* (1), *Streptococcus porcinus* (5), *S.anginosus* (3), *S. agalactiae* (1) and *S.uberis* (1).

Table 8: Details of sample collection in Assam and Karnataka

Study location	Total households selected	Total no. of milk samples	Total no. of hand swabs (animal handlers)	Total no. of nasal swabs (animal handlers)	Total no. of milking machine swabs	Total no. of samples
Guwahati, Assam	180	587	49	43	0	679
Karnataka	211	382	109	109	27	627

Under anthrax component of the project, five one day orientation cum technical seminar on 'Anthrax surveillance' for veterinary and medical professionals were organized for 259 professionals (169 veterinarians and 90 medical) at Karnataka (n=2), Odisha (n=2) and Jharkhand (n=1). Similarly, three day training program for 79 professionals (44 veterinarians and 35 medical) on 'Field Diagnosis and Outbreak Investigation of anthrax with One Health Approach' was organized at Odisha (n=1) and Karnataka (n=1). Further, to identify the gaps in anthrax surveillance and control expert opinion of veterinary and medical professionals (n=313) was carried out using a questionnaire. One day stakeholders meeting was organized at ICAR-NIVEDI on anthrax with officials from AH & VS, Karnataka and health officials from IDSP, NCDC to streamline the anthrax surveillance activity with one health approach. A joint anthrax outbreak investigation with NCDC and ICAR-NIVEDI and CDC was carried out in Odisha. Suspected anthrax outbreak in six villages of Tumkur district of Karnataka state was investigated.

IPC: ANSCNIVEDICOL201600500074 Project ID: OXX04235

ILRI Project: Assessment of Antimicrobial Residues and Resistance from Dairy Animals in India

BR Shome

A total of 328 milk samples from Assam and Haryana were processed for Gram positive bacteria. Significant number of these isolates were found to be resistant to one or more antibiotics viz. Cefoxitin and Oxacilin and Methicilin. Genotypic detection identified 74% (n=243) as genus *Staphylococcus* of which 7% (n=17) isolates harbored methicillin resistance [*mecA*- 6% (n=15) and *mecC*- 0.8% (n=2)]. A total of 401 milk samples from Assam and Haryana were processed for Gram negative bacteria. ABST revealed 81% (n=325) isolates to be resistant to one or more antibiotics viz. Cefoxitin, Cefotetan, Ceftriaxone, Ceftazidime, Imipenem and Meropenem. Genotypic detection identified 13% (n=43) isolates with resistance determinants viz., 59 % ESBL (n=7), 60% AmpC (n=26), 14% MBL (n=6), 7% MBL+AmpC (n=3) and 2% ESBL+ AmpC (n=1) which were identified as *E. coli*, *Klebsiella* Spp. and *Shigella* Spp. Two *mecC* were partially sequenced and submitted to GenBank under Accession No. MG334392 and MG334391 (*S. saprophyticus*). The AMR field Intervention was carried out in villages (n=8) including urban and rural Karnataka. In the first phase, Focus Group Discussion (FGD) was made with farmers (n=82) and Key Informative Interview for veterinary assistant (n=10) and professionals (n=6). In the second phase, 75 farmers participated in the FGD.

IPC:ANSCNIVEDICOL201600600075 Project ID: OXX04236

ILRI Project: Prevalence, Risk Factors, Economic Cost and Control Options of *Brucella*-Infection in Small and Large Ruminants and Humans in Eastern India

R Shome

Under the project, prevalence and risk factors for brucellosis and coxiellosis in small ruminants was carried out in Odisha and Assam. A total of 431 (Assam-198 and Odisha-233) sheep and goat serum samples collected from 3 districts each of Assam (Kamrup, Bongaigaon and Sonitpur) and Odisha (Kendrapara, Cuttack and Mayurbhanj). The overall 10.2% (44/431) samples were found positive for anti *Brucella* antibody with highest seroprevalence in Odisha [13.7% (32/233)] compared to Assam [6% (12/198)]. District wise seroprevalence in Assam showed highest brucellosis positivity of 12.8% (9/70) in Bongaigaon district followed by Kamrup (1.7%) and Sonitpur (1.3%). Similarly in Odisha, highest positivity was recorded in Kendrapara (29.3%) followed by Mayurbhanj (10.8%) and Cuttack (1.3%)

districts. In PCR, 2 out 198 samples from Assam, showed amplification for *Brucella* genus specific PCR. The *C. burnetti* seroprevalence in Odisha state was 8.1% (19/223) and in Assam 1.01% (2/198). District wise coxiellosis seroprevalence in Odisha showed highest in Mayurbhanj (13.25%) followed by Cuttack (10.6%) and in Assam, seropositivity was negligible in Kamrup district 1.7% (1/ 56) and Sonitpur 1.38% (1/72) districts. AMR and zoonosis field awareness programs under one health approach were organized in four villages of Karnataka.

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, and ticks were collected from Wayanad and Shimoga districts in different habitats such as environment, walkthrough, rodent, cattle, cattle shed. The protocol were standardized for morphological and molecular identification of ticks. A total of 114 ticks were collected during the pilot sampling of which 51 were *Haemaphysalis* Spp., 30 were *Rhipicephalus* Spp., 12 were *Hyalomma* Spp., one was *Dermacentor* Spp. and rest are yet to be identified (Fig.26). Standardized barcoding of tick samples was carried out. Molecular characterisation of 16 tick samples revealed seven as *Rhipicephalus microplus,* four as *Haemaphysalis bispinosa,* two each as *Haemaphysalis* spp and *Haemaphysalis longicornis* and one as *Dermacentor reticulatus*. Questionnaire data (n=120) was collected from different households in Shimoga district for identification of risk factors for occurrence of Kyasanur Forest disease.

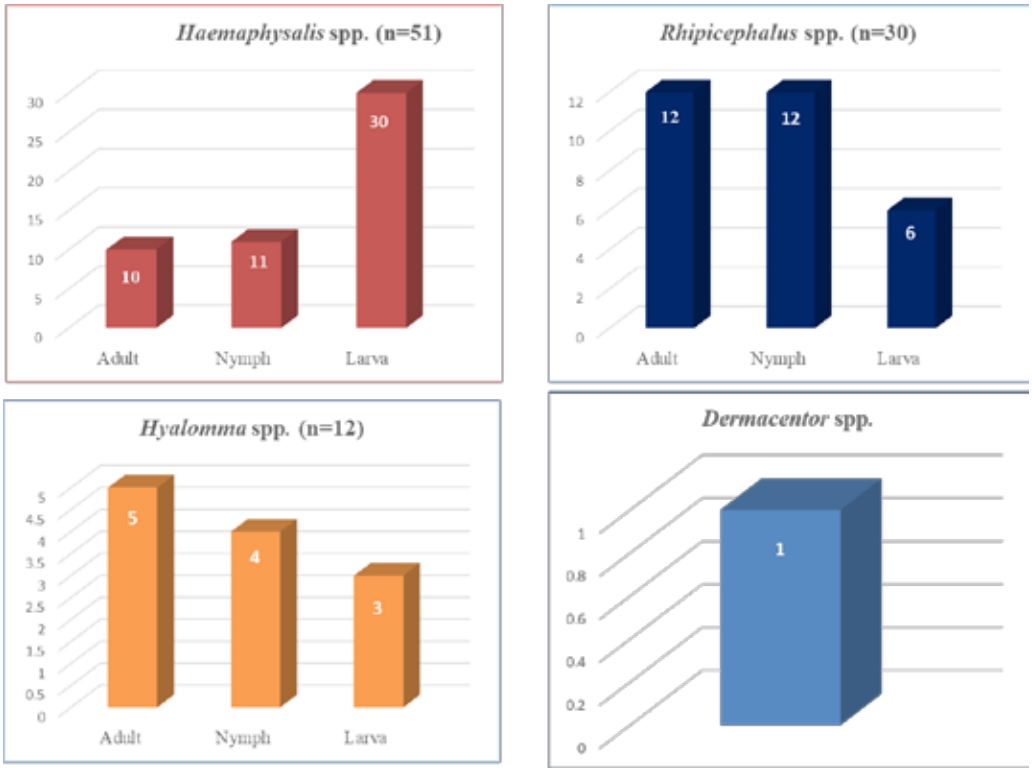


Fig. 26: Number of tick samples morphologically identified from pilot sampling in Shimoga and Wayanad

Tribal Sub Plan (TSP)

G Govindaraj, P Krishnamoorthy and R Yogisharadhya

During 2018-19, monitoring activities were carried out in Karnataka and Tamil Nadu. In Karnataka, team visited Dodderi and Kaluvehalli village on 27-28th October, 2018, Challekere taluk, Chitradurga district, Karnataka and monitored the performance of distributed animals among the beneficiaries. On 18th May, 2018 the team visited Kurumalai, Athiyur village, Anaicut Taluk, Vellore district, Tamil Nadu and interacted with beneficiaries and advisory regarding scientific rearing of small ruminants was provided. Further animal health calendar were distributed. Planning activities were chalked out to implement the program in aspirational districts during 2018-19, however due to non allotment of funds under TSP head, the program could not be implemented.

Distribution of Animal Health Card to TSP beneficiaries in Athiyur village, Anaicut Taluk, Vellore district, Tamil Nadu

Mera Gaon Mera Gaurav (MGMG)

During 2018-19, MGMG programme was implemented in the identified villages in Bengaluru rural district. The important activities undertaken are general village visit and interaction with farmers by scientists and interface meetings with women livestock farmers. During the interface meeting, the important livestock diseases and farm management practices to mitigate the disease incidence were highlighted. Further, in various MGMG adopted villages, Swatch bharat activities like Swachhata pledge administration, video screening, banner display and painting competition to school children were organized to create awareness on the importance of maintaining personal hygiene and also to protect the environment.

Administering Swachhta pledge to school children in Dasagondanahalli village, Bengaluru rural district, Karnataka

Swachh Bharath Abhiyan (SBA)

Swachh Bharat Abhiyaan (SBA) related activities are carried out on regular basis at ICAR-NIVEDI campus as per the Swachhta action plan and guidelines issued by the instructions from the Ministry of urban development, Government of India. All the Staff of ICAR-NIVEDI are actively involved in SBA. Two Swachhta Pakhwara were observed on 15th September to 2nd October 2018 and 16th to 31st December 2018). The Swachhta Sapath was taken by all the staff of ICAR-NIVEDI and committed to give at least 2hr a week and 100 hr a year towards cleanliness activities to keep self, community, society, villages, cities and country clean.

Regular cleaning of the office, stores and laboratories were carried out as per Standard Operating Procedures (SOP) provided by Ministry of Urban Development, Government of India. Awareness programmes were organized in Gatiganahalli, Basettahalli, Marasandra, Mavallipura, Dasagondanahalli, and Ramagondanahalli villages. Further, Swachhta pledge was administered to school children, villagers and panchayat staff. Villages adopted under MGMG was visited by scientists of the institute and carried out awareness about Swachh Bharat Abhiyaan involving school children, farm women and youth. Organized quiz competition on SBA and on 23rd December 2018, Kisan Diwas commemorating the Birth anniversary of the Late Chaudhary Charan Singh, former prime minister of India along with Swachhta Pakhwara was celebrated. Forty three progressive dairy and sheep farmers including 14 women, representing various taluks of Karnataka participated in the Kisan Diwas event.

Swachh Bharat Abhiyaan activities at ICAR-NIVEDI

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Capacity Building/Human Resource Development

Training/Refresher Course/Summer/ Winter School/Seminars/Conferences/ Symposia/Workshops/Krishi Mela/Fair Programmes *Organized*

Sl. No.	Name of Seminar/Workshop/Training	Venue	Date
1	Training: Bacterial Disease Diagnosis	AAU, Assam	4th April 2018
2	Training: Animal Disease Informatics and Biostatistics	ICAR- NIVEDI	3-8th May, 2018
3	Technical Seminar: Anthrax Surveillance	Sundergarh, Odisha	6th June, 2018
4	Training: Field Diagnosis and Outbreak Investigation of Anthrax: One Health Approach	ICAR-NIVEDI	17-20th July, 2018
5	Workshop: Livestock Disease Forewarning Mobile Application	ICAR-NIVEDI	19th July, 2018
6	Training: Anthrax Outbreak Investigation: One Health Approach	Bhubaneswar, Odisha	25-27th July, 2018
7	Workshop: Anthrax surveillance	Ranchi, Jharkhand	11th September, 2018
8	Training: Field Diagnosis and Outbreak Investigation of Anthrax: One Health Approach	ICAR-NIVEDI	17-20th Sept., 2018
9	Field orientation program: AMR surveillance in bovine mastitis	Jalige village, Devanahalli, Karnataka	29th September, 2018
10	Training: Molecular Techniques and Bioinformatics	ICAR-NIVEDI	9-11th October, 2019
11	Farmers interface meeting: Rashtriya Mahila Kisan Diwas	Kakkehalli village, Bengaluru, Karnataka	15th October, 2018
12	Meeting: AMR Awareness Program	S. Nagenahalli village, Bengaluru, Karnataka	15th November, 2018
13	Training: Introduction to Analytical Veterinary Epidemiology	ICAR-NIVEDI	3-5th December, 2018
14	Farmers Interface Meeting: Rashtriya Kisan Diwas	ICAR-NIVEDI	22nd December, 2018
15	Training: An Update of Molecular and Advanced Approaches for the Diagnosis of Parasitic Diseases in Animals	ICAR-NIVEDI	2-11th January, 2019
16	Training: Awareness Programme and User's Training Programme on CeRA	ICAR-NIVEDI	17th January, 2019

Sl. No.	Name of Seminar/Workshop/Training	Venue	Date
17	Meeting: ICAR-ICMR -FAO	ICAR-NIVEDI	18th January, 2019
18	Training: Field Veterinary Epidemiology	ICAR- NIVEDI	11-15th February, 2019
19	Training: Field Veterinary Epidemiology	ICAR- NIVEDI	12-16th March, 2019

Foreign visits

1. Dr. B.R.Shome and Dr. R.Shome attended ICAR-ILRI collaborative workshop at Nairobi, Kenya from 30th June to 8th July 2018

2. Dr. G.Govindaraj, Senior Scientist, attended and presented paper (oral) in 30th International Conference of Agricultural Economists (ICAE) held at Vancouver, Canada during 27th July-2nd August, 2018

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	Brucellosis in India: Collaborative Workshop to Define One Health Priorities	NAASC complex, New Delhi	3- 4th May 2018	Dr. R. Shome
2	3rd International Symposium on Aquaculture and Fisheries Education	ICAR-CIFE, Mumbai	16-18th May, 2018	Dr. K.P. Suresh Dr. G. B. Manjunatha Reddy
3	Geospatial Technologies for Climate Studies	NRSC, Hyderabad	29-31st May, 2018	Dr. P. Krishnamoorthy
4	Introduction to Progressive Control Pathway	ICAR-NIVEDI (Online)	June 2018	Dr. R Sridevi
5	Foot-and-Mouth Disease Investigation Training Course	ICAR-NIVEDI (Online)	June 2018	Dr. Krishnamoorthy P Dr. R Sridevi , Dr. M. Nagalingam and Dr. G.B. Manjunatha Reddy
6	Training: Enhancing Efficiency and Behavioral Skills of Stenographers Grade-III, PA,PS PPS and Sr.PPS of ICAR	ICAR-NAARM, Hyderabad	21- 26th June ,2018	Mrs. Saranya A
7	Training: Next Generation Genomic Technologies (Next Generation Sequencing and Bioinformatics)	TDU, Bengaluru	25-30th June, 2018	Dr. K. P. Suresh and Dr. S. S. Patil
8	20th National Conference of APCRI: APCRICON-2018	The Lalit, New Delhi	7-8th July, 2018	Dr. G. B. Manjunatha Reddy
9	Workshop: Advanced Epidemiology	NIMHANS, Bengaluru	9-13th July 2018	Dr. P. P. Sengupta
10	Workshop: PPR Control- Moving towards eradications	TANUVAS, Chennai	12th July, 2018	Dr. V. Balamurugan
11	Training: Antimicrobial Susceptibility Testing and WHONET Training for AMR Surveillance for Veterinarians	ICAR-IVRI, Bareilly	23-25th July, 2018	Dr. P. Krishnamoorthy
12	Workshop: Artificial Intelligence (AI) in Agriculture Status and Prospectus	ICAR-IASRI, New Delhi	30-31st July, 2018	Dr. K. P. Suresh
13	Training: Intellectual Property Valuation and Technology Management	ICAR-NAARM, Hyderabad	24-29th August, 2018	Dr. S.B. Shivachandra

Sl. No.	Name of Seminar/ Workshop/ Training	Venue	Date	Attended by
14	Training: Advances in Web and Mobile Application Development	ICAR-NAARM, Hyderabad	5-10th September, 2018	Dr. P. Krishnamoorthy
15	Training: Bioinformatics Tools and Techniques for Genomic Data Analysis	ICAR-IASRI, New Delhi	11- 15th September, 2018	Dr. M. Nagalingam Dr. Siju SJ
16	Training: Advanced Bioinformatics Tools and Its Applications in Agriculture	ICAR-NAARM, Hyderabad	25-29th September, 2018	Dr. R. Sridevi
17	Meeting: ICAR- ILRI	New Delhi	26th September, 2018	Dr. R.Shome
18	Field Intervention Training	ILRI Office, Guwahati	27 -29th September, 2018	Dr. R.Shome
19	Meeting: Brainstorming Meeting on Indian Anthrax Network (IAN)	IAH & VB, Bengaluru, Karnataka	29th September, 2018	Dr. S.B. Shivachandra
20	Seminar: Empowering Agriculture Research in India	KAU, Thrissur	8th October, 2018	Dr. Siju SJ
21	13th Annual Convention of Central Information Commission	Pravasi Bharatiya Kendra, Chanakyapuri, New Delhi	12th October, 2018	Dr. D. Hemadri
22	Conference: Agri-Startup and Entrepreneurship Conclave (UPAYA) and National Conference	NASC, ICAR, New Delhi	16-17th October, 2018	Dr. S.B. Shivachandra
23	XXXV Annual Conference of IAVP	CoVAS, Sardarkrushinagar, Gujarat	22-24th October, 2018	Dr. P. Krishnamoorthy
24	Field Intervention Training	ICAR-NIVEDI	22-26th October, 2018.	Dr. R.Shome
25	Training for Vigilance Officers of ICAR Institutes	ICAR- NAARM, Hyderabad	31st October - 1st November, 2018	Dr. D. Hemadri
26	International Conference of Virology (INTERVIROCON-2018)	PGIMER, Chandigarh	12-14th November, 2018	Dr. Balamurugan V Dr. G. B. Manjunathareddy
27	Krishi Mela	UAS, GKVK, Bengaluru	15-18th November, 2018	Dr. Govindaraj G Dr. J Hiremath Dr. Sridevi R Dr. Nagalingam M Dr. Manjunatha Reddy GB Dr. Siju SJ Dr. Yogisharadhya R

Sl. No.	Name of Seminar/ Workshop/ Training	Venue	Date	Attended by
28	Meeting: RKVY-RAFTAAR Scheme	Ministry of Agriculture and Farmers Welfare, New Delhi.	22nd November, 2018	Dr. S.B. Shivachandra
29	Training: Introduction to Analytical Veterinary Epidemiology	ICAR-NIVEDI	3-5th December, 2018	Dr. Sridevi R Dr. G. B. Manjunathareddy
30	Management Development Programme (MDP) on PME Training	ICAR-NAARM, Hyderabad	17-22nd December, 2018	Dr. G.Govindaraj
31	17th NAVS Congress	OUAT, Bhubaneshwar	19-20th December, 2018	Dr. P. P. Sengupta
32	Pashu Mela	Sindhanuru, Raichur	4-8th January, 2019	Dr. S. S. Patil Dr.Yogisharadhya R
33	Meeting: DST- Scientific Infrastructure Sharing Maintenance and Networks	CAMP, Bengaluru, Karnataka	10th January, 2019	Dr. S.B. Shivachandra
34	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
35	Training: E Office	IASRI, New Delhi	23-24th January, 2019	Sh.V Raghuraman Sh.A Vijaya Kumar
36	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
37	NCVP 2019	CVSc, Tirupati, Andhra Pradesh	28-30th January, 2019	Dr. P.P.Sengupta Dr. P. Krishnamoorthy Dr. Yogisharadhya R
38	Field Exposure Visit	ICAR-NIANP, Bengaluru	29-30th January, 2019	Shri. B. Hanumantharaju, Shri. M.K.Ramu Mr.Umesh H S
39	Conference: Bio Economy India Conclave	IISc, Bengaluru, Karnataka.	31st January, 2019	Dr. S.B. Shivachandra
40	XVI National Symposium of IAVPHS	Nagpur Veterinary College, Nagpur	26-27th February, 2019	Dr. P. Krishnamoorthy Dr. Balamurugan V Dr. Nagalingam M
41	SAMARTH - Innovation and Incubation Induction Workshop	ICAR-IARI, New Delhi	11-13th February, 2019	Dr. G. B. Manjunathareddy Dr. Yogisharadhya R
42	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

Sl. No.	Name of Seminar/ Workshop/ Training	Venue	Date	Attended by
43	19th Indian Veterinary Congress and 26th Annual Conference of IAAVR	Veterinary College, WBUAFS, Kolkata	1-2nd February, 2019	Dr. R.Shome
44	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
45	14th Agricultural Science Congress	IARI, New Delhi	20-23rd February, 2019	Dr. G. Govindaraj Dr. M.M. Chanda
46	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
47	7th Pan Commonwealth Veterinary Conference	ICAR-NINAP 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

Award / Fellowship / Recognition

1. ICAR-NIVEDI was awarded Certificate of Appreciation from ICAR for implementing ICAR research data management guidelines in KRISHI portal during 2018.
2. ICAR-NIVEDI was awarded Certificate of Appreciation from ADG (HRD), ICAR, for implementing ATP under HRD programme during 2017-18.
3. Dr. R. Shome, Principal Scientist, awarded IAAVR Fellowship during 2019.
4. Dr. P. P. Sengupta, Principal Scientist, awarded NAVS Fellow award by National Academy of Veterinary Sciences during 2018.
5. Best oral presentation award in INTERVIROCON-2018 held at PGIMER, Chandigarh during 12-14th December, 2018 (Manjunatha Reddy et al., 2018).
6. Best oral presentation award in National conference on advances and innovations in biotechnology: multidisciplinary approaches to food, health, environmental and energy issues held at Bengaluru during 15-16th November, 2018 (Susweta et al, 2018) .
7. Best poster award in PCVC-2019 held at ICAR-NIANP, Bengaluru during 3-7th March, 2019 (Yogisharadhya et al., 2019).
8. Best poster presentation award in National congress of Veterinary Parasitology held at CoVS, Tirupati during 28-30th January, 2019 (Dheeraj et al., 2019).
9. 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)

Sl. No	Name and Address	Position
1	Dr. C. Balachandran, VC, TANUVAS, Chennai-600 051, T.N	Chairman
2	Dr. Parimal Roy, Director	Member
3	Prof. Gaya Prasad, VC, SVPUAT, Meerut- 250110, U.P	Member
4	Dr. K. Kumanan, Prof. & Head, Dept. of Bioinformatics, MVC, TANUVAS, Chennai-600 051, T.N	Member
5	Dr. K. Prabhudas, Former Director, PD_ADMAS, Hyderabad- 500 016, T.S	Member
6	Dr. Manoj V Murhekar, Director & Scientist G, ICMR-NIE, Chennai-600 077, T.N	Member
7	Dr. V.V.S. Suryanarayana, Retd. Principal Scientist, ICAR-IVRI, Visakhapatnam-530040, A.P	Member
8	Dr. Manoj Raje, Chief Scientist, CSIR-IMT, Chandigarh-160 036	Member
9	Dr. Ashok Kumar, ADG (AH), ICAR, Krishi Bhavan, New Delhi-110 001	Member
10	Shri Mallappa Gowda, Progressive farmer, Saraswathipuram, Mysuru-570009, K.A	Member
11	Shri Ashok Allapur, Progressive farmer, Sindhagi-586128, Vijayapura, K.A	Member
12	Dr. V. Balamurugan, Principal Scientist	Member Secretary

XI RAC of ICAR-NIVEDI held on 2nd March, 2019

Institute Management Committee (IMC)

Sl. No	Name and Address	Position
1	Dr. Parimal Roy, Director	Chairman
2	Dr. Ashok Kumar, ADG (AH), ICAR, New Delhi	Member
3	Dr. B.C. Ghosh, Principal Scientist, ICAR-NDRI, Bengaluru	Member
4	Dr. A.K. Samanta, Principal Scientist, ICAR-NIANP, Bengaluru	Member
5	Dr. B. P. Srinivasa, Principal Scientist, ICAR-IVRI, Bengaluru	Member
6	Dr. P. K. Rout, Principal Scientist, CIRG, Makhdoom	Member
7	Sh. Mallappa Gowda, Mysore	Member
8	Sh. Ashok Allapur, Vijayapura	Member
9	Sh. Vijaya Kumar, AF&AO	Member
10	Sh. Raghuraman V, AO	Member Secretary

Institute Management Committee (IMC) meeting held on 29th December, 2018, at ICAR-NIVEDI, Bengaluru

Institutional Animal Ethics Committee (IAEC)

Sl. No	Name and Address	Position
1	Dr. Parimal Roy, Director	Chairman
2	Dr. R. K. Shakthi Devan, Syngene International Limited, Bengaluru	CPCSEA Nominee
3	Dr. Jagadeesh S, Professor , Department of veterinary pharmacology and toxicology, Veterinary College, Bengaluru	Link Nominee
4	Dr. Shivakumar, Head, Technical & Labs, Provimi Animal Nutrition India Ltd, Bengaluru	Scientist from outside the institute
5	Dr. R. G. Prakash, Senior Technical Officer, JNCASR, Jakkur, Bengaluru	Socially Aware Nominee
6	Dr. B R Shome, Principal Scientist	Biological Scientist
7	Dr. V. Balamurugan, Principal Scientist	Scientist of different discipline
8	Dr. Siju Susan Jacob, Scientist	Veterinarian
9	Dr. P. Krishnamoorthy, Senior Scientist	Member Secretary

12th Institutional Animal Ethics Committee (IAEC) meeting of ICAR-NIVEDI on 20th June, 2018

Institute Biosafety Committee (IBSC)

Sl. No	Name and Address	Position
1	Dr. Parimal Roy, Director	Chairman
2	Dr. Suresh H Basagoudanavar, Pr. Scientist, ICAR-IVRI, Bengaluru	DBT nominee
3	Dr. N. Ravi Sundaresan, Asst. Professor, Dept. of Microbiology and Cell Biology, IISc, Bengaluru	Outside expert
4	Dr. Sankey Srinivas, CMO, ICAR-IVRI, Bengaluru	Biosafety officer
5	Dr. Divakar Hemadri, Principal Scientist	Internal members
6	Dr. Satish B. Shivachandra, Principal Scientist	
7	Dr. M. Nagalingam, Scientist	
8	Dr. Jagadish Hiremath, Senior Scientist	Member secretary

Hindi Implementation Committee

Sl. No.	Name and Address	Position
1	Dr. Parimal Roy, Director	Chairman
2	Dr. Divakar Hemadri, Principal Scientist	Co-Chairman
3	Dr. Rajeswari Shome, Principal Scientist	Member
4	Dr. Manjunatha Reddy, Scientist	Member
5	Sh. A.Vijay Kumar, AF&AO	Member
6	Dr. Awadhesh Prajapati, Senior Technical Officer	Member secretary

DISTINGUISHED VISITORS

1. Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (ICAR)
2. Dr. J. Jena, DDG (Animal Science), ICAR, New Delhi
3. Shri. Chhabilendra Roul, Additional Secretary (DARE) and Secretary (ICAR), New Delhi
4. Shri. Upamanyu Basu, Joint Secretary (Livestock Health), DADF, New Delhi
5. Dr. Suresh Honnappagol, Animal Husbandry Commissioner, DADF, New Delhi
6. Dr. Ashok Kumar, ADG (AH), ICAR, New Delhi
7. Dr. H. Rahman, Regional Representative for South Asia, ILRI, New Delhi
8. Dr. Kayla Laserson, Country Director, CDC, India
9. Dr. Md. Nure Alam Siddikky, Senior Program Officer, SAARC Agriculture centre, Bangladesh
10. Dr. R. K. Singh, Vice Chancellor cum Director, ICAR-IVRI, Bareilly, U.P
11. Dr. C. Balachandran, VC, TANUVAS, Tamil Nadu
12. Dr. Gaya Prasad, VC, Sardar Vallabhai Patel University of Agriculture and Technology, Meerut
13. Dr. Narayan P Dakshinkar, VC, Chhattisgarh Kamadhenu Vishwavidyalaya, Durg, Chhattisgarh
14. Dr. Jyoti Misri, Principal Scientist (AH), ICAR, New Delhi
15. Dr. Kayla Laserson, Country Director, CDC, India
16. Dr. Jenny Hutchinson, Director & Executive consultant (Epidemiology), AUSVET
17. Dr. P. S. S. Sundar Rao, Consultant Research Director, LEPRA, India
18. Dr. Johanna Lindahl, ILRI, Nairobi
19. Dr. Annie Cook, ILRI, Nairobi
20. Dr. T. Shivarama Bhat, Director, Dept. AH&VS, Karnataka
21. Dr. K. C. Veeranna, Dean, Veterinary College, Shimoga
22. Dr. Shah Hussain, (Former CDC Expert), Manipal University
23. Dr. R. N. S. Gowda, Former Vice Chancellor, KVAFSU, Bidar
24. Dr. M. Rajasekhar, Founder Director, ICAR-NIVEDI
25. Dr. Harish Tewari, Epidemiology Consultant, AUSVET
26. Dr. K. Kumanan, Professor and Head, Department of Bioinformatics and ARIS cell, Madras Veterinary College, Chennai
27. Dr. Manoj V Murhekar, Director and Scientist G, NIE (ICMR), Chennai
28. Dr. V. V. S. Suryanarayana, Retd. Principal Scientist, ICAR-IVRI, Bengaluru
29. Dr. Manoj Raje, Chief Scientist,CSIR-IMT, Chandigarh
30. Dr. Utpal S Tatu, Professor, Department of Biochemistry, IISc, Bengaluru
31. Dr.Anjali A Karande, Professor, Department of Biochemistry, IISc, Bengaluru

STAFF POSITION (2018-19)

Sl. No.	Name	Designation
1	Dr. Parimal Roy	Director (RMP)
Scientific Staff		
2	Dr. B.R.Shome	Principal Scientist
3	Dr. (Mrs) R.Shome	Principal Scientist
4	Dr. D. Hemadri	Principal Scientist
5	Dr. P.P. Sengupta	Principal Scientist
6	Dr. K.P. Suresh	Principal Scientist
7	Dr.V. Balamurugan	Principal Scientist
8	Dr. S.S. Patil	Principal Scientist
9	Dr. Sathish B Shivachandra	Principal Scientist
10	Dr. G. Govindaraj	Senior Scientist
11	Dr. Jagadish Hiremath	Senior Scientist
12	Dr. P. Krishnamoorthy	Senior Scientist
13	Dr. (Mrs.). R.Sridevi	Scientist
14	Dr. Md. Muddassar Chanda	Scientist
15	Dr. M. Nagalingam	Scientist
16	Dr. G. B. Manjunatha Reddy	Scientist
17	Dr. (Mrs.) Siju Susan Jacob	Scientist
Technical Staff		
18	Dr. R.Yogisharadhya	Senior Technical Officer
19	Dr. Awadesh Prajapati	Senior Technical Officer
Administrative Staff		
20	Sh. V. Raghuraman	Administrative Officer
21	Sh. Rajeevalochana	Assistant Administrative Officer
22	Sh. A.Vijay Kumar	Assistant Finance & Accounts Officer
23	Smt. Divya C.N	Assistant
24	Sh. N. Narayanaswamy	Assistant

25	Smt. A. Saranya	Stenographer Grade-III
26	Mr. K.Vijayraj	Stenographer Grade-III
27	Smt. G. C. Sridevi	Lower Division Clerk
28	Sh. Gangadhareshwara L	Lower Division Clerk
Skilled Supporting Staff		
29	Sh. M. K Ramu	Skilled Support Staff
30	Sh. B. Hanumantharaju	Skilled Support Staff
31	Mr. H. S. Umesh	Skilled Support Staff

Joined/transferred/promoted

1. Sh. Babu R. K, AF & AO promoted as FAO and transferred to ICAR-CIBA, Chennai on 22.05.2018
2. Sh. A. Vijay Kumar joined as AF & AO at ICAR-NIVEDI on 28.06.2018
3. Dr. Jagadish Hiremath promoted to Senior Scientist w.e.f from 01.03.2017
4. Dr. P. Krishnamoorthy promoted to Senior Scientist w.e.f from 07.01.2018

BUDGET

Revised Estimate and Expenditure of ICAR-NIVEDI (2018-19)

(in lakh rupees)

Major Heads	Plan	
	Revised Estimate	Expenditure
Grants for creation of capital assets (Capital)		
Works	79.99	79.39
Equipments	89.00	73.10
Information Technology	10.01	10.01
Library Books & Journals	0.00	0.00
Vehicles & Vessels	0.00	0.00
Furniture & Fixture	40.00	38.73
Grants in Aid- Salaries (Revenue)		
Establishment Expenses (Salaries)	702.78	702.73
Grants in Aid- General (Revenue)		
Travelling Allowances	20.00	20.00
Research & Operational Expenses	174.90	173.80
Administrative Expenses	225.05	225.17
Miscellaneous Expenses	13.24	13.23
AICRP on ADMAS	96.81	96.81
SCSP	70.36	60.40
Grand Total	**1522.14**	**1493.37**

Revenue Receipts (2018-19)

(in lakh rupees)

Description	Amount
Licence Fee	0.62
Interest earned from loans & advances	0.15
Interest earned from short term deposits	33.71
Income generated from Training	3.60
Income generated from sale of kits	7.74
Miscellaneous receipts	15.8
Total	**61.63**

PHOTO GALLERY

Inauguration of Training cum Farmer's Hostel by Hon'ble Dr. Trilochan Mohapatra, Secretary (DARE) & DG (ICAR) on 30th June, 2018

Visit of Additional Secretary (DARE) and Secretary (ICAR), Sh.Chhabilendra Roul, ICAR, New Delhi on 20th April, 2018

ICAR-NIVEDI was awarded Certificate of Appreciation by ICAR for implementing ICAR research data management guidelines in KRISHI portal during 2018

12th Institute Research Committee (IRC) meeting of ICAR-NIVEDI on 10th May, 2018

Indo-UK project: Indian project partners workshop at Guwahati during 21-23rd March, 2019

One day orientation cum technical seminar under CDC project on 27th July, 2018

Orientation training on snail collection procedures for Kerala field veterinarians on 23rd June, 2018

Release of manual on 'Climate data generation, mapping and climate-disease relationship modelling using R' by Hon'ble Dr. Trilochan Mohapatra, Secretary, DARE & Director General, ICAR on 7th August 2018

Participation of ICAR-NIVEDI in the Krishimela held at GKVK, Bengaluru during 15-18th November, 2018

World Antibiotic Awareness week celebration at Government primary school, S. Nagenahalli village, Bengaluru on 15th November, 2018

Participation of ICAR-NIVEDI in the National Horticultural Fair held at ICAR-IIHR during 23-25th January, 2019

Farmers-Scientist interaction at Jalige Village, Devanahalli, Bengaluru Rural district on 29th September, 2018

Communal Harmony week celebrations at ICAR-NIVEDI during 19-24th November, 2018

International Women's Day celebration at ICAR-NIVEDI on 8th March, 2019 with the theme 'Think Equal, Build Smart, Innovate for change'.

Vigilance Awareness week was celebrated at ICAR-NIVEDI during 29th October-3rd November, 2018 and conducted various events on this occasion for the staff members.

ICAR-NIVEDI contingent participated in the ICAR zonal sports tournament 2018 (South Zone) at CTRI, Rajahmundry during 5-9th September, 2018

Health checkup for progressive women dairy and sheep farmers during Kisan Diwas on 22nd December, 2018 at ICAR-NIVEDI

Celebration of International Yoga Day on 21st June, 2018 at ICAR-NIVEDI

Glimpse of farmers and staff of ICAR-NIVEDI participated in the Kisan Diwas conducted on 22nd December, 2018 at ICAR-NIVEDI

Rashtriya Mahila Kisan Diwas organized at Milk Procurement Cooperative Society (MPCS), Kakkehalli village, Bengaluru North Taluk on 15th October, 2018

SAARC Regional Training on Animal Disease Informatics and Biostatistics was organized during 3-8th May, 2018 at ICAR-NIVEDI

Visit of Shri Upamanyu Basu, Joint Secretary (Livestock Health), DADF, New Delhi on 8th June, 2018

ICAR-NIVEDI participated in Kirshi Kalyan Abhiyan programme at Gonhal village, Raichur on 13th June, 2018

Participants during Live Telecast of Farmer's Interactive Meet by Hon'ble Prime Minister on 20th June, 2018 at ICAR-NIVEDI, Bengaluru

DBT-NER-ADMaC 3rd Annual Review Meeting on 13th July, 2018 at ICAR Research Complex for NE Hill region, Barapani, Meghalaya

One Day Workshop on Livestock Disease Forewarning-Mobile App at ICAR-NIVEDI on 19th July, 2018

Created awareness on cleanliness and personal hygiene among students of Govt. Primary School, Marasandra, Karnataka on 8th August, 2018

26th Annual Review Meet of AICRP on ADMAS at ICAR-NIVEDI during 16-17th November, 2018

ICAR-NIVEDI, ICAR-IVRI and ILRI joint training programme organized at ICAR-NIVEDI, Bengaluru during 3-5th December, 2018

Infrastructure