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

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The institute convey sincere thanks to all the principal investigators of AICRP on ADMAS and related state Animal Husbandry Department and Universities for their valuable inputs and cooperation

At the last, I sincerely thank all the staff members of ICAR-NIVEDI for their cooperation as and when required

Jai Hind!

(H. Rahman)
Director

Executive Summary

At large, during this year, the major thrust was given to develop the infrastructure facilities of the institute which was highly deserving. During this period, state of art biosafety laboratory (BSL2++ version), administrative building and utility block have been constructed and the same have become functional. Along with these, other facilities such as Committee room, Communication cell, Canteen etc, also have come up. Besides, six residential quarters (Type IV - 2 Nos. & Type III - 4 Nos.) have also been renovated for use of NIVEDI staff.

In research, this year the extensive epidemiological study was carried out on different viral, bacterial and parasitic diseases including Peste des petits ruminant (PPR), Brucellosis, Infectious Bovine Rhinotracheitis (IBR), Bluetongue (BT), Trypanosomosis, Fasciolosis, Sheep and Goat pox, Haemorrhagic Septicaemia (HS), Rabies, Mastitis, Avian Influenza, Foot and Mouth Disease (FMD),Classical Swine Fever (CSF), Porcine Reproductive and Respiratory Syndrome (PRRS), Malignant Catarrhal Fever (MCF) etc.

NADRES is a flagship project of NIVEDI which includes an in-built interactive dynamic web-based software with animal health information and disease forecasting system. During this period, in the list of top 10 animal diseases, fasciolosis ranked first followed by Coccidiosis, Trypanosomosis, Babesiosis, Foot and Mouth disease, Chronic respiratory disease, Theileriosis and sheep & goat pox. A total of 5577 records, originating from 30 states pertaining to various diseases were reported to the NADRES. The economic analysis of HS in cattle and buffaloes in selected endemic states of India was carried out. The estimated mortality loss due to HS was ₹ 27,647 and ₹ 31,901 in indigenous cattle and local buffaloes respectively, per animal. A cluster map of HS and FMD outbreaks occurred in Tamil Nadu and Kerala was prepared. The epidemiological study involving primary and secondary data shows no co-occurrence of the outbreaks between HS and FMD. The socio-economic impact of FMD study revealed total estimated direct loss due to FMD as ₹ 23193 crores during 2013-14. A parametric regression model with threshold for southern and eastern region of the country for PPR outbreak was developed. The incidence ratio of PPR has been calculated using zero inflated Poisson negative bionomial models. At the optimum incremental level of 10%, the estimated loss due to PPR in sheep and goats in India was ₹ 1,611 crores. Further, the hemagglutinin(H) and nucleocapsid (N) protein of PPR virus were expressed in prokaryotic system and on evaluation of indirect ELISA using recombinant N and H antigen showed 97.97% sensitivity and 99.49% specificity. A total of 391 serum samples were collected from seven states of NE region from sheep & goats. On screening for PPRV antibodies, a 17.90% and 63% of seroprevalance recorded in suspected and random population of goats. In a serosurvey conducted in Odisha, Arunachal Pradesh, Meghalaya, Manipur, Jharkhand and Karnataka, 29.78% seropositive cases for CSF were recorded. Phylogenetic analysis was carried out with a total 24 E2 sequences and it was found that all the recent CSFV were grouped into subtype 2.2 gradually dominating the traditional 1.1 group. The porcine tissue samples from Udupi, Karnataka were screened for the detection of TTV gene group 1& 2 and the samples were found to be positive for gene group 2. Out of 1022 bovine samples from 14 states of the country, 31.5% cases were positive for the presence of IBR antibodies. Arunachal Pradesh topped the list with 90% seropositivity and West Bengal showed a minimum of 43.30%. In Yak, a high percentage of animals (95.23%) were found positive for the presence of IBR antibodies.

In an epidemiological study of Rabies in Livestock, 124 samples from animals were collected from Uttar Pradesh, Gujarat, Karnataka and Kerala .Out of them, 45 samples were found positive to Rabies antigen by fluorescent antibody technique. The N-gene sequences of the Rabies positive samples were analysed phylogenetically and it showed that, all the isolates belonging to gene type 1 of rabies virus are of arctic lineage. A total 3425 pox outbreaks were reported from different states during 2005-13. There was a increased trend from 2005-13 followed by a decline trend. The highest number of outbreak

reported form Andhra Pradesh. The number of deaths is directly proportional to number of outbreaks and number of attack in each year. The outbreaks were mostly recorded during December-May months. In goats, 70.31% morbidity and 46.87% mortality were reported with the sequence of P_{32} gene of Capripox virus, the phylogenetic analysis revealed, 94.6-100% homology with all the other Indian isolates.

Risk path analysis of Notifiable Avian Influenza (NA, HPNAI, LPNAI) has been identified for the import of chicken and by-products and also live birds which includes the hazard identification, release assessment, exposure assessment and consequent assessment. Previously reported HPAI outbreaks were mapped based on GIS co-ordinates as point dot maps. Temporal data analysis suggests that, three different introductions of disease in 2008 in different places. Majority outbreaks were in the adjoining districts with Bangladesh and Nepal which are endemic to H5N1 Avian Influenza. The outbreaks in crows were reported during 2011-12 from Jharkhand, Maharashtra, Odisha and Bihar. This study suggests the spreading of the disease in different places/locations since the crows are found near human habitations. To study the epidemiology of swine influenza virus, the blood, serum and nasal swabs were collected from Pigs and their analysis are in progress. To study the epidemiology of Ganjam virus infection in sheep and goats, 135 serum, 119 blood and 17 tick samples from sheep and goats and 14 human serum samples were collected for screening. Under All India Network Program on BT, 562 serum samples from 9 districts of Maharashtra were screened for the presence of antibodies of BTV. An overall 87.54% of prevalence was recorded. The age-wise analysis of the prevalence showed that, the number of affected animals increase with the increase in the age. 143 clinical samples from BT suspected cases were screened and isolation of BTV from positive samples in cell culture is under way. In a cross sectional surveillance study, an overall prevalence of OvHV-2 in Maharashtra was 55.5%. The study indicates that, in the southern region of Maharashtra, the prevalence is significantly lower than the other parts of the state. The screening of 260 samples collected form Telangana state, revealed 43.03% prevalence for MCF.

Under the DBT-Network Project on brucellosis, several hands on training programs on the diagnosis of brucellosis were conducted. Among 1360 samples collected from different species of animals, more than 10% were found positive by screening through RBPT and ELISA. A newly developed LFA kit for detection of brucellosis in animals showed 87.1% sensitivity and 92.6% specificity. Another LFA kit developed for diagnosis of human brucellosis showed 84% sensitivity and 99.8% specificity on comparison with RBPT. The recombinant proteins of Brucella namely rBLS (36 KDa) rBP26 (44 KDa) were expressed which showed immunoreactivity. Standardization of ELISA using such recombinant proteins was also carried out. Standardization of Fluorescent Polarization Assay for detection of brucellosis in animals was carried out using 200 standard panel of serum samples and it showed 90% sensitivity and 78.33% specificity. Besides, 3459 animal serum samples received from seven AICRP collaborating centres were screened for brucellosis .Out of them, 0.54% cattle, 0.33% buffalo, 0.97% goat were found positive for the presence of *Brucella* antibodies. Under brucellosis control programme, trainings were organised to field veterinarians for creations of awareness related to vaccination and control. In a questionnaire survey, 86% veterinarians opined in favour of brucellosis vaccination in animals whereas 14% were against the vaccination.

On the study of methicillin resistant staphylococci organism, out of 97 goat samples, 2 isolates showed amplification for *MEC* A gene by PCR. The antibiotic sensitivity test (ABST) showed one of the isolate as intermediate resistant to cefoxitin but the other isolate was sensitive to both Methicillin and Cefoxitin. One of the *MEC* A positive isolate was identified as *Staphylococcus epidermis*. On the study of *in vivo* pharmacological properties of membrane active glycoprotein antibiotic (YV11455) against MRSA, it was observed that effective dose response of the drug in 50% maximal bacterial killing (ED_{50}) was 1.43 mg/kg. The beta lactamase producing *Enterobacteriaceae* organisms were also studied. A

total of 88 isolates were obtained from goat fecal samples of which 54% isolates were detected as *E. coli* by multiplex PCR. All 54% isolates were subjected to ABST for detection of ESBL, MVL and *AMP* C which indicated 14 isolates to ESBL showing resistance to Cephamycin, 5 were ESBL and NBL, 7 were ESBL and *AMP* C, 6 were ESBL and MBL and *AMP* C. In an another study, 20 cultures from Meghalaya and 21 nasal swabs from Arunachal Pradesh were screened. Among them, *Staphylococcus*, *Enterococcus*, *Corynebacterium* etc. were identified.

19 Leptospira serovars were used for MAT screening for the detection of *Leptospira* antibodies in the samples. For sero epidemiology of leptospirois, this year 887 animal serum samples from Odisha, West Bengal and Karnataka were screened and overall 36.87% sero prevalence were recorded with 36.45% in cattle, 54.28% in buffalo,28.33% in goat,44.44% in sheep and 31.37% in horse. Among human, 5.55% cases of leptospirosis was detected by MAT screening.A lateral flow kit for the diagnosis of *Listeria* species has been designed using Listerolysin-o and colloidal gold conjugated Protein G and the test was evaluated with 405 serum samples showing 100% agreement with LLO based Indirect ELISA. A total of 2093 serum samples from cattle, buffalo, horse, donkey and camel from Karnataka, Orissa, West Bengal and Rajasthan were screened for the presence of antibodies against *Trypanosoma evansi* by ELISA. An overall, 586 samples were found positive for the presence of antibodies. The buffalo showed highest seroprevalance (36%) followed by cattle (28-31.25%), camel (31%) donkey (6.895) and horse (5.10%). A total 222 fecal samples were collected from cattle, buffalo, sheep and goats form Karnataka. An overall 19.81% were found positive for parasitic infections. Among the positive samples, Fasciola was 17%, Strongyles 12%, Amphistome 15%. Out of 32 *Lymnea* species snails, an overall 13% were found positive for Fasciola infection by PCR assay. During this year, 148 human samples collected from West Bengal, Karnataka and Andra Pradesh were screened for the presence of *Toxoplasma gondii* antibodies by agglutination test. An overall 12.16% seroprevalance were recorded with 25.49% in Andhra Pradesh, 17.85% in Karnataka and 0% in West Bengal. During 2014-15, 2151 serum samples from states including Jharkhand, Madhya Pradesh, Maharastra, Meghalaya, Odhisha, Punjab and Tamil Nadu were received and screened for bovine, ovines, caprine and swine brucellosis, IBR and CSF.

About ICAR - NIVEDI

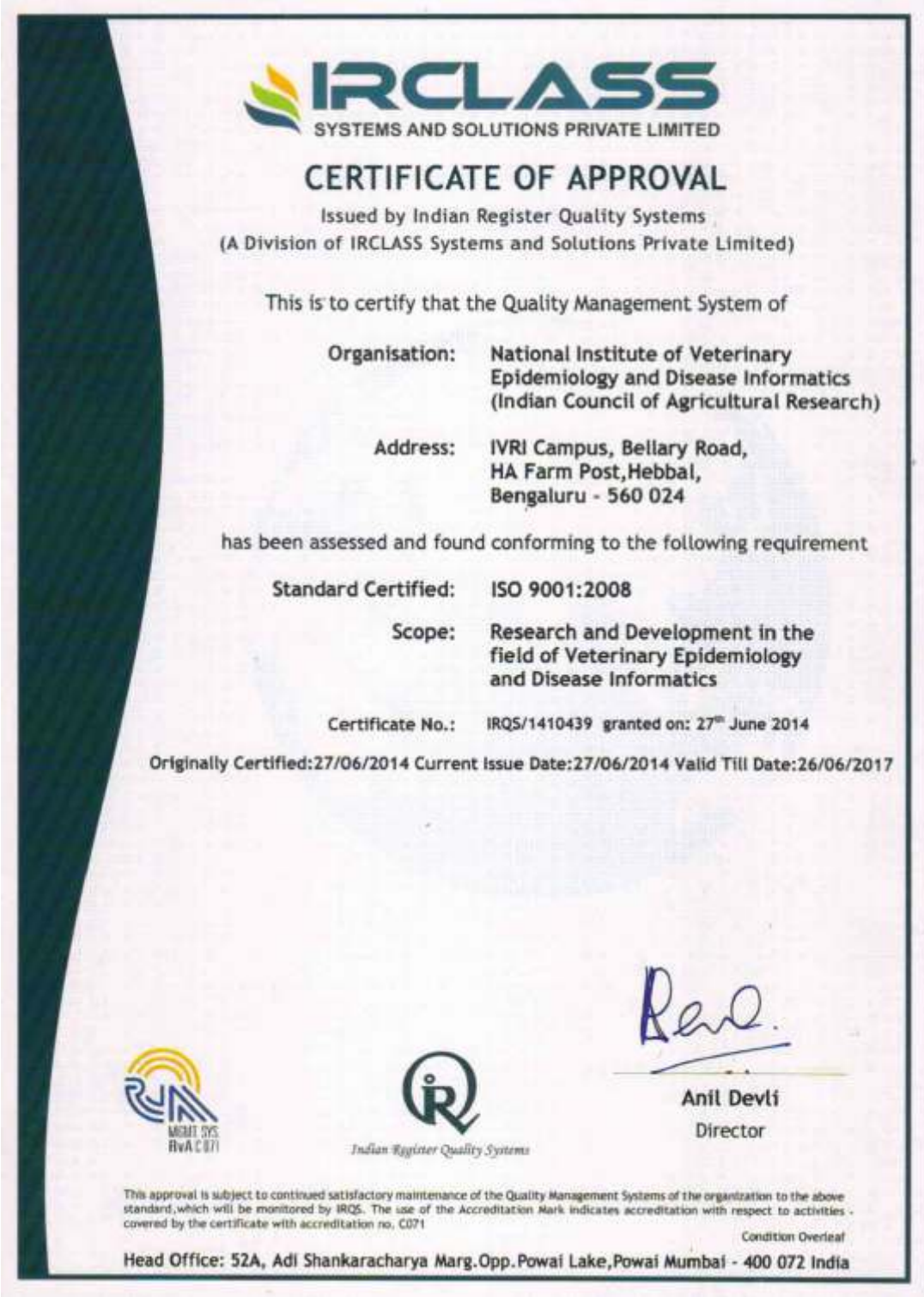
ICAR-NIVEDI was initiated by the ICAR in the VIIth five year plan as an All India Coordinated Research Project (AICRP-ADMAS). It became fully functional during the last quarter of 1987 with the establishment of four Regional Research Units (RRUs) located at Bengaluru, Hyderabad, Pune, and Ludhiana. The Central Coordinating Unit (CCU) was established at the Institute of Animal Health and Veterinary Biologicals, Bengaluru to coordinate research activities of the regional units. ADMAS was further strengthened in the VIIIth plan with support of ICAR and European union by taking the responsibility of the National Project on Rinderpest Eradication (NPRE) involving the participation of 32 state level diagnostic/ disease investigation laboratories. Later, realizing the impact of animal disease monitoring and surveillance on our entire livestock sector and to give a boost, ICAR upgraded this project to an independent institute status on 1st April, 2000 (during the IX plan) as - "Project Directorate on Animal Disease Monitoring and Surveillance (PDADMAS)" with ten collaborating units. The Directorate got further impetus with addition of five more collaborating units in the Xth plan. In XI plan Guwahati Centre in Assam was included as a collaborating unit of AICRP on ADMAS. Keeping in view of the significant contributions of this institute to country's livestock health sector, the ICAR further upgraded to National institute and rechristened as National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI) on 26th October 2013. On 9th January 2015, its new campus was inaugurated in Yelahanka with BSL-2 laboratory and administrative building.

Research mandates of NIVEDI

* Research and development on livestock disease epidemiology and informatics.
* Understanding specific disease process for rational development of diagnostics and strategic control technologies for livestock diseases including zoonosis.
* Development of systems for forecasting and forewarning of economically important livestock diseases.
* Economics of livestock diseases and health care measures.

Research Mandates of AICRP-ADMAS

* Sero-monitoring for important livestock diseases based on sample frame.
* Investigation of endemic, emerging and reemerging livestock disease outbreaks in respective area using innovative technologies.
* Participation/strengthening of National Livestock Serum Repository.
* Participation in strengthening of microbial pathogen repository at NIVEDI
* Effective updating of NADRES with active disease and related meteorological data.
* Utilization of forecasting models through NADRES for forecasting and forewarning of livestock diseases.
* Collaborative study on economic losses due to livestock diseases and their control measures.



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Anil Devli
Director

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National Institute of Veterinary Epidemiology and Disease Informatics, Bengaluru has been awarded ISO 9001:2008 Quality Management System certificate with scope of "Research and Development in the field of Veterinary Epidemiology and Disease Informatics" by Indian Register of Quality Systems, India on 27th June 2014

INSTITUTE RESEARCH PROJECTS

IPC:ANSCNIVEDISIL201200900033 Project ID:IXX09487

Modeling and forecasting the incidence, prevalence and outbreak of PPR in India

K.P. Suresh, V. Balamurugan, S.S. Patil, D. Hemadri and G. Govindaraj

Regression methods of outbreak detection have been widely used, both for detecting outbreaks in surveillance systems based on laboratory reports and notified infections, and for syndromic surveillance. A commonly used fully parametric outbreak detection regression model is based on that of Serfling(1963), who modelled the historical baselines using a trigonometric function with linear trend of the form

$$E(y_t)=\mu+\alpha t+\sum(\beta_t sin(w_t t)+\gamma_t cos(w_t t)),$$

where $E(y_t)$ is calculated as mean of observed counts at months t-1,t, t+1 over pre-specified number of years. This ensures that seasonal effects are automatically adjusted by design rather than by explicit modelling, thus providing the robustness to the model.

Often count variables are treated as continuous and linear regression is applied. Using linear regression models for count data is inefficient, due to inconsistent standard errors and negative predictions. Further, count data frequently display overdispersion and excess zeros. In this study, variety of count models including zero-inflated models were applied for outbreak prediction of PPR disease in India. PPR has been recorded throughout the year and show no seasonality. However, the disease is less recorded during the peak summer months indicating the virus is unlikely to survive the extreme heat. This is further supported by the highest incidence during the winter months (December to February). The result of PPR Model revealed that in West Bengal (East zone) and Andhra Pradesh (South zone) recorded more mean number of outbreak with 0.45 and 0.49 respectively. Karnataka, Jharkhand and Orissa also recorded moderate mean outbreaks. Whereas Kerala, Madhya Pradesh, Tamil Nadu, Maharashtra, Rajasthan recorded low mean outbreaks. Incidence rate ratio(IRR) results indicated that highest IRR was recorded for Himachal Pradesh, West Bengal, Karnataka, Gujarat and Maharasthra for monsoon season (June-September) Incidence of PPR is more likely in post-monsoon period (October-November) in Orissa, Himachal Pradesh, Karnataka, Gujarat and Maharasthra. Gujarat recorded highest IRR for PPR outbreak with 3.06, followed by Karnataka (2.81), Odisha (1.57), Andhra Pradesh (1.23),Tamil Nadu (1.31) in Winter (January-February). Outbreak of PPR is consistent in all season except summer for Karnataka, Gujarat, Maharashtra and Himachal Pradesh.

Table 1: Zone -wise model estimates and model fit parameters

State	Model Fit	Fit Statistics				Fit Statistics			
						Traditional models		Zero-inflated models	
		GOF	AIC	AICc	BIC	Intercept	Time	Intercept	Time
Central	ZINB	1.000	254.78	254.78	283.86	0.557	-1.0E-04	29.828	-59.591
East	ZINB	1.000	3435.30	3435.30	3474.20	-0.171	6.0E-04	29.638	-57.195
North East	ZINB	1.000	126.26	126.26	164.01	-14.599	5.4E-03	5.758	-1.031
North	ZINB	1.000	237.34	237.34	278.27	1.731	-6.0E-04	35.028	-62.297
South	ZINB	1.000	3628.16	3628.16	3666.82	1.727	-4.0E-04	29.549	-57.131
West	ZINB	1.000	244.22	244.22	274.80	0.633	-2.0E-04	29.396	-49.379

The count models such as Poisson, negative binomial and zero-inflated models were employed on outbreak data across states and zones. Out of fourteen states, five states provide the best fit for zero-inflated negative binomial and remaining nine states provided best fit for zero-inflated Poisson model. All zones are provided the best fit for zero-inflated negative binomial models. The models estimates can be used to predict the outbreak at any time (month) with in study period and nearest future. Space autocorrelation was performed using VARIOGRAM procedure with Moran`s I(z=103.40) and Geary`s c(z=3.18) statistic shows space continuity in PPR outbreak and rejecting the zero-space autocorrelation, hence model fitting was done in different zones to have better model estimates.

Models were evaluated using goodness-of-fit (P value), AIC, AICc, BIC criteria. The best fit models satisfied non-significance of goodness-of-fit and AIC, AICc and BIC were low. Further, the fit of the regular count models such as Poisson and negative binomial models, was compared along with their zero-inflated analogs, Zero-inflated Poisson and Zero-inflated negative binomial, using Voung test, a likelihood ratio -based statistic that measures the distance or closeness between two models.

Fig. 1: Parametric regression model with threshold for Eastern region of PPR outbreak

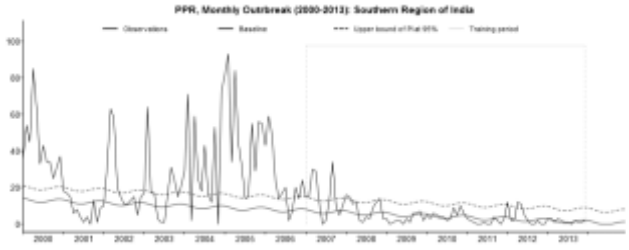

Fig. 2: Parametric regression model with threshold for Southern region of PPR outbreak

IPC:ANSCNIVEDISIL201200200026 Project ID: IXX07978

Economic analysis of Haemorrhagic Septicaemia in cattle and buffaloes in selected endemic states of India

G. Govindaraj, M.R. Gajendragad and P. Krishnamoorthy

Haemorrhagic Septicaemia (HS) is an important bacterial disease affecting primarily cattle and buffaloes. Haemorrhagic Septicaemia is caused by the bacterium *P.multocida (P.septica)*. During the period under report collection and analysis of primary data from Gujarat state was undertaken to assess the loss due to HS disease. Gujarat state was purposively selected for conducting primary survey during the year 2014-15 to assess loss due to HS disease in Cattle and Buffaloes. The three districts viz., Ahmedabad, Mahisagar and Patan were selected based on high prevalence of HS disease. Purposive sampling method was followed to identify the affected farms. Ten villages in the study districts were surveyed during the year 2014-15. Appropriate mathematical models were developed to assess mortality loss, milk loss, treatment cost, cost of extra labour engaged for nursing the animal etc. The results revealed that, high mortality was observed among the indigenous cattle, though the number of affected cattle is less. The average case fatality rate among the local buffalo in the surveyed districts was 78%.In 47% of the HS affected farms the disease persisted for less than three days, while in 18% farms it persisted for 4-6 days and in 34% farms it persisted for 7-9 days. Only in 1% farms the disease persisted for more than 10 days. In majority of the farms HS disease occurred during monsoon period (August and September) and winter months (November and December).

The estimated mortality loss per animal was Rs.27647 and Rs.31901 for indigenous and local buffalo respectively.

IPC:ANSCNIVEDISIL201201000034 Project ID: IXX09422

Epidemiology of Haemorrhagic Septicaemia in livestock vis-à-vis Foot and Mouth Disease in India

P. Krishnamoorthy, B.R. Shome and G. Govindaraj

Secondary data was collected on HS and FMD outbreaks occurred in Southern India. The year wise HS and FMD outbreaks occurred in Southern India during 2002-13 (11 years) is depicted in Fig 3. The HS and FMD outbreaks in Southern India showed decreasing trend from 2002. This might be due to effective vaccination and preventive measures adopted by state animal husbandry departments of southern states. The geographical coordinates (latitude and longitude) of HS and FMD outbreaks occurred villages in Tamil Nadu and Kerala during 2009-14, was collected and Cluster map was prepared using EpiInfo software version 7, CDC, Atlanta, USA (Fig.3). The cluster analysis revealed occurrence of different clusters for HS and FMD and no overlapping of the outbreaks was observed. There was no co-occurrence of HS and FMD outbreaks in Tamil Nadu and Kerala.

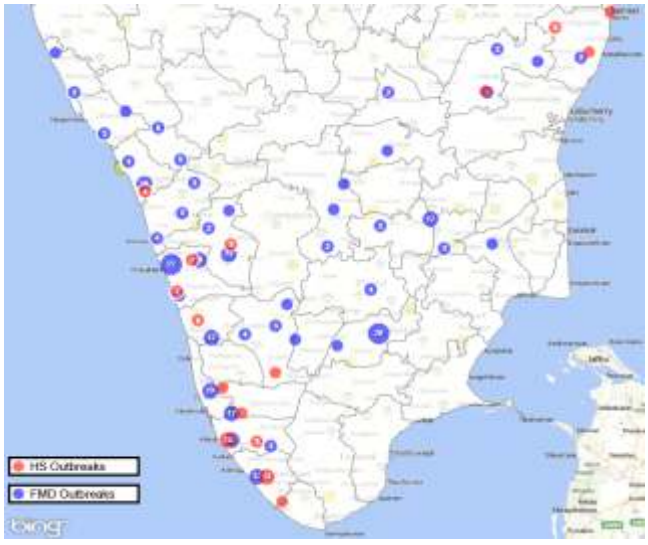

Fig. 3: Cluster map of HS and FMD outbreaks occurred in Tamil Nadu and Kerala during 2009-14

The districts affected with HS and FMD outbreaks during 2002-13 in southern states was given in Table 2. The districts affected with both HS and FMD was more in Andhra Pradesh and Karnataka when compared to other states.

Table 2: Number of districts affected with HS and FMD in different states in India

State	Total no. of Districts	Districts with HS	Districts with FMD	HS and FMD
Andhra Pradesh	23	22	18	18
Karnataka	30	24	21	21
Kerala	14	10	14	9
Tamil Nadu	32	2	12	2
Madhya Pradesh	51	14	11	6

Based on the analysis of secondary data, the season wise occurrence of HS outbreaks showed more in monsoon in Kerala and Karnataka and FMD outbreaks more in post monsoon in Tamil Nadu, Kerala and Karnataka. Month wise analysis of HS outbreaks showed high occurrence in November and September in Tamil Nadu and Kerala, respectively, which indicates the more occurrence during the monsoon season. FMD outbreaks showed high occurrence in December and October in Tamil Nadu and Kerala, respectively.

Nasal swabs (Mandya-10, Puducherry-4, Hosur-5, Bidar-25) and 10 throat swabs (Puducherry) suspected of having FMD. Tissue samples from Sheep (liver, spleen, lung, intestines) from Sidlaghatta, Karnataka and Cattle (liver, kidney, spleen, lung, heart) from Tavarekere, Karnataka were collected. Swabs were used for bacterial isolation and DNA extracted from bacterial culture and tissues. *Pasteurella multocida* species and type B specific PCR was done and all samples were found negative. Thus both primary data and secondary data showed there is no co-occurrence of HS and FMD.

IPC:ANSCNIVEDISIL201100200021 Project ID: IXX08329

Molecular epidemiology of MRSA, MR-CoNS and ESBL producing Gram-negative bacteria in animals including their environment

B.R. Shome and R. Shome

Methicillin resistant *Staphylococci*

A total of 97 samples were collected from goat farm located in Hossur, Tamil Nadu. Eighty three isolates were obtained and confirmed to be of genus *Staphylococcus* sp. Two out of 83 isolates showed amplification for *mec*A gene by *mec*A PCR. Antibiotic sensitivity test (ABST) showed one of the isolate as intermediate resistant to cefoxitin but the other isolate was sensitive to both methicillin and cefoxitin. One of the *mec*A positive isolate was identified as *Staphylococcus epidermidis* by m-PCR, while the unidentified isolate subjected for partial 16SrRNA sequencing and analysis indicated as *S. Xylosus*/ *S.saprophyticus*/ *S. cohinii*. Two *mec*A positive isolates found to be non typeable under SCC *mec* typing by PCR.

Membrane active glycopeptide antibiotic (YV11455), a cationic lipophilic vancomycin analogue, synthesized by JNCASR, was used for evaluating *in-vivo* antibacterial efficacy in murine thigh infection model. The mice rendered neutropenic were infected with ~10^7 CFU/ml concentration of MRSA by injection into the thigh. Subsequently, animals were treated intravenously with saline, vancomycin, linezolid and YV11455 at 12 mg/kg body weight and results were analyzed. The *in-vivo* efficacy of YV11455 in comparison with linezolid and vancomycin against MRSA is shown in Fig. 4. Vancomycin resulted in no change of bacterial growth from the initial titer (ED_{stasis}) whereas linezolid produced 50% maximal response from the vehicle treated mice (ED_{50}). In contrast, YV11455 showed excellent efficacy, where it produced ~3.0 log_{10} CFU/g reduction in bacterial count from the initial titer ($ED_{3\text{-}logkill}$).

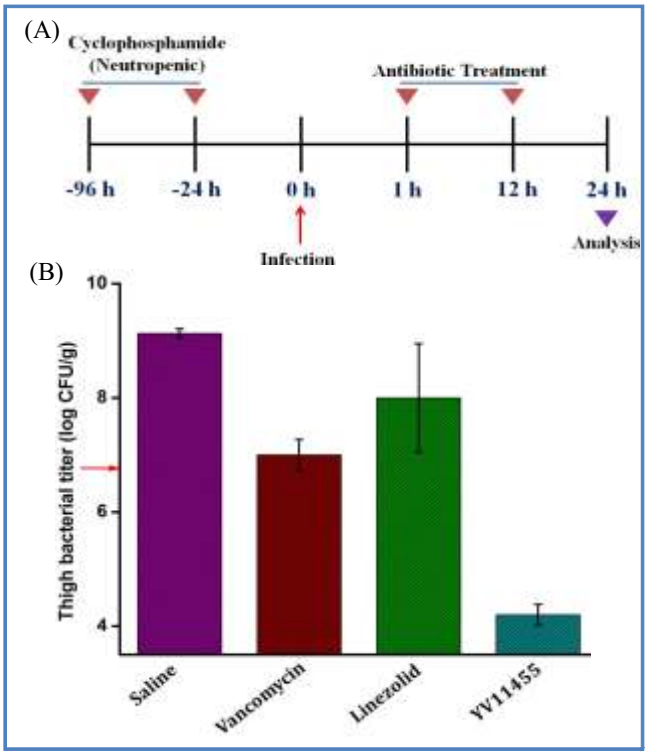

Fig. 4: *In-vivo* activity of YV11455 against MRSA.

The effect of dose response on the efficacy of YV11455 was performed in the NMT infection model against 50 µL of MRSA (10^7 CFU/ml). A single YV11455 dose that resulted in 50% maximal bacterial killing (ED_{50}) was 1.43 mg/kg. The YV11455 dose that resulted in a 24-h colony count similar to the pretreatment count was 2.68 mg/kg (ED_{stasis}). The value of 1-log_{10} kill dose ($ED_{1\text{-log kill}}$) for YV11455 was 3.86 mg/kg. It was also found that at the highest dosing regimen (12 mg/kg) YV11455 showed $ED_{3\text{-logkill}}$.

A total of 88 isolates were obtained from goat faecal samples, of which, 54 isolates were confirmed as *E. coli* by specific multiplex PCR. All 54 isolates were subjected to ABST for detection of ESBL, MBL and *Amp C*, which indicated 14 isolates to be ESBL showing resistance to any one of cephalosporins /monobactams, 3 were *Amp C* showing resistance to cephamycins (cefoxitin/cefotetan), 5 were ESBL + MBL, 7 were ESBL +*Amp C*, 6 were ESBL+ MBL+ AmpC (showing resistance to cephalosporins, cephamycins and carbapenems and 19 isolates were sensitive to all the antibiotics used.

Similarly, a total of 34 non *E. coli* isolates were also subjected to ABST for detection of ESBL, *Amp C* and MBL phenotypically. Non *E coli* isolates (8) were found to be resistant to cephalosporins/ monobactams. They were further confirmed by DDST, IPDD and E-test. Only one isolate was found to be resistant to one of the cephamycins and hence considered to be positive for *Amp C*. Three isolates were found to be ESBL +MBL, 10 isolates were ESBL +*Amp C*, one isolate was positive for MBL + *Amp C*, while 9 isolates were found to be ESBL+ *Amp C*+ MBL and 2 isolates were sensitive to all antibiotics used.

All ESBL non *E. coli* (30) isolates were subjected to PCR for detection of ESBL genes (TEM, SHV and CTX-M), of which 2 isolates were positive for both TEM and SHV gene, while 4 isolates were positive only for SHV gene. All TEM and SHV positive isolates (6) were identified as *Klebsiella pneumoniae* by genus and species specific PCR. None of the isolates were positive for CTX-M groups. The prevalence of ESBL producing *pneumoniae* in goat was found to be 17.64%.

A total of 40 milk samples from lactating cows in dairy farm, Karnataka resulted in 36 isolates as *E. coli* which were screened for beta lactamase genes of family *tem* and *shv* by PCR. A total of 12 *E. coli* isolates were positive for *tem* gene and rest all were negative for *shv* gene.

Preliminary studies were performed to evaluate the *in-vivo* antibacterial efficacy of combination of MAMs and antibiotics. Mice were injected (1 h and 12 h post-infection) with MAM1 (15 mg kg^{-1}), doxycycline (100 mg kg^{-1}) and MAM1 + doxycyline (15 mg kg^{-1} + 100 mg kg^{-1}). The bacterial burdens in thigh muscle of the mice treated with the combination of MAM 1 + doxycyline were found to be significantly (P = 0.03) lower than the saline treated mice (Fig. 5). The preliminary studies showed some potential of combination therapy.

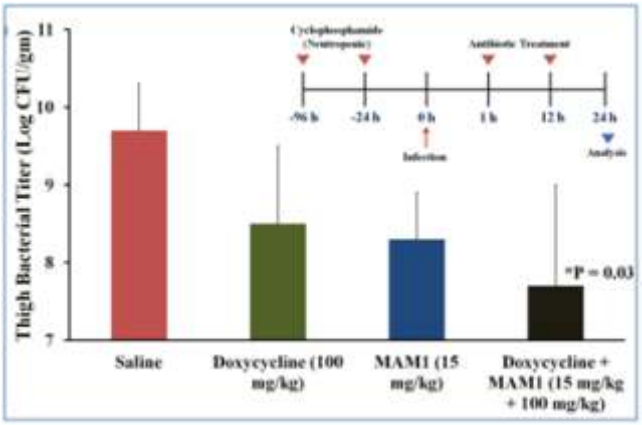

Fig. 5: *In-vivo* antibacterial efficacy of MAM1 and doxycycline in mouse model. Inset experimental design.

IPC: ANSCNIVEDISIL201200100025 Project ID: IXX08032

Epidemiological survey and estimation of economic impact of PPR in sheep and goats

V. Balamurugan, G. Govindaraj, P. Krishnamoorthy and M.R. Gajendragad

Time series data for PPR outbreaks from 2003 to 2013 years in India and Karnataka was collected for epidemiological analysis and estimation of economic losses. Analysis of the monthly occurrence of the disease showed that till August, there were few outbreaks but there after the number increased slowly. Movement of animals due to increased sheep trade also increases the disease incidence.

PPR clinical score card was developed based on the certain scientific inputs acquired during field investigation of outbreaks and assumptions for assessing disease severity pattern during PPR outbreaks in field conditions. Analyses of primary data collected during outbreaks were used for the evaluating the developed clinical scorecard. This card will be useful in assessing the severity of the disease pattern like severe, moderate, mild etc. during PPR outbreaks in sheep and goats in the vaccinated and unvaccinated area. The direct and indirect economic loss due to PPR in sheep and goats were using the secondary data. Appropriate mathematical models were used to assess the different losses. The various parameters considered for assessing the loss due to PPR were adults and young populations, PPR prevalence (%), adult and young one mortality(%) and morbidity(%) etc. At the optimum incremental prevalence level (10%), the estimated total loss due to PPR in sheep and goats in India was Rs.1611 crores (mortality loss amounts to Rs.1204 crores and morbidity loss was Rs.407 crores). Sensitivity analysis results revealed that the mortality and morbidity loss at the minimum PPR incremental prevalence levels 5% in sheep and goats in India amounts to 805 crores whereas, at the maximum incremental prevalence (15%), the total loss estimated was 2416 crores. Further, secondary data was collected on the National Control Programme of PPR from Karnataka and AP state for assessing the impact of the ongoing NCP-PPR programme in Karnataka and Andhra Pradesh states.

IPC: ANSCNIVEDISIL201201800042 Project ID: IXX09665

Epidemiology and impact analysis of sheep and goat pox

G.B. Manjunatha Reddy, V. Balamurugan, K.P. Suresh, D. Hemadri and S.S. Patil

The sheep and goat pox secondary data was collected from various states of India with the help of NADRES data and other open source websites. The data was restructured according to number of disease outbreaks, number of attacks, number of deaths, month and year. The disease outbreak data collected was stratified in to district, region, month/season and yearwise. A total 3425 pox outbreaks were reported from 2005-2013 from different states in India. There was increasing trend in number of disease outbreaks from 2005 to 2013 then was decline. Highest number of outbreaks were reported from AP. The sheep and goat pox disease outbreaks were more recorded during December to May. The disease outbreaks were recorded in the month of April 2014 and March 2015 in four unvaccinated flocks. The morbidity and mortality rate in the flock with goats was 70.31% and 46.87%, respectively. The disease intensity was more in young animals (60%) than adults (40%). The morbidity and mortality rate in the flock with mixed population of sheep and goats was 62.22% and 22.22% respectively.

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. The *Capripox virus* was confirmed in the clinical samples and cell culture by p32 gene based PCR and expected specific amplification of

237 bp product was observed and confirmed as *Capripox virus* by sequencing. The phylogenetic analysis revealed 94.6% to 100 % homology with all the other Indian *Capripox virus* isolates at nucleotide as well as aminoacid levels. The previous studies also revealed similar findings, in which Indian isolates were not only closely related to Indian but also to Chinese and standard Indian vaccine strain. The sequences matched 100% between Pox/NIVEDI-1 and Pox/NIVEDI-2 suggesting both the flocks had same virus infection in both sheep and goats (Fig. 6)

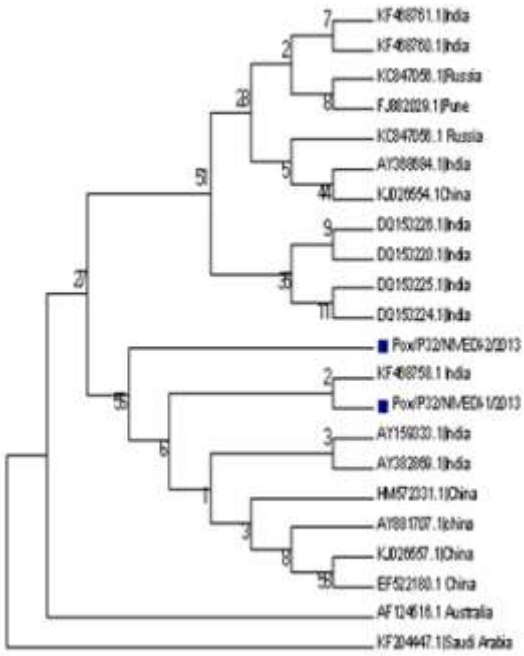

Fig. 6: Phylogenetic analysis of *Capripox virus* isolates based on the partial nucleotide sequence of P32 gene. The phylogenetic tree was constructed by the neighbor joining algorithm using MEGA 5.1 software.

IPC: ANSCNIVEDISIL201100400023 Project ID: IXX07919

Epidemiology of Classical swine fever in India

S.S. Patil, D. Hemadri. M.R. Gajendragad and H. Rahman

A total of 94 serum samples were screened for CSFV antibodies, of which 28 samples were found positive (28/94=29.78%). The sera samples were from the following states:Odisha(1/5), Arunachal Pradesh(1/1), Meghalaya(0/2), Manipur (0/1), Jharkhand (15/25), Karnataka (11/61). Twenty seven (27) pig blood samples from Karnataka were screened by RT=PCR using the primers specific for 5'UTR and all were found negative. A total of 8 pig tissue samples (pooled spleen, liver, LNs kidney) from Karnataka were screened for CSFV by RT-PCR using primers specific for 5'UTR, NS 5B and E2 genomic region, of which two (2) samples were positive for all the three regions.

A total of 24 E2 sequences obtained as RT-PCR amplicons from different clinical samples from Arunachal Pradesh (6), Karnataka (12), Punjab (1), Andhra Pradesh (3), Maharashtra (1) and Odisha (1) along with 41 reference sequences available in the GenBank. It was found that all the recent CSFV 24 E 2 sequences were grouped into subtype 2.2 gradually dominating the traditional 1.1 group (Fig. 7). However, some more samples need to be screened and other genetic regions of the CSFV should also been analysed.

Table. 3: Cumulative seroprevalence of CSF in India during 2010-14

Sl No	Year	No. Tested	No. Positive	No. Negative	Percent Positivity
1	2010-11	1257	237	1020	18.85
2	2011-12	426	191	235	44.83
3	2012-13	1110	535	575	48.19
4	2013-14	373	160	213	42.8
5	2014-15	94	28	66	29.78
	Total	**3260**	**1151**	**2109**	**35.30**

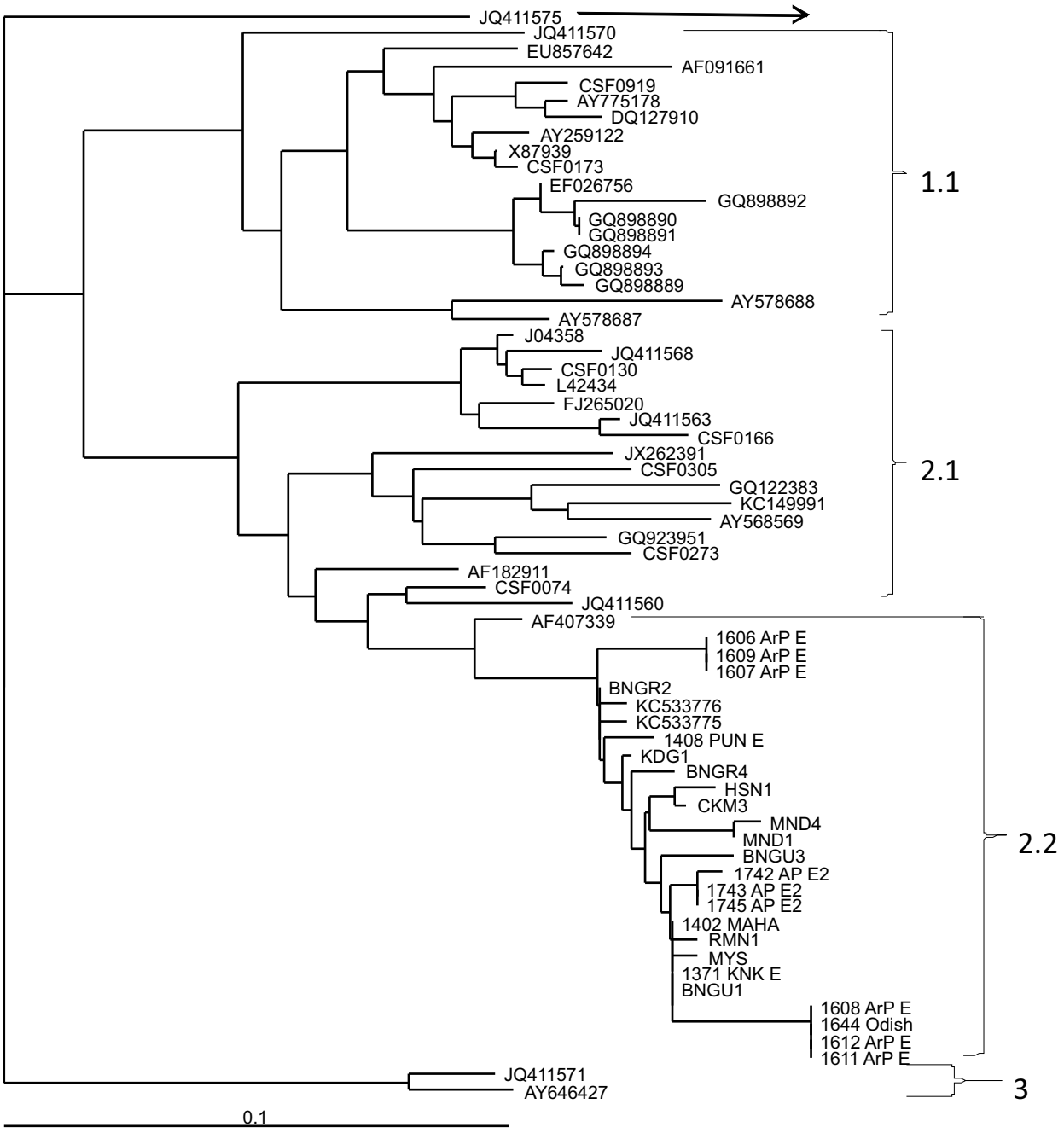

Fig. 7: Genetic grouping of recent Classical swine fever virus isolates from India based on E2 genomic region.

IPC: ANSCNIVEDISIL201400700060 Project ID: IXX11817

Molecular epidemiology of Ganjam virus in sheep and goats

G.S. Desai (NIVEDI), A.K. Tiwari, G. Ravikumar, Hira Ram (IVRI, Izatnagar)

Ganjam virus is the identical or closely related virus of Nairobi sheep disease virus prevalent in sheep and goats in India. Nairobi sheep disease is a tick transmitted disease characterized by haemorrhagic gastroenteritis and high mortality (over 90%) in susceptible in sheep and goats and prevalent in African countries.Serological investigations have shown the presence of Ganjam Virus neutralizing antibodies in Sheep, Goat, Cattle of Karnataka, Tamil Nadu, Punjab, Gujarat, Orissa, Jammu and Kashmir states. Though the serological evidence suggests that Ganjam virus infection of Sheep and Goats does occur, the extent of associated clinical disease, pathology and its epidemiology is not known. Also, there are no diagnostic assays and vaccines available for the timely diagnosis for effective control of the disease.

Under the project, 135 serum, 119 blood and 17 tick pool samples from sheep and goats were collected from different places. Also, 14 human serum samples were collected. The plasmid clone containing 970 bp of Ganjam virus NP gene was re-amplified with primers containing HIS tag sequence. The product was cloned in pGEMT vector.The *Nde*I and *Hind*III cut insert in pGEMT vector was subcloned in pET30a vector and the ligation mixture was transformed in BL21 cells. The recombinant colonies were isolated, plasmid DNA extracted and purified. The sample of purified DNA was sequenced to confirm the translating ORF during protein expression. This ORF was found to be in frame with N-terminal HIS tag.

IPC: ANSCNIVEDISIL201100500024 Project ID: IXX07976

Epidemiological study of surra and fascioliosis in animals

P.P. Sengupta, V. Balamurugan, P. Krishnamoorthy

A total of 2093 cattle, buffalo, horse, donkey and camel serum samples from Karnataka (943), Odisha (71), West Bengal (327) and Rajasthan (752) were screened by ELISA. An overall 586 samples were found positive for the presence of antibodies of surra. The percentage of sero-positivity in different spps. has been depicted in Fig. 8.

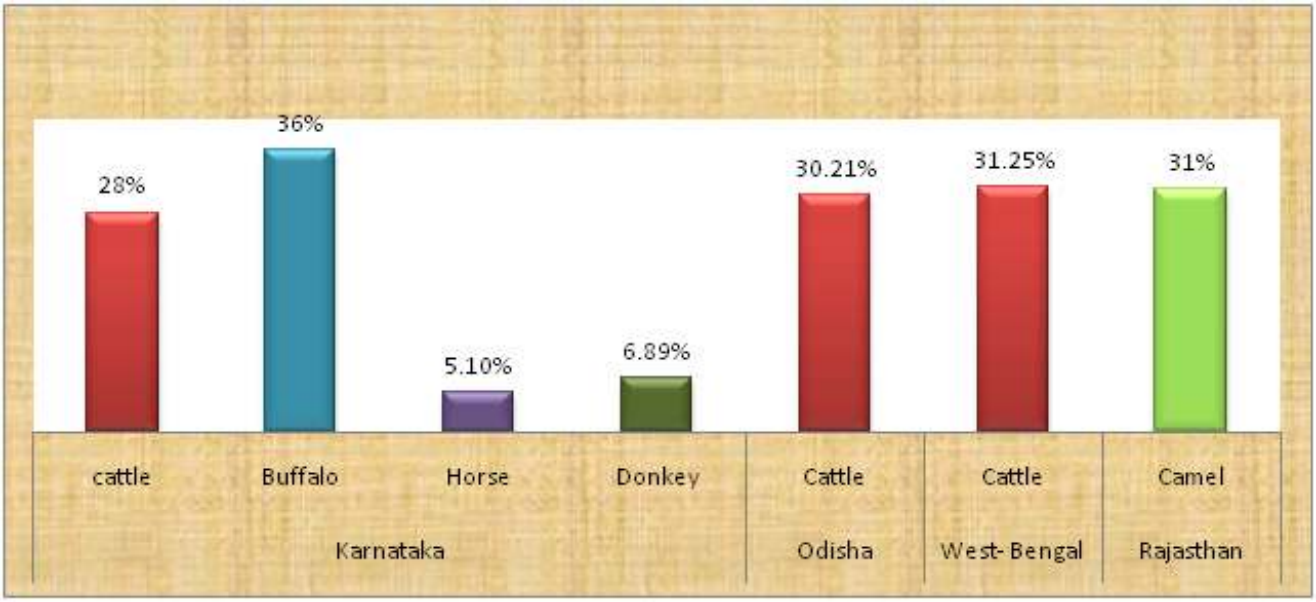

Fig. 8: Antibody detecting ELISA result for the presence of T. evansi antibody

A total of 222 faecal samples were collected from cattle, buffalo, sheep and goats from Karnataka. Overall 19.81% of the samples were found positive. Among the positive samples, *Fasciola* was 17%, Strongyles 12%, Amphistome 15%. Thirty two snails (*Lymnea* sp.) were collected from Karnataka and subjected to PCR for the presence of *Fasciola* infection. Over all 13% were found positive in Karnataka for *Fasciola* infection.

INTER INSTITUTIONAL PROJECTS

IPC: ANSCNIVEDICOL201300400047 Project ID: OXX02385

Assessment of Socio-economic impact of FMD and its control in India

G. Govindaraj, S.S. Patil and K.P. Suresh (NIVEDI)
B.B. Dash, S. Saravanan,S.S. Pawar,G.K. Sharma(PD-FMD) B. Ganesh Kumar (NAARM),
R.G. Bambal (DADF), J. Mishri (ICAR)

Livestock provides large self-employment opportunities and stability to income especially in the arid and semi-arid regions of the country. The growth of the livestock sector can be increased by focusing on the control of important livestock diseases; most importantly Foot and Mouth Disease (FMD). FMD causes huge loss to livestock farmers besides other stakeholders in the livestock value chain. The magnitude of losses helps in initiating appropriate action; hence, this project was initiated with funding from PDFMD, Mukteshwar and executed in collaboration with AICRP on FMD centres located in eleven states and one Union territory.

Multistage Cluster Random Sampling technique was followed to survey the livestock farms in each of the identified states. In the first stage, three districts with different risk levels were selected in each state. In the second stage, two taluks were randomly selected. In the third stage, in each of the selected taluks, two blocks were randomly selected. In the fourth stage a cluster comprising 5-10 villages were selected. In the last stage, the individual farmers were randomly selected in the identified cluster. The sample size in each district is 150. The distribution of the sample farmers across villages was based on the proportional representation of cattle rearing households. Appropriate mathematical models were developed to assess milk loss, draught power loss, treatment cost incurred for the FMD infected animal, cost of extra labour engaged for nursing the animal, mortality loss and loss due to distress sale. The results of the study revealed that at all India level, the total estimated direct loss due to FMD during 2013-14 was 23193 crores. Besides all India level, the state level estimates were also derived based on the susceptibility rate of different species, estimated per animal loss etc.

IPC: ANSCNIVEDICIL201400600059 Project ID: IXX11154

Epidemiology of Influenza viruses in pigs

G.S. Desai, S.S. Patil (NIVEDI), N.N. Barman (Veterinary College, Khanapara)

Swine influenza is a highly contagious viral infection of pigs that can have significant economic impact on an affected herd. These viruses, now classified as classical-swine H1N1, H1N2 viruses and a widespread novel triple-reassortant H3N2 virus. Influenza A viruses are clinically the most important pathogens and have been responsible for severe pandemics in humans around the globe.In India, though there is interrupted surveillance of seasonal and other human influenza by the medical institutes and the systematic surveillance of HPAI and other influenza of poultry by animal health institute in Bhopal, no systematic epidemiological and surveillance of animal influenza viruses especially that of swine influenza has been taken up till date. Hence the project is undertaken with the objectives of (i) to understand and identify the circulating influenza virus (type and) subtypes in pigs in India and (ii) to study the genetic heterogeneity of the circulating influenza strains in pigs.Under the project blood, serum and nasal swabs were collected from pigs of different places. Other consumables and the Influenza A antibody ELISA kits were procured from IDEXX. For collection of samples from field the sample frame of pigs is being calculated using the statistical programmes.

IPC: ANSCNIVEDICOP201201100035 ProjectID-IXX09659

Risk analysis of Introduction of Notifiable Avian Influenza (NAI, HPNAI and LPNAI) in India with special referance to Risk of NAI through Trade and / or Non- trade Activities

K.P. Suresh (NIVEDI), D.D. Kulkarni, S. Bhatia, H.V. Murugkar, C. Tosh (NIHSAD, Bhopal)

Risk path analysis has been identified for import of Chicken meat and by-products and live-birds which includes the hazard identification, Release assessment, Exposure assessment and consequence assessment. Total of 15 nodes were identified and estimated the risk probabilities for each node. The total risk probability for five dimensional risk is estimated to be 0.001636. Quantitative import risk analysis of five countries suggested that France shown to be more risk followed by USA for importing the live birds/chicken/byproducts

The risk of import of AI is estimated for five major countries as shown below

Country	Import Quantity (MT)	Import Quantity(kg)	Estimated Quantity(kg) Import Risk	% of risk
Canada	16.83	16830.0	27.5	0.16
USA	63.88	63880.0	209.4	0.33
France	62.26	62260.0	712.1	1.14
Australia	0.13	130.0	0.06	0.04
Thailand	2.73	2730.0	0.52	0.02

IPC: ANSCNIVEDISIL201300300046 Project ID:IXX10616

Retrospective Epidemiological studies on HPAI with reference to spatio-temporal pattern and the probable associated risk factors identification

R. Sridevi (NIVEDI), A.A. Raut (NIHSAD, Bhopal), K.P. Suresh, P. Krishnamoorthy (NIVEDI)

Understanding the spatio-temporal patterns of H5N1 outbreaks in India, can provide visual clues to the dynamics of disease spread and of areas at risk, and thus improve the cost-effectiveness of disease control and prevention. In India, from 2006, H5N1 avian influenza disease outbreaks have been reported. This study attempt to describe the AI (H5N1) outbreaks in spatial and temporal aspects of epidemiology and some of the associated risk factor identification. Previously reported HPAI outbreaks were mapped spatially based on the GIS co-ordinates as point maps/dot maps. The spatial outbreak maps for the North Eastern states for various years prepared. The year 2008 had reported more outbreaks compared to other years. Temporal data analysis suggests that there might be three different introductions of disease in that year in different places. Epidemic curves were also plotted. In the year 2008, majority outbreaks occurred in the districts adjoining the neighbouring countries Bangladesh, Nepal which are endemic to H5N1 avian influenza. H5N1 outbreaks were reported in crows in 2011-12 from Jharkhand, Maharashtra, Orissa, Bihar. Spatial outbreak maps /point map for the crow outbreaks prepared. To study probable associated factors/ risk factors for disease occurrence, questionnaire is the required tool. Hence a preliminary study questionnaire was prepared based on the animal husbandry practices, ecological factors, managemental practices mainly biosecurity measures employed, demographic factors, etc. The questionnaire was prepared targeting the poultry farmers/farm owners. The outbreaks in crows were scattered in occurrence denotes disease spread in different places/locations since the crows are wild /semi domestic species found near human habitations. This poses threat to public health and spread to new locations.

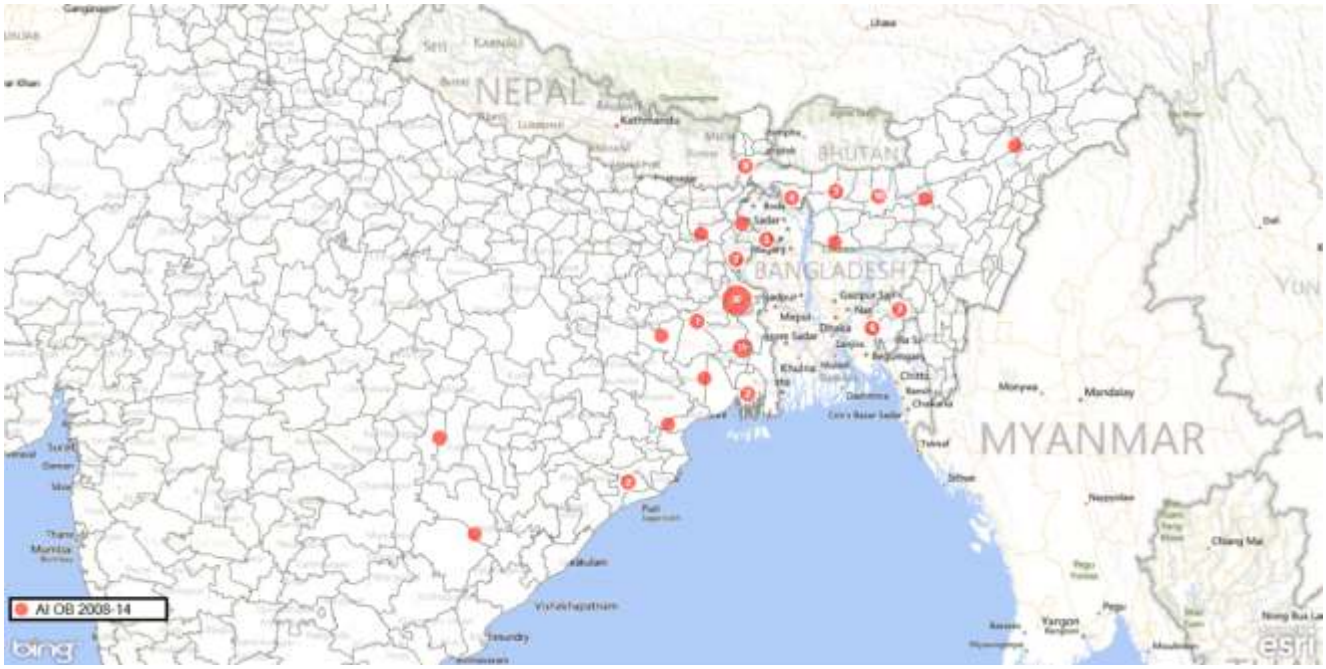

Fig. 9: Spatial map depicting Avian Influenza outbreaks with clusters (2008 -14)

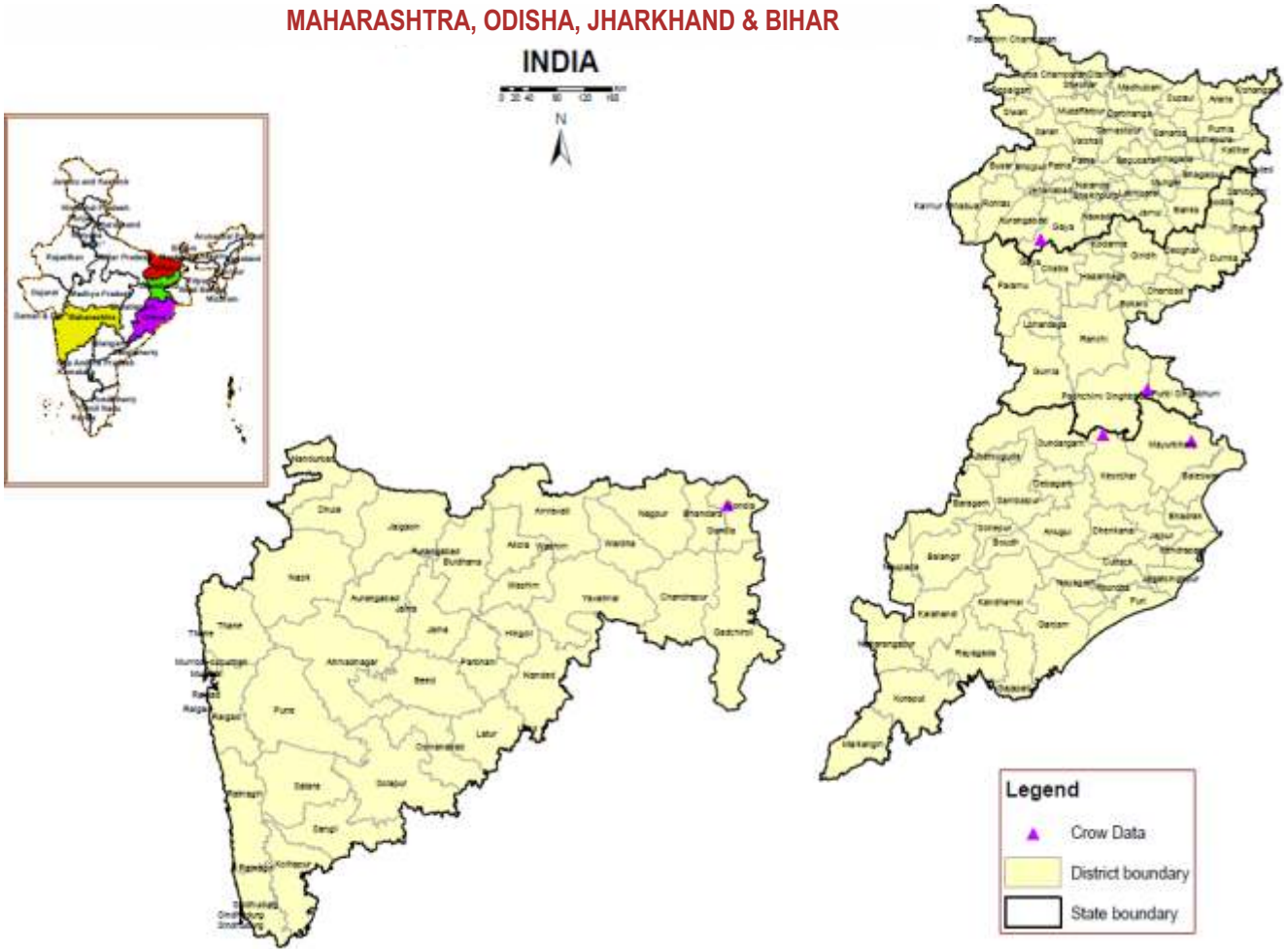

Fig. 10: H5N1 avian influenza outbreaks in crows (2011-12)

IPC: ANSCNIVEDICOP201201400038 Project ID: IXX10059

Cross-sectional surveillance of Malignant Catarrhal Fever infection in domestic and wild ruminants in Southern India

D. Hemadri, S.S. Patil, M.R. Gajendragad, K.P. Suresh (NIVEDI),
Richa Sood, Manoj Kumar, Victoria Chanu (NIHSAD, Bhopal)

A total of 553 blood samples were collected (based on stratified random sampling method) from 25 locations in 17 taluks of nine districts Maharashtra. The results show that prevalences vary from as low as 12% (Malshiras taluk) to as high as 90% (Daund Taluk). Overall prevalence of OvHV-2 in Maharashtra was about 55.5% which is almost double than neighbouring state Karnataka. The study also indicated that prevalence is not uniform not only within state but also within the districts. Areas of high prevalence and low prevalence co-existed even at the village level. Interestingly, study also provided indications that in the Southern-most regions (Solapur, Kolhapur districts) of Maharashtra , the prevalence (Fig. 11a, 11b) is half of the state average. Sheep migrations from these regions mostly occur to parts of Karnataka, where the disease prevalence is low

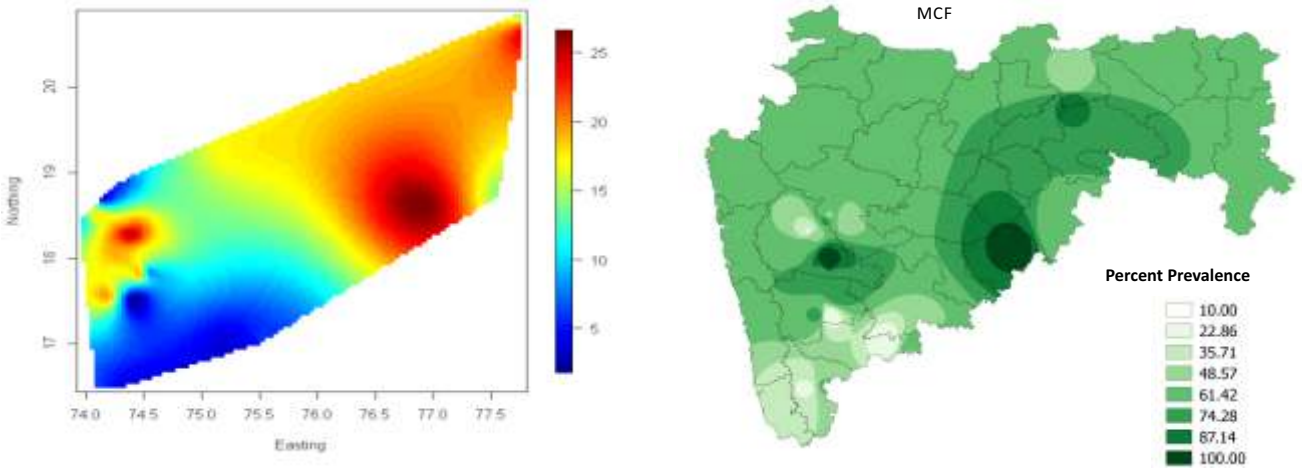

Fig. 11: a. Spline and b. IDW interpolation showing regions of high and low prevalence of OvHV-2 in Maharashtra

Sheep density in Telangana state (Fig.12) varies from 10-225 sheep per square km, with highest sheep density at Mahaboob Nagar. As crowding plays important role in the spread of Ovine herpes virus-2 (OvHV-2), the villages were classified into three different strata based on sheep density and proportionate samples were drawn randomly. Accordingly, 260 blood samples were collected from three districts (Mahaboobnagar, Warrangal and Nalgonda) and 11 mandals. The results are given below.

District/Mandals	Percent Prevalence
Mahbubnagar	**44.92**
Chinnachintakunta	16.67
Kollapur	58.82
Makthal	66.67
Pangal	23.53
Peddamandadi	70.59
Telkapalle	11.11
Veepangandla	52.29
Nalgonda	**79.41**
Bhongir	70.59
Bibinagar	88.24
Warangal	**20.59**
Ghanpur	14.71
Thorrur	26.47
Grand Total	**43.03**

The results indicated that Nalgonda district has prevalence which is higher than the state average, where as Warrangal district has average lower than the state average.

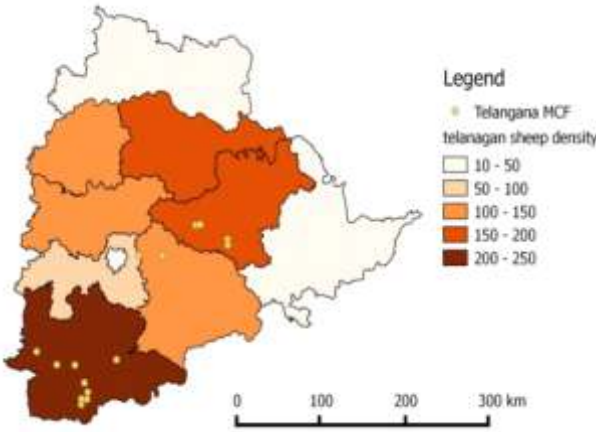

Fig.12: Sample locations in the backdrop of sheep density

EXTERNALLY FUNDED PROJECTS

IPC: ANSCNIVEDIISOP200900500017 Project ID: OXX02232

Outreach Programme on Zoonotic Diseases

V. Balamurugan, P.P. Sengupta and R. Sridevi

During the period under report, 678 serum samples (69 bovine, 372 sheep & goat, 51 horse and 186 Human) were tested for antibodies against *Leptospira, Listeria* and *Toxoplasma* by Microscopic agglutination test, Listeriolysin-O base iELISA and Latex agglutination test, respectively. High seropositivity was found with the *Leptospira*, followed by *Listeria* and *Toxoplasma* respectively. All the three zoonotic diseases, clearly shows the concurrent occurrence of the multiple zoonotic diseases in livestock and human beings. Hence regular monitoring of the zoonotic diseases by sensitive diagnostic tests, good management practices in fields, awareness campaigns are essential for control of diseases.

Table 4: Sero-prevelance of leptospirosis, toxoplasmosis and listeriosis

Species	Total samples analysed	Leptospirosis			Listeriosis	Toxoplasmosis
		MAT	LAT	PCR	LLO ELISA	LAT
Sheep	113	11	0	0	0	0
Goat	259	74	14	0	0	0
Horse	51	4/51	0	0	0	0
Human	186	2/36	96	10	0/13	19/72
Cattle	69	0	28	0	11	10
Total	**678**	**91**	**138**	**10**	**11**	**29**

Listeriolysin–O, a major virulence factor involved in pathogenesis was harvested from *L.monocytogenes* cultures grown at 37^{0}C for 16 hrs on brain heart infusion broth and cell free supernatant was precipitated by ammonium sulphate purified by DEAE agarose anion exchange chromatography, tested by SDS-PAGE/ Western Blot and evaluated by IELISA with hyper immune sera raised in rabbits. Lateral Flow Assay kits for *Listeria* diagnosis was designed in collaboration with M/s Ubio Biotechnology systems Pvt Ltd., Cochin using Listeriolysin–O and Colloidal gold conjugated Protein G and the test was evaluated with 405 number of serum samples of livestock and humans. LFA tests showed 100% agreement with LLO based Indirect ELISA. But LFA test device failed to detect anti Listeria antibodies in blood sample analysis. Further improvement and validation of the test device with commercially available OIE complaint kit is required to make it suitable for field use and blood samples for greater sensitivity.

Table 5: Screening of samples serological tests for listeriosis

Species	Total No .of Samples	LLO iELISA Positive	Serum LFA Positive	Blood LFA Positive
Cattle	170	11/170	11/170	0/170
Sheep and Goat	119	7/119	7/119	0/19
Human	116	0/116	0/116	0/116
Total	**405**	**18/405**	**18/405**	**0/305**
Percentage positive		**4.45%**	**4.45%**	**0.00**

Diagnosis of leptospirosis depends upon the isolation of leptospires from clinical specimens or serodiagnosis in paired acute and convalescent serum samples. Conventional PCR assays have been developed, but all have limitations which restricted their widespread use. In order to overcome these limitations, multiplex PCR using two primer set targeted at 16s RNA (331bp) and ligB (434bp) gene, which are conserved in pathogenic *Leptospira*. Lept 1 & 2 can detect the samples positive for the *Leptospira* whereas Lig B 3 & 4 detects samples for pathogenic *Leptospira* was developed. Using around 18 pathogenic *Leptospira* and one non - pathogenic *Leptospira* DNA, assay was standardized. Any serum/blood/plasma/urine (DNA extracted) samples from human showing the symptoms of the *Leptospira* such as fever, pyrexia and jaundice etc., can be tested for the presence of pathogenic *Leptospira*.

Table 6: Seroprevalence of Toxoplasmosis in humans

State/District	Samples Tested	Samples Positive	Percentage Positive
Andhra Pradesh	51	13	13/51 (25.49%)
Karnataka	28	5	5/28 (17.85%)
West Bengal	69	0	0/60 (0.00%)
Grand Total	**148**	**18**	**18/148 (12.16%)**

IPC:ANSCNIVEDISOP201200600030 Project ID: OXX01504

All India Network Programme on Bluetongue (AINPBT)

D. Hemadri

Bluetongue has not been officially reported from Maharashtra for almost a decade. Since, vaccination against bluetongue is not in practice, the antibodies to bluetongue virus in a susceptible animal species like sheep essentially indicates the virus circulation in the field. A serological survey was conducted based on a predetermined sampling plan. Briefly, the sampling plan consisted of classifying the villages into three categories and allotting the samples proportionately to each category and then selecting the samples randomly within each category. A total of 562 serum samples from nine districts (23 taluks) of Maharashtra were collected (Fig. 13) and screened for the presence of antibodies to BTV using a commercial kit.

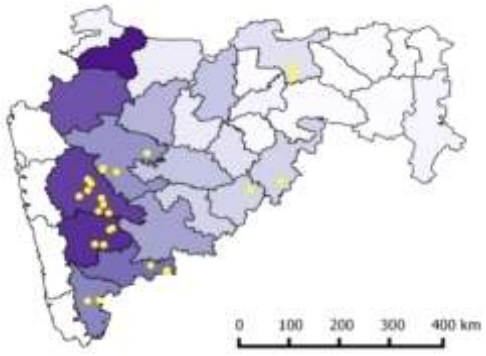

Fig. 13: Map showing sampled locations in the backdrop of district-wise sheep density in Maharashtra state (Deeper the colour, higher the density).

The results indicated that a high proportion (492/562, 87.54%) samples are positive. Overall prevalence of bluetongue in Maharashtra varied from 82.3 (CI 95% 71-89.8%) to 100%. Taluk wise analysis of results indicated that Haveli and Daund have lower prevalence, 59.1 & 66.7 respectively as compared to rest of the taluks in the state. Age wise analysis of results indicated that the disease is less prevalent in animals less than 1 year of age, while most (85%) of the animals get exposed to the virus by two years of age. The number of affected animals increases as the age increases. Taken together, the results clearly indicate that BTV is circulating in the Maharashtra and higher prevalence could be one of the reasons for animals not showing overt clinical signs.

A total of 230 clinical samples (blood) were collected from suspected bluetongue outbreaks from seven districts (Chikkaballapur, Koppal, Raichur, Bagalkot, Gadag, Davanagere, Tumkur) of Karnataka and two districts (Erode, Tiruppur), of Tamil Nadu. All the samples were initially screened by antigen ELISA kit supplied by IVRI Mukteswar. Preliminary analysis of clinical samples by PCR has indicated involvement of serotypes 1 and 2 in the outbreaks. Following processing of clinical samples in insect cell line was done.

IPC:ANSCNIVEDICOL201201500039 Project ID:OXX02733

DBT - Network Project on Brucellosis Project Monitoring Unit (PMU)

H. Rahman and G.B. Manjunatha Reddy

Brucellosis is an important zoonotic disease of major economic importance in animals and human. The DBT-Network Project on Brucellosis is a multi-instuitional Pan-India programme aimed at prevention and control of brucellosis in the country. The project has different subunits on brucellosis epidemiology (8), Brucellosis diagnostics (3), Brucellosis vaccine (2), Brucellosis repository (1) and Brucellosis bioinformatics (1), with overall monitoring of project entrusted to Project Monitoring Unit (PMU) at NIVEDI, Bengaluru. PMU is involved in co-ordinating different activities of all the subunits under DBT Network Project on Brucellosis. Monitoring the research activities of different centres by means of monthly and quarterly reports, also submitting the compiled monthly, quarterly and annual reports to DBT. PMU Coordinated the Midterm Review Meet at Ahmedabad in collaboration with BE-2 Unit, SDAU (08.08.2014) and Annual Review Meet at Jawaharlal Nehru University JNU, New Delhi in collaboration with BV-1 Unit, JNU (21st-22nd November, 2014). Regularly sending the updates on different activities undertaken under the project by different subunits to web manager for the updating and maintenance of DBT-Brucellosis website. PMU organized DBT sponsored "Hands on Training on quantitative Real time PCR for diagnosis of brucellosis" from 2nd - 4th, June, 2014 at NIVEDI, Bengaluru and coordinated *Brucella* Isolation workshop at IVRI, Izatnagar for the PI/CoPIs/contractual staff working under different subunits of network project. PMU co-ordinated in sending the serum samples, bacterial cultures, *Brucella* antigens procurement, DNA between the different subunits. PMU also undertook the validation of different *Brucella* diagnostic kits developed under the project.

IPC: ANSCNIVEDISOP201201600040 Project ID:OXX02578

DBT Network project: Brucellosis Epidemiology (BE-1)

Rajeswari Shome, B.R. Shome and G.B. Manjunatha Reddy

Bovine serum samples (n=685) collected from different farms were screened for brucellosis by RBPT and Protein G based Indirect ELISA. Of 685 samples, 52 (7.59%) and 49 (7.15%) samples were positive by RBPT and iELISA respectively. The cumulative sero monitoring result has been presents in Table (7).

Table 7: Cumulative results of seroprevalence study of brucellosis

Species	No. of Farms	No. of samples	RBPT	ELISA	Percentage
Cattle	9	685	52	49	7.59
Buffalo	3	202	82	82	40.59
Goat	3	194	6	6	3.0
Sheep	4	166	11	Not Done	6.63
Pig	5	113	49	Not Done	43.36
Total	**24**	**1360**	**200 (14.70%)**	**137 (10.07%)**	

A total of 153 serum samples were tested to detect the presence of brucella antibodies by LFA and three other serological tests i.e., RBPT, protein G based iELISA, and competitive ELISA (cELISA). The performances of LFA and other serological tests were evaluated using cELISA as the gold standard. Serological tests revealed 50% of the animals were seropositive for Brucella antibodies and correlated with clinical history of abortions, infertility, and productive failures. The newly developed assay showed 87.1% and 92.6% sensitivity and specificity, which was even higher than the specificity of RBPT. Three *Brucella abortus* were recovered from eight vaginal swabs and 4 cattle placenta samples processed for isolation confirmed by biochemical tests, bcsp genus (223bp product) and species specific PCRs (AMOS and Bruce ladder) during the period. MLST typing of 3 Karnataka isolates (DBT BE1-C3, C4 and C5) and six DNA samples from Gujarat and one each from Assam and Punjab have been completed and all the 11 *B. abortus* were found to be sequence type 1. So far, 25 MLST sequences of field isolates were analysed which revealed 4 different STs having a genetic similarity to the global isolates. Lateral Flow assay for anti brucella IgM and anti brucella IgG has been developed for the diagnosis of the human brucellosis and evaluated with field based RBPT test for 1033 samples and the details of test performance and characteristics are presented in Table 8.

Table 8: Performance of LFA for human brucellosis

Diagnostic parameter	IgM and IgG Combined LFA	95% CI
Sensitivity	84.00	70.88 - 92.81
Specificity	99.80	99.27 - 99.97
Positive Likelihood Ratio (PLR)	412.86	102.85 - 1657.23
Negative Likelihood Ratio (NLR)	0.16	0.08 - 0.30
Positive Predictive Value (PPV)	95.45	84.50 - 99.31
Negative Predictive Value (NPV)	99.19	98.41 - 99.65

IPC: ANSCNIVEDISOP201201700041 Project ID: OXX02384

DBT-Network project: Brucellosis Diagnostics (BD-2)

V. Balamurugan, M. Nagalingam, Rajeswari Shome and G.B. Manjunatha Reddy

Four target genes were identified (*bls, bp26, sod c, p39*) for the production of either individual and/or multiple recombinant proteins which can be used in diagnostics. All the four genes were amplified from *Brucella abortus* S99 strain, TA cloning performed in pGEMT easy vector in Top 10 F'cells and further inserts were sub-cloned into pET32a vector at EcoRI and *Not* I sites. *E. coli* BL21 (DE3 pLysS) cells were transformed with recombinant plasmids. Expression carried out by induction with IPTG using standard conditions and analyzed by SDS-PAGE. *E. coli* BL21 cells transformed with recombinant *bls* and *bp 26* gene were induced at 30C using 1mM IPTG for the expression. Samples were collected at 6h post induction and were analyzed in SDS-PAGE. Further, expression was carried out with varying concentration of IPTG at time intervals. The IPTG concentration was optimized at 1mM for rBLS, whereas for rBp26 at 0.5mM for five hours. The expressed recombinant *Brucella* proteins *viz.* rBLS (36 kDa), rBP26 (44 kDa) were analyzed using SDS-PAGE and western blot using anti-Histidine HRPO conjugate (1:6000). Purification of recombinant proteins was standardized using Ni-NTA column and the fractions were assayed by SDS-PAGE.

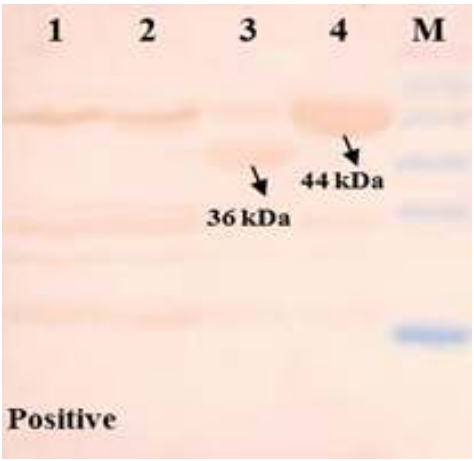

Fig. 14: Western blot analysis of recombinant BLS and BP26 protein of *B. abortus*

Standardization of ELISA using recombinant protein (s) was carried out. Briefly, 96 well micro titer plates were coated with 100µl per well with recombinant BLS antigen and Bp26 (1 µg/well) in PBS buffer. Positive and negative sera (1 in 25) and the anti-bovine IgG HRP conjugate (1:7000) diluted in blocking buffer was used. The optimum antigen concentration of BLS and Bp26 recombinant antigen was found to be 0.5 µg /well and 1 µg/well. Serum and conjugate dilution was determined as 1:10 and 1:5000 dilutions. Optimization of ELISA reactivity was determined with purified, dialyzed and concentrated B_P-26 /BLS antigen concentration (from 0.5 µg to 8 µg/well in PBS) using checker board titration with positive and negative cattle serum samples (dilution from 6.25 to 200) in order to determine the working dilution of positive and negative reactivity. A serum dilution of 1:10 with an antigen concentration of 0.5 or 1 micro gram found working well with the large window of negative reactivity ratio of 5.54 in case of BLS protein, 2.7 in case of B_P-26 protein. This optimum working dilution is going to be used for further standardization of recombinant antigen based ELISA either as single protein or together for screening of serum samples for diagnosis of bovine brucellosis. Further, two genes *sod c gene and p 39* of *B. abortus* were amplified from *B.abortus* S99 strian and cloned into pGEMT easy vector. Subsequently, sub-cloning of insert into pET32a vector and expression is in progress.

IPC: ANSCNIVEDISOL201200400028 Project ID:OXX01505

Development of recombinant antigen based diagnostics for surveillance of *Peste des Petits* Ruminants

V. Balamurugan, M. Nagalingam and D. Hemadri

The, expression of PPR Virus (PPRV) haemagglutinin (H) and Nucelocapsid (N) protein in *Escherichia coli* (BL21) was envisaged to evaluate the potential use of recombinant protein as a diagnostic antigen in ELISA. The coding gene sequences for the immunogenic region of PPR vaccine strain viral H and N was amplified, cloned and expressed in *E.coli*. The expressed protien was characterized by SDS-PAGE and Western blot using a PPRV specific serum, anti-His Tag conjugate, that confirmed PPRV specific recombinant protein (s). Results of all these expression studies showed that, the PPRV protein (s) was expressed as insoluble fraction (inclusion bodies) in the bacterial host. Then Ni-NTA purification method was standardized for purification of the expressed recombinant proteins in *E. coli.* On column refolding methods with different concentration of urea were used and optimized to obtain the expressed protein in native soluble form and was used as coating antigen in the ELISA for its suitability as diagnostic antigen. The characterization and reactivity of the protein in indirect ELISA was assessed using known positive and negative serum samples with respect to PPRV antibodies to optimize the reactivity and checked with whole PPRV antigen based indirect ELISA. Standardization and evaluation of recombinant antigen based indirect ELISA has been completed using 395 field samples, which showed 97.97% sensitivity and 99.49% specificity. Further evaluated recombinant N and H antigen based indirect ELISA using 194 field samples, which showed 61 samples showed positive and 133 were negative with respect to PPRV antibodies. Further standardization and evaluation of both recombinant PPRV H and PPRV N protein based ELISA for sero diagnosis of PPR in sheep and goats is in progress.

IPC: ANSCNIVEDICOP2012019 00043 Project ID:OXX02254

Sero surveillance and association of Toll-like receptors, Th1-Th2 status and Viral genotypes in susceptibility and severity of PPR among Goats and Sheep of North-East India

V. Balamurugan, M. Nagalingam and D. Hemadri

Seroprevalence and virus genotyping study of PPR virus from sheep and goats in NE India was envisaged to know the status of PPR. Serum samples of goats and sheep from the North Eastern India submitted or collected through AICRP centres of NIVEDI and collected sample submitted by the lead parent collaborating Institute to NIVEDI were screened for PPRV-specific antibodies by using PPR Competitive ELISA kit.

A total of 391 serum samples (318 random and 73 outbreak/suspected) were collected from 28 districts in 7 states (Meghalaya, Assam, Manipur, Nagaland, Arunachal Pradesh, Tripura and Mizoram) of NE India. Analysis of 391 serum samples indicated that an overall seroprevalence of 17.90 % [CI 95 % 14.40–22.00] in goats {45.2 % in suspected [CI 95 % 34.32–56.58] and 11.63 % in random [CI 95 % 8.56–15.63] samples} in NE India. As expected prevalence was high in outbreaks *vis-a-vis* random samples. Further, a total of 165 goat serum samples have been received (148 samples processed) from 3 states and 10 districts of North Eastern region in India i.e., Meghalaya (Burnihat district), Assam (Lakhimpur, Nagaon, Burnihat GRS, Kamrup, Dhubri, Dhemaji, Karbi Anglong, Khanapara

district), Nagaland (Medziphema district), Mizoram, Arunachal Pradesh (Papum Pare). Overall, a total of 266 serum samples (Goats) were collected from 22 districts in six states of NE India. Analysis of 266 samples indicated that an overall sero-prevalence of 27.11% and 16.89% in goats. The random survey results has specific implication in epidemiological perspectives, since it highlights the exact PPR prevalence under natural situations, where the subclinical, in apparent or nonlethal or recovery of infection was suspected in goats, as samples were collected from unvaccinated animals. It also warrants appropriate control measures against PPR in NE region to prevent spread of infection besides widespread presence of the disease in rest of India.

The phylogenetic analysis of the N and F gene sequences of PPRV from the suspected clinical goat samples revealed circulation of lineage IV virus in NE regions.

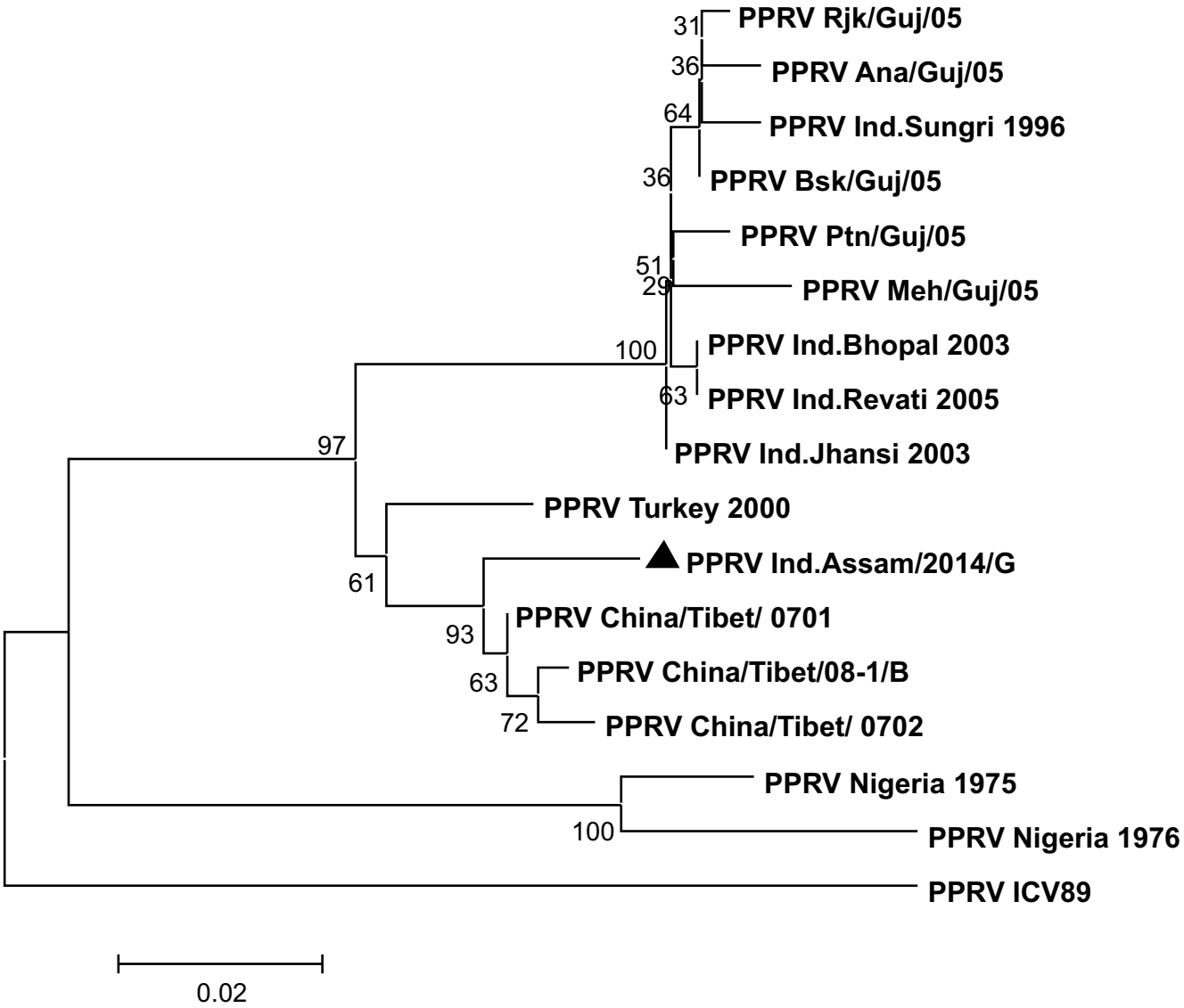

Fig. 15: PPRV N-gene based phylogenetic analysis showed that Assam virus belongs to lineage IV

IPC:ANSCNIVEDISOL201200500029 Project ID: OXX01506

Development of newer economical sensitive diagnostics for the detection of carrier status of surra for surveillance

P.P. Sengupta, V. Balamurugan and M. Nagalingam,

Exploring VSG recombinant protein, (VSG & ISG) their corresponding mAbs, flagellar antigen of *T. evansi* competitive Inhibition (Ab detecting) and double antibody sandwich ELISA (Ag detecting) were developed. The application for patenting of CI-ELISA has been filed. (Patent application no. 370/CHE/2015). A Total of 1485 cattle and buffaloes, horse, donkey and camel serum samples from Karnataka (895), Odisha (63), West Bengal (225) and Rajasthan (302) were screened by ELISA. An overall 280 samples were found positive for the presence of antibodies of surra. The sero-positive percentage in different spps. has been depicted in Fig. 16.

These tests are expected to be very helpful in surveillance and control programme of trypanosomosis in the country. They have been designed in such a way that each single test can be employed to screen any species of animals.

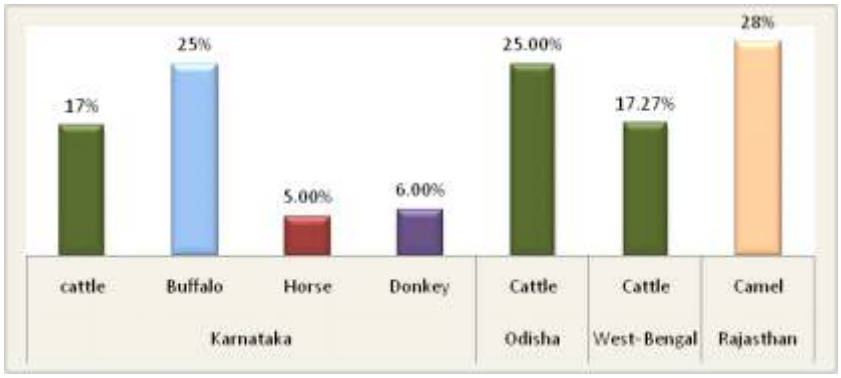

Fig. 16: CI-ELISA result for the presence of *T.evansi* antibody

A total of 752 blood samples collected from Cattle, Buffaloes, Horse and Camel were subjected to Ag-ELISA and PCR for the presence of *T.evansi* antigen. A total of 22% was found to be positive for the presence of *T. evansi* antigen. The detail has been shown in Fig 17.

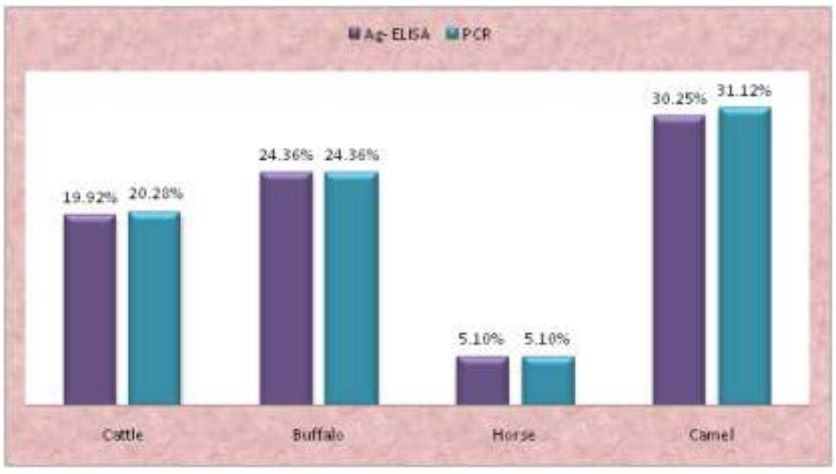

Fig. 17: Ag-ELISA and PCR result in animals for the presence of *T.evansi* antigen

NER Centre for Advanced Animal Disease Diagnostics and Services on Animal on Health and Diseases (ADSAHD)

IPC:ANSCNIVEDISOL201200100054 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 in North East Region in India

B.R. Shome, K.P. Suresh, P. Krishnamoorthy

A total of 20 stab cultures were received from Meghalaya. The samples were brought to live culture on respective medium. On subculture a sum of 21 isolates were obtained. Genotypic identification and sequencing data revealed different *Staphylococcus species* (n=17), *Enterococcus* species (n=3) and *Brevibacterium species*/*Corynebacterium species* (n=1).PCR screening for *mec*A (n=21) showed all isolates to be negative for *mec*A gene. A total of 21 nasal swabs were received from Arunachal Pradesh. On subculture a sum of 20 isolates were obtained. *Staphylococcus* genus specific PCR confirmed 8 isolates as *Staphylococcus* spp and species specific PCR identified 5 isolates as *S. sciuri* and one as *S. haemolyticus* by m-PCR. None of the isolates (n=20) were positive for *mec*A gene by *mec*A PCR. Two *Staphylococcus* isolates which did not amplify by m-PCR showed to be uncultured clones by BLAST result.

IPC: ANSCNIVEDISOL201400200055 Project ID: OXX03176

Sub-Project 2: Sero-Epidemiology study of Brucellosis in livestock in North-East states of India using ELISA and Fluorescent Polarization Assay

Rajeswari Shome, R. Sridevi and G.B. Manjunatha Reddy

Sero-epidemiology study of Brucellosis in livestock in North-East states of India using ELISA and Fluorescent Polarization Assay. For the standardization of Fluorescence Polarization two batches O- polysaccharide(OPS) from standard Strain of *B. abortus*S99 was extracted by using acetic acid method as per OIE (2011). OPS based iELISAwas standardized and compared with in house developed Protein-G iELISA using a 200 standard panel of serum samples and has shown the 90% sensitivity and 78.33% specificity. These serum samples, containing 60 positives and 140 negatives for brucellosis will be used for the evaluation of fluorescence polarization Assay

IPC:ANSCNIVEDISOL201400300056 Project ID: OXX03175

Sub-Project 3: Epidemiology study of Classical Swine Fever virus (CSF), Porcine Reproductive and Respiratory Syndrome virus (PRRSV) and TarqueTenoViruse (TTV) from North-East (NE) region of India

D. Hemadri, S.S. Patil, V. Balamurugan, G.B. Manjunatha Reddy

A total of 29 blood samples from Karnataka were tested for CSFV out of which two samples were found positive by antigen ELISA. Hundred serum samples from Karnataka, Kerala and Andhra Pradesh were screened for CSFV out of which 26 samples were found positive by antibody ELISA. Tissue samples (lungs, spleen and liver) from Udupi, Karnataka were processed for detection of TTV genogroup 1 and 2, the samples were found to be positive for genogroup 2. The tissue samples collected from one of the pig farm from Udupi (Karnataka).These samples screen for PRRSV through PCR and found to be positive and amplicon length 121bps

IPC:ANSCNIVEDISOL201400400057 Project ID: OXX03162

Sub-Project 4: Development of Infectious Disease Information System (IDIS) and Risk assessment models for Trans-boundary animal diseases (TAD) & other emerging livestock diseases in NE region of India

K.P. Suresh, G. Govindaraj, S.S. Patil, M.R. Gajendragad

Poisson, Negative Binomial and Zero inflated models were performed to fit the CSF data, Zero-inflated Negative Binomial model provided the best for CSF data (Data taken from NADRES, NIVEDI).Climate data (4176 records) for rainfall, temperature (Min and Max) for all the states of North Eastern region were collected, compiled and database developed from 1991 to 2014

IPC: ANSCNIVEDICOP201300500048 Project ID: OXX02582

Sero-serveillance, molecular characterization and epidemiology of pox viral infections in animals from North-Eastern region of India

G.B. Manjunatha Reddy and V. Balamurugan

The questionnaire was prepared for collection of data during outbreak investigation and sent to main centre for collection of data. The main centre was also advised for collection of secondary disease in the given format from state animal husbandry departments. The pox virus vaccine strain was adopted in vero cells and standardized the cell culture procedure for isolation of field pox viruses from clinical samples. Further preparation of extension material for farmers/field veterinarians is in progress, which has to be submitted to main centre for further preparing in local languages suitable for NE states of India. The pox viral disease outbreak data and the livestock population data was compiled for NER states for epidemiological analysis.

IPC: ANSCNIVEDICOP201300600049 Project ID:OXX02583

Prevalence and molecular epidemiology of BVD in ruminants with special reference to Mithun *(Bos frontalis)* in North-Eastern States of India

D. Hemadri and S.S.Patil

Under this project a stratified random sampling plan for the collection of samples from the states of Arunachal, Nagaland and Manipur has been designed. Collected samples are being screened at NIHSAD Bhopal.

IPC: ANSCNIVEDICOP201300700050 Project ID: OXX02584

Aetio-Pathology and molecular epidemiology of bacterial and viral diseases associated with the respiratory problems of yak in the North-Eastern Region of India

Rajeswari Shome, S.S. Patil and G.B. Manjunatha Reddy

Two isolates of *Mannheimia haemolytica* from 42 nasal swabs were isolated and identified by biochemical identification. The protocols for isolation and identification of *M. haemolytica* from nasal swabs were standardized in the laboratory. Two out of 42 DNA samples extracted from 42 nasal samples enriched in Brain Heart Infusion broth (BHI) amplified specific product for *P. multocida* in PCR. However *P. multocida* could not be isolated on 10% sheep blood agar and hence the direct detection in broth culture appears to be promising for diagnosis of very fastidious bacteria like *P. multocida*. The limited sample screening clearly indicated involvement of *P. multocida* in respiratory infections of yak. Failure to isolate may be due to deterioration of nasal sample quality during shipment or over growth by other non fastidious bacteria.

From the set of 42 nasal samples, three cultures have been identified as *K. pneumonia* by biochemical tests, genus (441bp) and species specific (108bp) PCRs. Simultaneous detection of both genus and pathogenic species of *K. pneumonia* is a paramount importance while confirming the isolates from clinical samples. *In vitro* antibiotic sensitivity test, *K. pneumonia* isolates were found sensitive to most of the antibiotics but shown resistance towards co-trimoxazole.

The other most dominant bacteria in the mixed cultures recovered were *Staphylococcus* sp., *Pseudomonas* sp., *E.coli, Proteus* sp., etc. The suspected staphylococcal cultures were confirmed by bio-physiological tests, 842bp in genus and species specific PCR, 7 isolates as *S. sciuri* (306bp) and one as *S. haemolytica* (539bp). The characterized *S. sciuri* and *S. haemolytica* isolates were deposited in the ICAR-VTCC, Hissar. Nasal swab (N=42) samples were processed for IBR virus isolation in MDBK monolayer and similarly, the DNA extracted from nasal swabs were subjected to PCR using primers specific for the region tk, gB, gC,gD and US1 region and all were found to be negative. A total of 42 serum samples collected from yak were screened by IBR Indirect ELISA and 40 out 42 (95.23%) were positive for IBR antibody. This result clearly indicates very high prevalence of IBR among yak population of Arunachal Pradesh. PCR assays for amplification of *P. multocida* species primers was used for direct detection from the clinical samples. The predominance of *K. pneumonia* was evident in the respiratory infections of yak in the processed samples and hence a multiplex PCR has been standardized for simultaneous detection of the genus and species of *Klebsiella* using primer *gyrA* gene for genus and *ropB* gene for species. This PCR will be used in future screening of more number of clinical samples for direct detection of *K. pneumonia* from the respiratory infections.

IPC: ANSCNIVEDICOP201300900051 Project ID: OXX02585

Serosurveillance and molecular epidemiology of Bovine Herpesvirus 1 (BoHV-1) infection in bovines of North-Eastern states of Mizoram, Meghalaya and Tripura

S.S. Patil, D. Hemadri and H. Rahman

A total number of 31 bovine sera samples from Mizoram were tested for IBR (BoHV-1) antibodies. Ten samples were found positive for IBR antibodies and the percent positivity was 32.25(10/31). A total number of 43 blood samples from Mizoram were subjected to DNA extraction and performed PCR for BoHV-1. All samples were found negative for Bohv-1 infection by gD region specific primer.

A total of 359 bovine serum samples from Meghalaya were screened, of which 230 samples were found positive for IBR antibodies (64.06%)

IPC: ANSCNIVEDICOP201401000061 Project ID: OXX03173

Serosurveillance isolation and molecular characterization of bluetongue virus in sheep and goats of Tripura and Assam states

D. Hemadri and V. Balamurugan

The DBT sponsored twinning project on bluetongue aims to study the prevalence of the said disease in North Eastern states of Manipur, Meghalaya and Assam, where substantial small ruminant population is present. The project was launched in February, 2015 and in the project about 150 serum samples from various locations of the above three states have been collected.

IPC:ANSCNIVEDISOL201300100044 Project ID: OXX02579

Molecular diagnosis and epidemiology of rabies in Livestock

G.B. Manjunatha Reddy

The present study addresses the differential efficacy of diagnosis by different rabies diagnostic tests and molecular epidemiology by partial N gene sequencing. During this period we have collected brain samples from Indian veterinary research institute (IVRI), Bareilly, Uttar Pradesh (15), Gujarat (4), Veterinary College, Bangalore, Karnataka (94) and Kerala (11). Along with these domestic animal samples we have received the brain sample from wild life (3). All the samples were subjected to different diagnostic methods like dFAT staining, Reverse transcriptase PCR (RT-PCR), Real time PCR (q-PCR). All samples were initially subjected to dFAT staining against Nucleoprotein antigen, 45 samples were found positive among 124 (Fig. 18). The RNA was isolated from all the samples and tested for Nucleoprotein gene amplification by RT-PCR and RT-qPCR, it was standardized using PVS strain of rabies virus. RNA was isolated from 124 samples and subjected to PCR, of which 46 were found positive. All positive samples were sent to sequencing, out of 46 positive samples 36 samples of sequences were received correctly and edited these sequences with the compassion of standard PV strain sequence by using Meg-Align software. The sequences were aligned by clastal-W and phylogenetic tree (Fig.19) was constructed with the reference sequence using MEGA5.10 bioinformatics tool. The same 124 samples of RNA was used for c-DNA synthesis using RevertAid c-DNA synthesis kit and used for SYBR

Green Real time PCR. Six additional samples were found positive by QPCR assay compared to RT-PCR, total 52 samples were found positive by SYBR Green real time PCR assay. Sensitivity and specificity were calculated by comparing the 3 diagnostic tests. Sensitivity and specificity of dFAT is 94.23% and 94.4% respectively with respect to RT-qPCR. Sensitivity and specificity of RT-PCR is 100% and 91.02% respectively with respect to RT-qPCR.

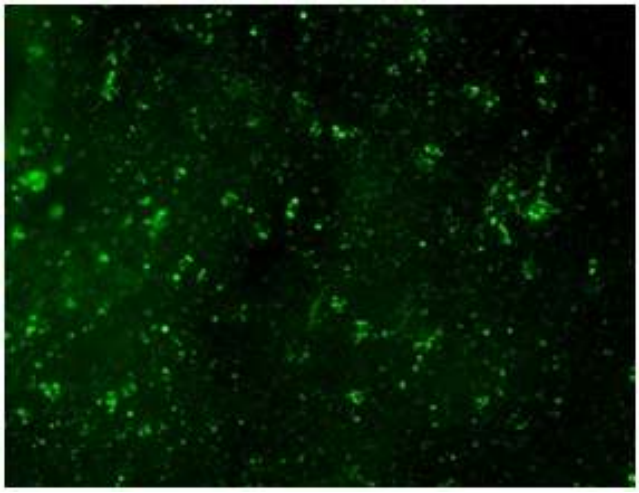

Fig. 18: dFAT staining of Rabies suspected samples : Positive test of dFAT staining showing that bright dusty apple green flouresence.

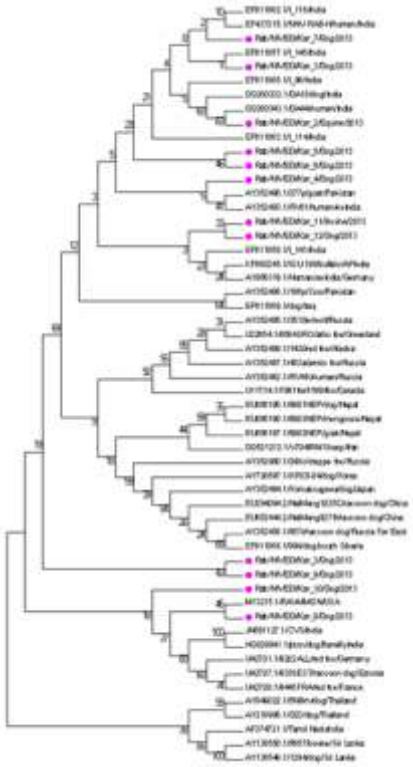

Fig. 19: Phylogenetic tree for N gene sequences revealing all the isolates belonging to genotype-I of rabies virus are of arctic lineage.

IPC: ANSCNIVEDICOL201300400047 Project ID: OXX02581

National Surveillance Programme for Aquatic Animal Diseases (NSPAAD)

M.R. Gajendragad, K.P. Suresh and G.B. Manjunatha Reddy

The main objectives of the NIVEDI center of the NSPAAD are

I. To Development of Database frame work for Aquatic Animal Disease Surveillance

II. To develop the software for the surveillance programme.

During the year under report, with the consultation of the fisheries scientists, a MS Access based software for collection of baseline data was developed. It was sent for validation to all the centers of the project through the National coordinator. (Fig. 20). The data regarding Fish diseases and Fisheries related information like Fish resources, Fish catch information, facilities and training provided to Fish farmers and their community etc with reference to Karnataka state have been included.

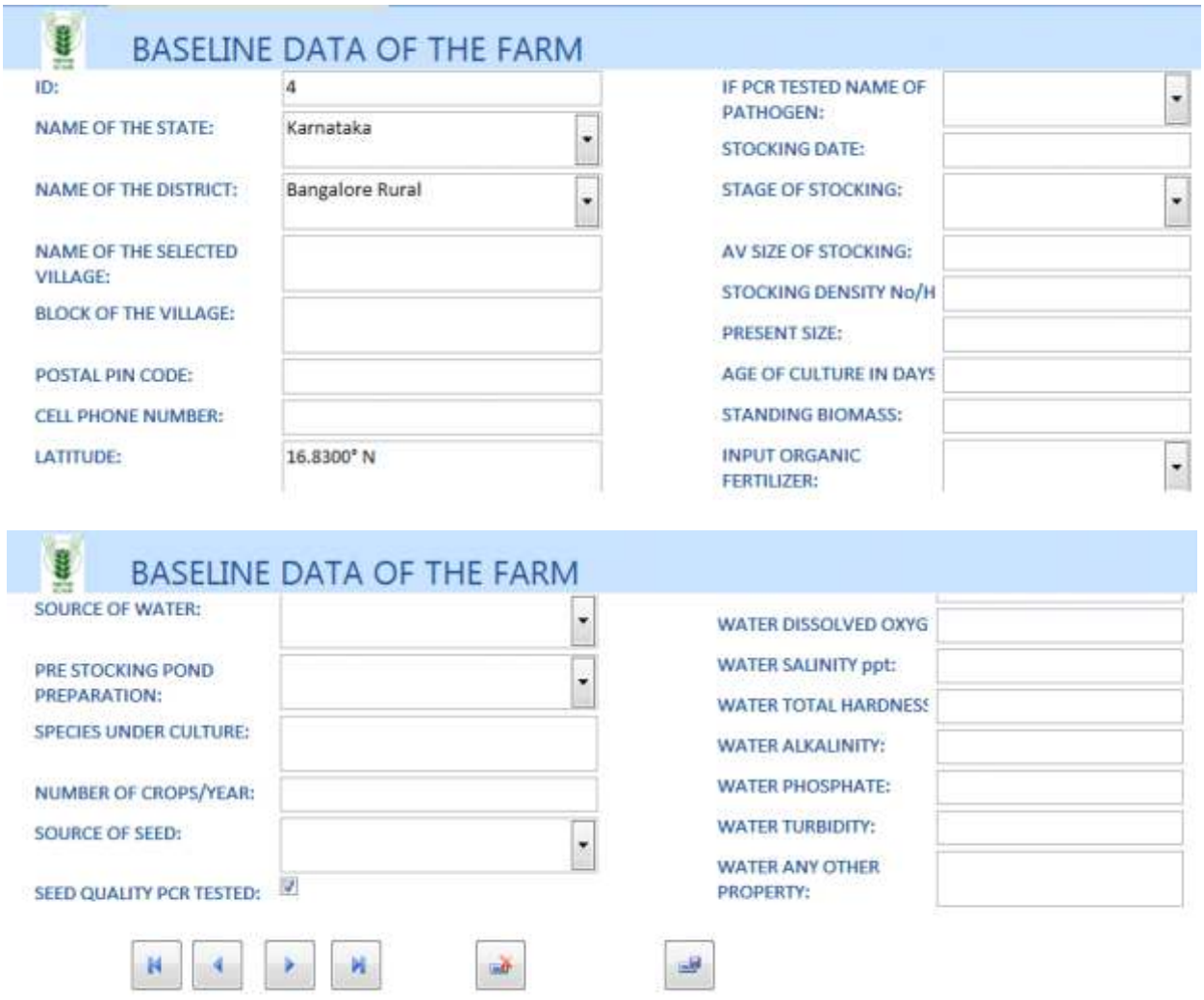

Fig. 20: Screen shot of the software

IPC: ANSCNIVEDICOP201400900062 Project ID: OXX03174

Development of diagnostic systems, reference collection and molecular epidemiology studies for important arboviral pathogens of livestock in India

D. Hemadri

In the project, which was initiated in November, 2014, till date 143 clinical samples from bluetongue suspected cases have been collected from 30 locations in seven districts of Karnataka (Fig. 21). Of the 143 samples screened by a sandwich ELISA, 120 samples have been found to contain bluetongue antigen. Cell culture isolation of positive samples is underway.

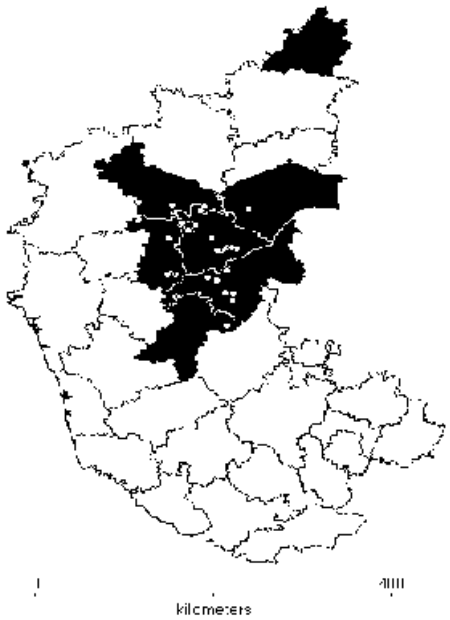

Fig. 21: Location of bluetongue suspected outbreaks in Karnataka during 2014-15.

IPC: ANSCNIVEDICOP201500100064 Project ID: OXX02963

National Innovation on Climate Resilient Agriculture (NICRA) - Livestock disease surveillance in relation to weather data and emergence of new pathogens

B.R. Shome, P. Krishnamoorthy, K.P. Suresh, G.B. Manjunatha Reddy, S.S. Patil, G. Govindaraj, R. Yogisharadhya and A. Prajapati

The project under National Innovation on Climate Resilient Agriculture entitled "Livestock disease surveillance in relation to weather data and emergence of new pathogens", Project No. 1006540, Scheme code: 13921 started in March 2015. Minor equipments, consumables etc. were purchased utilizing 56.94% of fund received. Recruitment of staff was carried and technical programme of the project was presented in the technical programme workshop at CRIDA, Hyderabad.

INSTITUTE SERVICE PROJECTS

IPC: ANSCNIVEDISIL201100100020 Project ID: IXX08329

National Animal Disease Referral Expert System (NADRES)

M.R. Gajendragad, K.P. Suresh and G.B. Manjunatha Reddy

During the year 2014, a total of 5577 records pertaining to various diseases were uploaded to the NADRES server. The data originated from 30 states of the country. An analysis of the data showed that the parasitic diseases are the top diseases reported (Fig. 22).

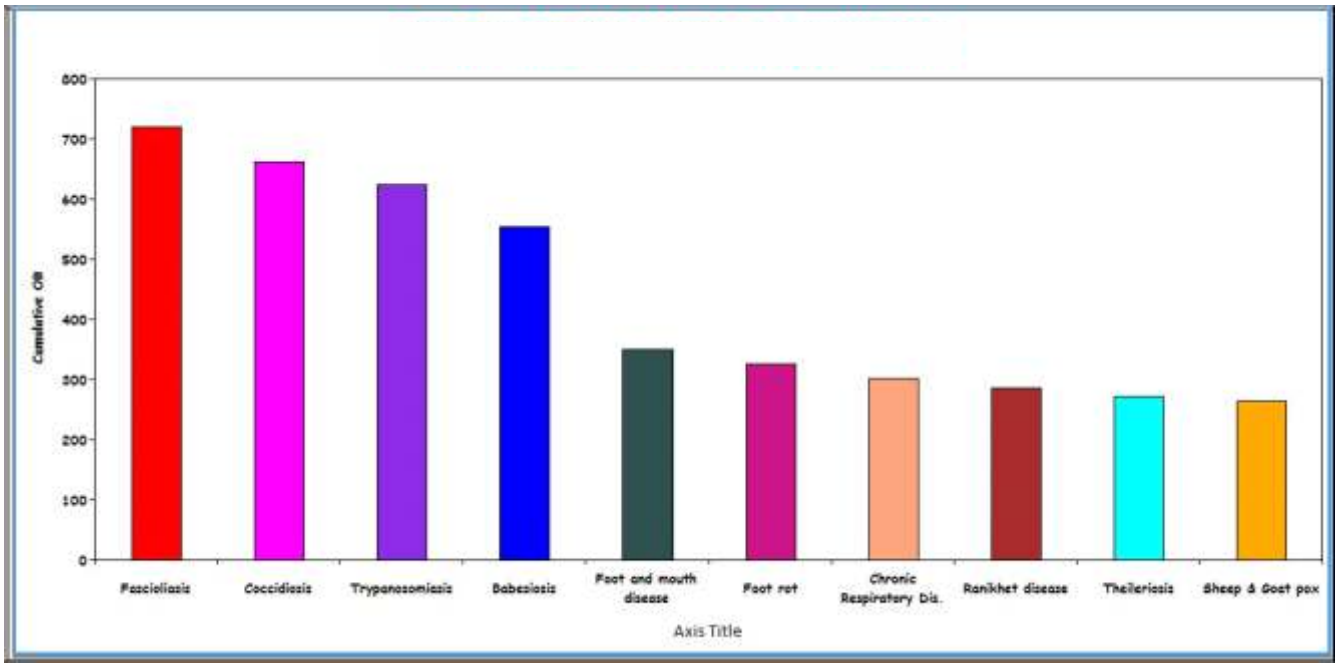

Fig. 22: Top ten diseases reported from the country during 2014

It may be noted that amongst the top ten diseases, five are parasitic diseases. Fascioliasis is the top most disease. The trend shows that due to increased awareness and appropriate control measures taken up by the government, the incidence of the infectious diseases has reduced. Coccidiosis, a parasitic disease of poultry, is in the second place. This call for a re-look into the management of the poultry farm and bring in suitable changes and to introduce suitable control measures. Two more poultry diseases *viz.*, CRD and ND, also figure in the top ten diseases. The emergence of these two diseases is to be looked as a fresh threat to the industry. Three protozoan diseases, *viz.*, Trypanosomosis, Babesiosis and Theileriasis, have been recorded. Babesia and theileria need vectors for their transmission and care should be taken to control the vector in addition to tackling the disease itself. Strict management measures are required for prevention of *Typanosoma* transmission. The other infectious disease noticed are FMD, Foot rot and Sheep & Goat pox. FMD has been reported extensively throughout the country whereas foot rot has been restricted to certain pockets. Recording of Sheep and Goat pox shows the need for good vaccination programme to control this malady (Fig. 23).

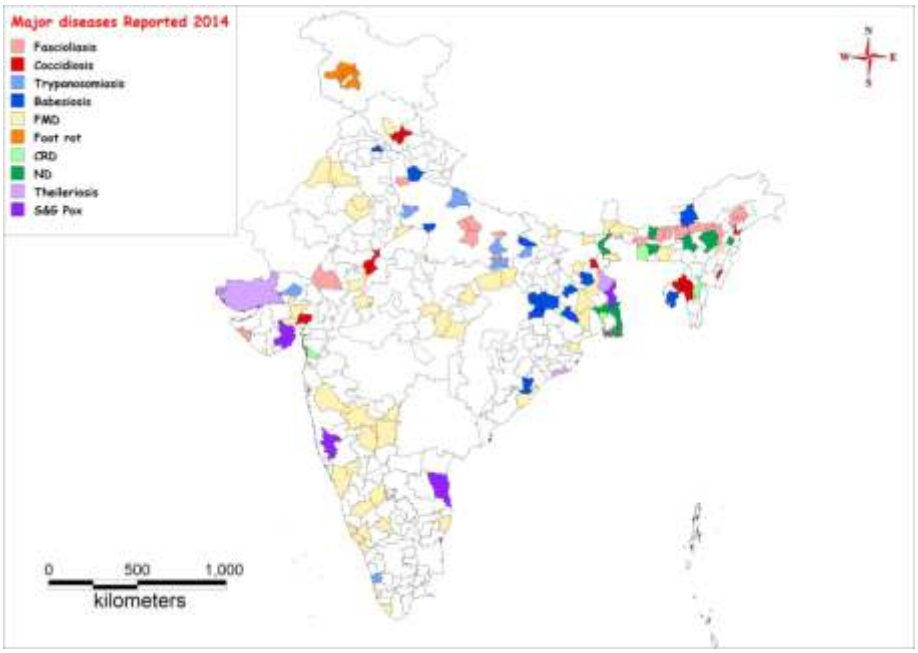

Fig. 23: Spatial distribution of major livestock diseases recorded during 2014.

The seasonality of the occurrence of the major diseases was studied. It was observed that the parasitic diseases did not show any specific seasonality. FMD and Sheep & Goat pox occurred more during winter whereas foot rot occurred throughout the year with nearly equal frequency. CRD initiated during the summer months and continued till the end of winter. The highest number of Ranikhet disease (ND) outbreaks were during summer but continued throughout the year except pre-summer. (Fig.24).

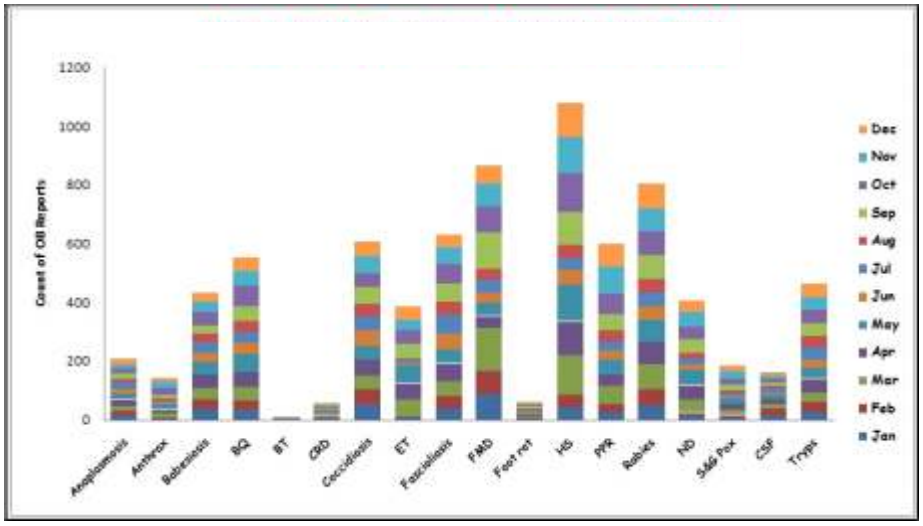

Fig. 24: Seasonal incidence of livestock diseases during 2014.

Apart from updating the livestock disease database the other databases such as meteorological data, livestock demography were also updated. Data of the 19th livestock census was obtained from the Department of Agriculture, Dairying and Fisheries, collated and formatted as per the requirement for epidemiological analysis.

IPC:ANSCNIVEDISIL201300200045 Project ID: IXX10708

Seroepidemiology of Bovine Brucellosis

Rajeswari Shome, B.R. Shome and M. Nagalingam

A total of 3459 sera samples received from 7 AICRP collaboration centers were screened in the year 2014-2015. Among these samples Cattle=7(0.54%), Buffalo=2(0.33%) and Goat=14 (0.97%) have shown seropositivity for brucellosis and all the screened pigs and sheep samples were found negative for anti brucella antibodies. An overall prevalence of 0.66% (23/3459) was found as positive (Table 9). During the period, camel (n= 760), equine (n=210) and yak (n= 113) serum samples were screened for brucellosis by indirect Protein G based ELISA and 0.9 % and 2% Camel and Equine, samples were seropositive respectively and none of the Yak samples were seropositive. Bovine: A total of 12,054 [cattle (n_1)-9236, buffaloes (n_2) -2818] bovine serum samples from 373 districts of 15 states of the country were randomly collected and tested by Protein G iELISA. True prevalence of disease was found to be 8.3% and 3.6%, in cattle and buffaloes, respectively. Except Manipur state, in all other states higher prevalence was found in cattle than buffaloes. Small ruminants: A total of 8971 samples [sheep (n_1) - 4925, goat (n_2) -4036] from different states of the country were randomly collected and tested by indigenously developed iELISA kit. True prevalence of disease was found to be 5.5% (95% CI: 4.6-6.3%) and 2.3(95% CI: 1.5-3.1), in sheep and goat, respectively. Porcine: A total of 2576 random serum samples screened in 10 states, 365 were positive by iELISA with true prevalence of 7.2% (95%CI 5.6-8.7).

Table 9: Cumulative sero screening of stratified random samples during 2014-15

Sl. No.	State	Cattle	Buffalo	Sheep	Goat	Pig	Total	Percent Positivity
1	MadhyaPradesh	525(2)	440(0)	20(0)	1035(6)	0(0)	2020(8)	0.39%
2	Punjab	45(3)	41(2)	0	1(0)	0(0)	87(5)	5.74%
3	WestBengal	20(0)	4(0)	3(0)	6(0)	0(0)	33(0)	0%
4	Orissa	218(0)	42(0)	42(0)	151(0)	7(0)	460(0)	0%
5	Meghalaya	88(1)	0	0	0	0(0)	88(1)	1.13%
6	TamilNadu	100(1)	2(0)	0	0	0(0)	102(1)	0.98%
7	Jharkhand	292(0)	76(0)	23(0)	250(8)	28(0)	669(8)	1.19%
Total		**1288(7)**	**605(2)**	**88(0)**	**1443(14)**	**35(0)**	**3459(23)**	
Percent Positivity		**0.54%**	**0.33%**	**0%**	**0.97%**	**0%**	**0.66%**	

IPC: ANSCNIVEDISIL201200700031 Project ID: IXX10496

Sero-prevalence of Leptospirosis in Livestock Species

V. Balamurugan, M. Nagalingam, R. Sridevi and D. Hemadri

Knowledge of prevalence of serovars in particular geographical area will help in selection of serovars for providing prompt diagnosis and subsequent treatment and control measures. Leptospira reference antigen panels were regularly screened and subcultured every week in EMJH media for preparation of antigen for MAT. Reference strains of different serovars representing the serogroups in EMJH semi solid media were maintained and used in the study. All the serum samples were subjected to microscopic agglutination test (MAT) by employing the references serovars.

Study area 1: Random non purposive serum samples (n=537) from Orissa (Jajpur, kendrapara, Puri, Subarnapur, Cuttack, Bargarh, Angul, Nayagarh,Koraput, jagatsinghpur, Dhenkanal Sasar, Khurda and Ganjam) collected round the year including the natural calamities such as rain, flood and cyclone over a period of 2011-2014, were screened during this year. Study area 2: Random Non purposive serum samples from West Bengal (n=119). Study area 3: random non purposive samples (n=231) from Karnataka (Kunigal, Gadag and Gulbarga)

The overall seroprevalence of 36.87% (198/537) with 36.45% in Cattle, 54.28 % in Buffaloes, 28.33% in Goats and 44.44 % in Sheep was observed, during the screening of samples collected over a period of 2011-2014 from 13 districts of Odisha. In West Bengal, the overall prevalence was found to be 31.09%, (37/119) with 44.44% in Cattle, 55.55% in Buffalo, 100% in Goats and 33.33% in Sheep while testing for the non purposive serum samples in MAT 293 positive reacted sera, 100 samples showed reactivity with more than one serovars representing 50.76% prevalence of multiple serovars in livestock. Among the targeted districts, high prevalence was observed in Kalahandi (74%) followed by Angul (72%), Ganjam (68.18%), Subarnapur (60 %),Jajpur (54.54%), Puri (53%), Bolangir (32%), Dhenakanal Sadar (30%), Khurda (18.37%), Cuttack (13.79%), Jagatsinghpur (10.9%) and Kendrapara (9.8%). The predominant leptospiral antibodies against major serovars were Hardjo (30.3%), Tarassovi (20.7%), Kaup (15.65%), Australis (19.19%) Bankinang (18.18%), Hebdomadis (11.11%), Pomona (16.66%), Icterohaemorrhagiae (9.09%), and Javanica (6.56%) were determined against frequency distribution of the serovars. In Karnataka, the overall seroprevalance was 12.55% (29/231) with 31.37 % in Horse from Kunigal, and 3.19% in Buffalo from Gadag, and 11.62% in Gulbarga, following the samples analysis in MAT. The total study supports shows that the livestock species are a major reservoir for both Hardjo and Autralis in these states, apart from the other predominant serovars of Leptospira presented in the table. This study supports that ruminants may have a role in maintaining intermediate species serovar Kaup apart from being a well known reservoir for Hardjo serovar in endemic states of India. In conclusion, the coastal region of these states or zone is endemic for leptospirosis as indicated by the high seroprevalence on screening for MAT especially Eastern part of country viz., West Bengal and Odisha states. The prevalence of *Leptospira* in apparently healthy animals indicates the presence of this agent in the environment, which may be a source of human infection.

IPC:ANSCNIVEDISIL201200800032 Project ID: IXX10709

Seroepidemiology of Infectious Bovine Rhinotracheitis in India

S.S. Patil, M.R. Gajendragad and H. Rahman

Bovine serum samples Manipur, Meghalaya, Mizoram and Arunachal Pradesh (Yak) showed percent positivity of 40.23, 64.06, 32.25 and 90 for IBR antibodies respectively which is apparently high, that may be attributed to the unrestricted movement of animals across the states and also across the neighbouring countries. Bovine serum samples from Kerala showed 47.94 percent positivity for IBR antibodies. Kerala always buys the cattle either from Karnataka (54.69%) or from Tamil Nadu (41.31%).

Table 10: State wise seroprevalence of IBR during 2014-15

State	No.Tested	No.Positive	Positive pecentage
Manipur	169	68	40.23
Kerala	340	163	47.94
Odisha	448	194	43.30
West Bengal	97	19	19.58
Karnataka	415	227	54.69
Jammu & Kashmir	331	80	24.16
Madhya Pradesh	953	292	30.64
Meghalaya	359	230	64.06
Punjab	86	31	36.04
Jharkhand	359	86	23.95
Tamil Nadu	213	88	41.31
Pondicherry	77	57	74.02
Mizoram	31	10	32.25
Arunachal Pradesh(yak)	40	36	90.00
Total	**1022**	**322**	**31.5**

IPC:ANSCNIVEDISIL201100300022 Project ID: IXX08279

Maintenance and updating of livestock serum repository

D. Hemadri, S.S. Patil and M.R. Gajendragad

The work involved designing of sample frame for collection of serum samples by 15 AICRP centers. Receipt, aliquoting and distribution of samples to various laboratories for antibody screening, receipt of results, communication of results, storing of serum samples for future use, and record keeping, maintenance of freezers etc., were carried out.During the period under report, 2151 serum samples received from 9 states were screened; the state wise distribution of samples is given below (Fig. 25).

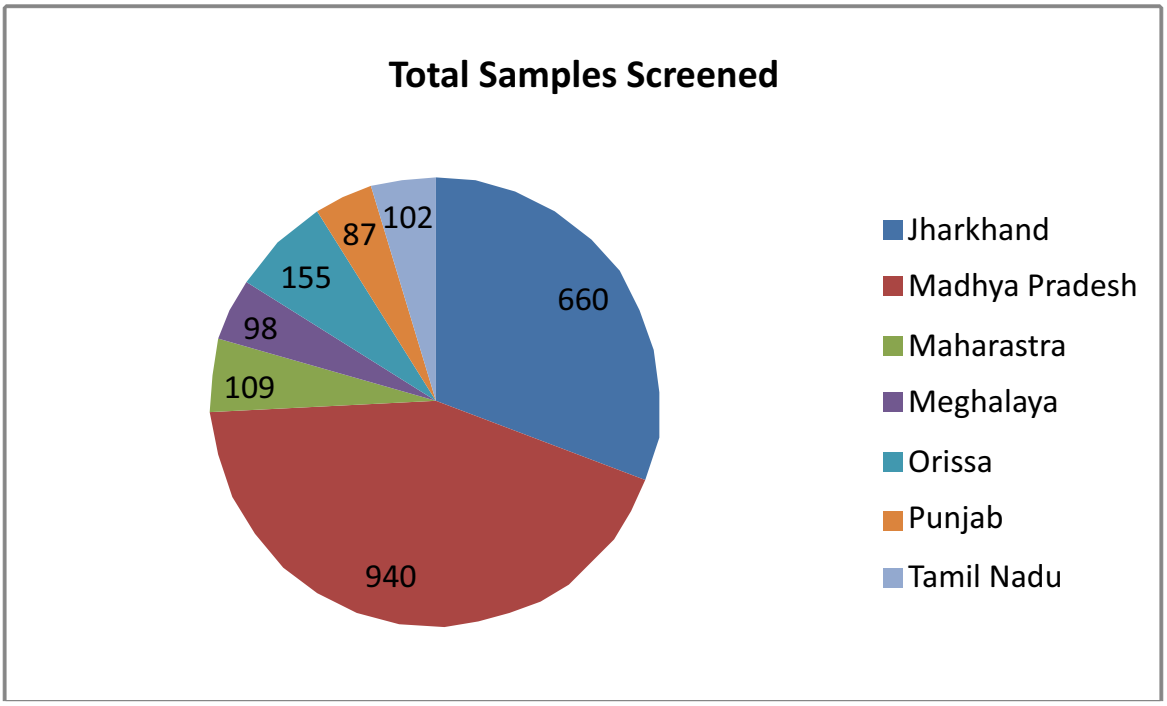

Fig. 25: The samples of different states record in serum bank.

Depending on the origin of the species, the samples were screened for bovine, ovine, caprine and swine brucellosis as well as Infectious Bovine Rhinotracheitis and classical swine fever.

GRANT- IN- AID PROJECTS

IPC: ANSCNIVEDISOL201200300027 Project ID: OXX02580

Brucellosis Control Programme

Rajeswari Shome and G.B. Manjunatha Reddy

The LFA tests are fast emerging point of care diagnostic tools (POCD) and gaining popularity worldwide because test is highly suitable for field conditions, easy to perform, no refrigeration, skill and equipment are required. The test developed in the Institute has been evaluated and showed kappa value of 0.9 for Cattle and Buffalo samples; and sensitivity and specificity far above RBPT. The test will really improve the disease surveillance and monitoring status in the country and play a key role in Brucellosis Control Program. Trainings were organised to veterinarians under BCP in different states to educate the zoonotic potential of Brucellosis, vaccination and control and importance of surveillance. The feedback from veterinarians were collected through structured proforma from 453 veterinarians working in various capacities in the departments. Majority of veterinarians (86%) were in favor of brucellosis vaccination in the country and only 14% respondents were not in favour of vaccination. The reasons for not accepting vaccination expressed were increased work load and fear of acquiring brucella infection while vaccinating animals. Similarly, majority of veterinarians expressed that the farmers should be given compensation or insurance coverage for brucellosis infected animals, to provide adequate protective measures and medical aid and leave to infected veterinarians. These issues suggest strengthening of manpower in the hospitals for routine care of the animals and regular vaccinations in control programs (Table 11).

Table 11: Perception of veterinarians on brucellosis

National Policy	Response	Number of respondents(n=453)	% of respondents
Insurance	Yes	392	86.53
	No	61	13.46
Provide protective measures like gloves/masks /googles /aprons	Yes	436	96.24
	No	17	3.75
	NR	70	15.45
Medical aid to infected vets and para vets	Yes	423	93.3
	No	30	6.62

All India Coordinated Research Project (AICRP) on Animal Disease Monitoring and Surveillance

The primary mandate of NIVEDI is monitoring and surveillance of the livestock diseases in the country. To achieve this mandate, an AICRP is functioning at the Institute with 15 centers. The aim of these centers is to collect livestock disease data from their respective states on real time basis and pass on to the central unit. Further they will also carry out the sero-epidemiology of major diseases and field validates the technologies developed at the Institute. The livestock diseases reported from various states of the country were compiled species-wise, month-wise at district level. A total of 7586 data were received during 2014. Based on the data compiled during the year 2013-14 Foot rot, Foot and Mouth disease and Fascioliasis were the top bacterial, viral and parasitic diseases respectively in the country. Epidemiological analysis of Anthrax, co-occurrence of FMD and HS, PPR, and CSF were carried out.

The annual review meet of AICRP on ADMAS was held at Imphal, Manipur on 27th June, 2014 under the Chairmanship of Dr. Gaya Prasad, ADG (AH). The Principal investigators from fourteen out of fifteen AICRP on ADMAS centers participated in the meet. The national disease ranking in descending order was he preliminary economic analysis of major diseases of respective states was presented by the PIs during the meet. The ADMAS centers were graded based on ten parameters for their work carried out during 2013-14 and the following centers were adjudged as top three centres.

1.	The best centre	Palode, Thiruvananthapuram, Kerala
2.	The Second best centre	Pune, Maharastra
3.	The third best centre	Bhopal, Madhya Pradesh

Fig. 26: Release of Annual Report of AICRP on ADMAS by the dignitaries

Fig. 27: Presidential address by Dr Gaya Prasad, ADG (AH).

Tribal Sub-Plan

Tribal Sub Plan (TSP) activities were implemented in various states by NIVEDI through its AICRP centres. The TSP activities were initiated during the year 2011-12 and continuing till date. The core objectives of the TSP programme is to reduce poverty and unemployment of the Schedule Tribe (ST); creation of productive assets in favour of ST and provision of financial security against all types of exploitation and suppression. During the year reported upon TSP activities were implemented through four AICRP on ADMAS centers viz., Barapani (Meghalaya), Jaipur (Rajasthan) and Bhopal (Madhya Pradesh). Major animal husbandry activities undertaken under TSP programmme during 2014-15 were establishment of poultry sheds, organizing animal health camps, sero-surveillance activities to ascertain the presence livestock diseases, distribution of animal feed and mineral mixtures, training on Goat husbandry, distribution of Poultry and Piglets etc. In Madhya Pradesh, eight tribal women cooperative group were formed to manage eight broiler poultry units (500 birds each capacity) established under TSP. Five animal health camps and sero-surveillance were also undertaken by this centre during 2014-15. In Rajasthan, total 38 animal health camps were organized in which 7801 animals were treated during the camps and 649 animal breeders were benefitted. Around 325 kg of animal feed were also distributed to the TSP beneficiaries. Appropriate training were also organized for the benefit of tribal farmers. In Meghalaya, the activities like organizing health camps, distribution of Piglets and Poultry, distribution animal and Poultry feed and training on scientific livestock management were undertaken during 2014-15.

Fig. 28: Animal health camp and Medicine Distribution at Rasidpur, Rasisen, Meghalaya

Fig. 29: Distribution of Piglets to tribal farmers in East Khasi Hills, Meghalaya.

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Capacity Building / Human Resource Development

Training/ Refresher Course/ Summer/ Winter School/ Seminars/ Conferences/ Symposia/ Workshops/ Programmes Organized

Sl. No.	Name of Seminar /Workshop /Training	Venue	Duration (Days)	Date
1.	Hands on training on Quantitative Real time PCR for diagnosis of Brucellosis	ICAR-NIVEDI, Bengaluru	3 days	02.06.2014-04.06.2014
2.	One day Brucellosis training	Chandigarh	1 day	06.06.2014
3.	Training to Veterinary Officers in the project B_CP.	Chandigarh, Punjab	2 days	06.06.2014–07.06.2014
4.	Review meeting cum workshop on Economic impact of FMD and its control in India	ICAR-NIVEDI, Bengaluru	1 day	31.07.2014
5.	One day Brucellosis training	Agartala, Tripura	1 day	21.09.2014
6.	Training to Veterinary Officers in the project B_CP.	Agartala, Tripura	2 days	21.10.2014-22.10.2014
7.	Training on Basic Epidemiology in collaboration with CDC, USA and Medical College, Manipal	ICAR-NIVEDI, Bengaluru	5 days	01.12.2014-05.12.2014
8.	Training programme on Research Methodology, Epidemiology and Biostatistics	ICAR-NIVEDI, Bengaluru	3 days	16.01.2015-18.01.2015
9.	Training Programme on Basic Epidemiology in collaboration with CDC, USA and Medical College, Manipal	ICAR-NIVEDI, Bengaluru	5 days	02.02.2015-06.02.2015
10.	One day Brucella awareness programme	Jakkur, Bengaluru	1 day	08.03.2015
11.	One day Brucella awareness programme	Maligenahalli, Bengaluru	1 day	1903.2015
12.	Socio-economic data analysis to assess the impact of FMD	ICAR-NIVEDI, Bengaluru	2 days	23.03.2015-24.03.2015
13.	Training to Veterinary Officers in the project B_CP	Srinagar, Kashmir	3 days	24.03.2015-26.03.2015
14.	One day Brucellosis trainings	Srinagar	1 day	25.03.2015
15.	One day Brucella awareness programme	Chickkaballapur, Bengaluru	1 day	27.03.2015

Epidemiology training organized in collaboration with Centers for Disease Control and Prevention (CDC), USA

A training programme on Basic Epidemiology was organised at NIVEDI in collaboration with Indian arm of CDC, USA during 1-5th December, 2014 at Bengaluru. Hon'ble, Secretary DARE & Director General, ICAR Dr. S Ayyappan stressed the need for such training programme and appreciated the efforts of the CDC in capacity building in the area of epidemiology in India. He also had a word of advice for the participants and urged them to adapt the knowledge gained during the training programme in disease investigations and epidemiological studies. Dr. Kayla Laserson, Country Director, CDC, India who was also one of the resource persons, expressed satisfaction over the conduction of training programme and appreciated the enthusiasm of the trainees. Dr. Agarwal, Assistant Director General (National Fund) who was also present on the occasion appreciated good works of NIVEDI and stressed on usefulness of disease surveillance programmes. Dr. H. Rahman, Director, NIVEDI, explained the events leading to CDC collaboration and the objectives of the course and One Health programmes.

A five-day training programme on Basic Epidemiology was organised by NIVEDI in collaboration with Indian arm of CDC, USA from 2 - 6 February, 2015 at Bengaluru. Basic Epidemiology training programme was inaugurated on 2nd February 2015. During the inaugural address, Prof Dr. Sandeep Shastri, Pro Vice-Chancellor, Jain University and Chief Guest of the function, stressed the need for training programmes in capacity building.

Training/ Refresher Course/ Summer/ Winter School/ Seminars/ Conferences/ Symposia/ Workshops/ Programmes participated

Sl. No	Name of the Seminar /Workshop/Training	Venue	Date	Scientist attended
1.	Technical Workshop on IBR and BVD control in semen stations	NDDB, Anand, Gujarat	12.04.2014	Dr. S.S. Patil
2.	International Conference Glance 2014	Bengaluru	20.04.2014	Dr. H. Rahman
3.	Directors Conference	ICAR Head Quarters, New Delhi	27.04.2014-28.04.2014	Dr. H. Rahman
4.	Regional Committee Meeting of Zone-VIII	Thiruvanthapuram , Kerala	02.05.2014-03.05.2014	Dr. H. Rahman
5.	Brainstorming Workshop on the theme "Strategies for Enhancing Livestock and Fishery Production in Chhattisgarh" (Panelist for Animal Health Session).	College of Veterinary Science and Animal Husbandry	12.05.2014-13.05.2014	Dr. H. Rahman
6.	BBSRC sponsored "International Programme on Stakeholders Meeting of Bluetongue Disease Risk Assessment"	IAH & VB, Bengaluru	21.05. 2014	Dr. H. Rahman
7.	NAAS Foundation Day Lecture by Bharat Ratna Prof CNR. Rao	ICAR, New Delhi	05.06.2014-07.062014	Dr. H. Rahman
8.	ICAR Directors' Conference and NAIP-IFPRI workshop on "Impact of capacity building programmes under NAIP"	ICAR, New Delhi	06.06.2014–07.06. 2014	Dr. H. Rahman
9.	FMD_CP State level Monitoring Committee meeting for 7th Round Vaccination	AH & VS Dept. Govt of Karnataka	12.06.2014	Dr. H. Rahman
10.	Technical Advisory Committee for Monitoring and Supervision of National Surveillance Program for Aquatic Animal Diseases	DADF, Ministry of Agriculture, Govt of India, New Delhi	30.06.2014	Dr. H. Rahman
11.	Brainstorming Meeting on "Strategies for Breeding Buffaloes production Round the year"	ICAR-NAVS New Delhi (Panelist for Health & Management Session)	04.07.2014	Dr. H. Rahman

12.	International Conference on Host Pathogen Interactions (ICHPI) (Chaired a session on Translational Research - Vaccine & Vaccination)	NIAB, Hyderabad	14.07.2014	Dr. H. Rahman
13.	XXI Annual convention of India society for veterinary immunology and biotechnology and international symposium on livestock disease affecting livelihood options and global trade strategies and solutions	TANUVAS, Chennai	17.07.2014-19.07.2014	Dr. V. Balamurugan Dr. G. Govindaraj Dr. M. Nagalingam
14.	FMD _CP State level Monitoring Committee meeting for FMD – Vaccination	AH & VS Dept. Govt of Karnataka	19.07.2014.	Dr. H. Rahman
15.	DBT task force meeting	New Delhi	31.07.2014	Dr. P.P. Sengupta Dr. V. Balamurugan
16.	Review meet on Assessment of Economic Impact of FMD and its control in India	ICAR-NIVEDI, Bengaluru	31.07.2014	Dr. G. Govindaraj Dr. S.S. Patil Dr. K.P. Suresh
17.	Brainstorming session on "Insects related to Veterinary and Fisheries Sciences" ICAR-NBAIR, Society for Bio-control Advancement	Veterinary College Bengaluru, ICAR-NBAIR, Bengaluru.	02.08.2014	Dr. H. Rahman
18.	MDP on PME of Agricultural Research Projects	NAARM, Hyderabad	04.08.2014-08.08.2014	Dr.V. Balamurugan
19.	Finalization of Avian Influenza-preparedness in India, DADF, Ministry of Agriculture	New Delhi	06.08.2014	Dr. H. Rahman
20.	DBT midterm review meeting of DBT Network project on Brucellosis	Ahmadabad, Gujarat	08.08. 2014	Dr. R. Shome
21.	Workshop on Bio security UNSCR 1540 organised at ICGEB	ICGEB, New Delhi	21.08.2014-22.08. 2014	Dr. H. Rahman Dr. R. Shome Dr.V. Balamurugan
22.	7th Bengaluru India Nano-curtain raiser programme and Press meet	Bengaluru	01.09.2014	Dr.V. Balamurugan
23.	FAO lecture by Secretary DARE & DG, ICAR	New Delhi	08.09.2014	Dr. H. Rahman

24.	Geospatial Technologies in Veterinary Epidemiology	IIRS, Deharadun	08.09.2014-12.09. 2014	Dr. B.R. Shome, Dr. R. Shome, Dr. D. Hemadri, Dr. P.P. Sengupta, Dr. V. Balamurugan, Dr. G.S. Desai, Dr. K.P. Suresh, Dr. P. Krishnamoorthy, Dr. R. Sridevi, Dr. G.B. Manjuntha Reddy, Dr. R. Yogisgaradhya, Dr. A. Prajapati
25.	Collaborative research meeting of discovery of new pathogens	NCBS, Bengaluru	10.9.2014.	Dr. H. Rahman Dr. V. Balamurugan
26.	2nd India EIS Conference on the theme "Emerging Public Health Challenges in India"	NCDC, New Delhi	12.09.2014	Dr. H. Rahman
27.	International conference on Animal and Dairy sciences	Hyderabad	15.09.2014-17.09.2014	Dr. P. Krishnamoorthy Dr. R. Sridevi
28.	6th ZTMC Annual Meeting-cum-Workshop AgrIP 2014	IIHR, Bengaluru	09.10.2014-10.10.2014	Dr. R. Sridevi
29.	Review meeting on the progress of BE8 unit of DBT Network Project on Brucellosis.	Peerless hospital, Kolkata	23.10.2014	Dr. R. Shome
30.	Meeting of the diagnostic group of DBT Network Project on Brucellosis	Hyderabad	25.10.2014-27.10.2014	Dr. R. Shome
31.	XXVIII Annual convention and International Conference on "Challenges and opportunities in Animal health at the face of Globalization and climate change"	DUVASU Mathura	30.10.2014-01.11.2014	Dr. G.S. Desai
32.	International conference cum workshop	NBFGR, Lucknow	12.11.2014-17.11.2014	Dr. K.P. Suresh
33.	National symposium on Impact of climate change on pathobiology of diseases of animals, poultry and fish	Anand	13.11.2014-15.11.2014.	Dr. P. Krishnamoorthy Dr. G.B. Manjunatha Reddy
34.	Annual Review Meet on DBT-Network Project on Brucellosis	JNU campus, New Delhi	21.11.2014-22.11.2014	Dr. H. Rahman Dr. R. Shome Dr. V. Balamurugan
35.	National conference on PPR	NASC Complex, New Delhi	28.11.2014-29.11.2014	Dr. V. Balamurugan Dr. G. Govindaraj

36.	Training on Basic Epidemiology	CDC & ICAR-NIVEDI, Bengaluru	01.12.2014-05.12.2014.	Dr. P. Krishnamoorthy
37.	2nd Joint meeting of ICMR-ICAR on " Nationwide Avian Influenza surveillance plan"	National Institute of Virology, Pune	05.12.2014	Dr. K.P. Suresh Dr. R. Sridevi
38.	XXIII National Conference on "Recent Trends in Virology Research in the Omics Era"	Tamil Nadu Agricultural University Coimbatore	18.12.2014-20.12.2014.	Dr. V. Balamurugan
39.	CDC sponsored Bangladesh – India Cooperative Workshop on Anthrax -2015	Dhaka	25.01.2015-29.01.2015	Dr. H. Rahman, Dr. M.R. Gajendragad
40.	XIII Annual Conference of Indian Association of Veterinary Public Health Specialists (IAVPHS) and National symposium on Safety of Foods of Animal Origin for Domestic and Export Markets: Legal Perspectives	Veterinary college, Bengaluru	10.02.2015–12.02.2015	Dr. B.R. Shome Dr. R. Shome Dr. V. Balamurugan
41.	ICAR - University of Edinburgh, UK Joint International Workshop on Production Animal Health and Welfare Research: Impact and Opportunities	ICAR, New Delhi	16.02.2015 – 17.02.2015	Dr. H. Rahman, Dr. B.R.Shome
42.	Training on Research methodology and bio-statistics	Coimbatore, Tamil Nadu	18.02.2015-19.02.2015	Dr. K.P. Suresh
43.	Workshop on Scientific /strategic research on Biosafety and Biosecurity	DBT, New Delhi	25.02.2015	Dr. H. Rahman
44.	Training cum interactive session of DBT-ADSHAD project	Veterinary College, Assam	25.02.2015-27.02. 2015	Dr. R. Shome Dr. S.S. Patil Dr. K.P. Suresh
45.	Commercialization of diagnostic kit of Brucellosis	CIFT Cochin	18.03.2015	Dr. H. Rahman
46.	Training program on Research methodology, Biostatistics and scientific article writing	BMCRI, Bengaluru	28.03.2015	Dr. K.P. Suresh

NIVEDI Scientists in International Arena

Dr. H. Rahman, Director and Dr. M.R. Gajendragad, Principal Scientist attended Bangladesh-India Cooperative workshop on Anthrax during 26-28th January 2015

Dr. D. Hemadri, Principal Scientist participated in International conference on Bluetongue and related Orbiviruses held at Rome, Italy during 5-7th November, 2014

Dr. G.B. Manjunatha Reddy, Scientist attended 8th Annual meet of EPIZONE-2014 held during 23-25th September, 2014 at Copenhagen, Denmark

Awards/Fellowship/Recognition

1. Dr. R. Shome awarded Best Poster on Brucellosis in Risk vis-a-vis Non-risk Human Population: An Evaluation. In: XXI Annual Convention of ISVIB and International symposium on Livestock Diseases Affecting Livelihood Options and Global Trade-Strategies and Solutions,17 - 19th July 2014, TANUVAS, Chennai .
2. Dr. B.R. Shome awarded Best Poster on Biofilm formation and *Staphylococcus epidermidis*: Emergence of Ica negative biofilm strains of bovine origin. In: XXI Annual Convention of Indian Society for Veterinary Immunology and Biotechnology and International Symposium on Livestock Diseases Affecting Livelihood Options and Global Trade-Strategies and Solutions,17-19th July 2014, TANUVAS, Chennai.
3. Dr. S.D. Mitra awarded Best Poster on Identification of Single Nucleotide Polymorphisms in the Bovine TLR2 and TLR4 gene in Bos indicus and Bos Taurus. In: XXVIII Annual Convention of Indian Association of Veterinary Microbiologists, Immunologists and Specialists in Infectious Diseases and International Conference on Challenges and Opportunities in Animal health at the Face of Globalization and Climate Change, 30th – 1st November 2014, DUVASU, Mathura, Uttar Pradesh.
4. Dr. S.D. Mitra awarded Best Poster on MicroRNA- key players regulating inflammatory response in intramammary infection in in-vivo mice model in XXVIII Annual Convention of Indian Association of Veterinary Microbiologists, Immunologists and Specialists in Infectious Diseases and International Conference on Challenges and Opportunities in Animal health at the Face of Globalization and Climate Change, 30th – 1st November 2014, DUVASU, Mathura, Uttar Pradesh
5. R. Tewari awarded Best Poster on Extended Spectrum lactamase (ESBL) producing Enterobacteriaceae in Farm Animals-A threat to Public health in XXVIII Annual Convention of Indian Association of Veterinary Microbiologists, Immunologists and Specialists in Infectious Diseases and International Conference on Challenges and Opportunities in Animal health at the Face of Globalization and Climate Change, 30th – 1st November 2014, DUVASU, Mathura, Uttar Pradesh
6. Dr. V. Balamurugan awarded second Best poster presentation on Recombinant peste des petits ruminants virus nucleocapsid (N) protein/antigen based indirect ELISA for serodiagnostics of PPR in sheep and goats. In: VIROCON-2014 XXIII National Conference on Recent Trends in Virology Research in the Omics Era, 18-20th December 2014,Tamil Nadu Agricultural University Coimbatore, Tamil Nadu.
7. Dr. G.S. Desai awarded Best oral presentation on Expression and immunogenicity of chimeric HNF protein containing B and T cell epitopic regions of HN and F surface glycoproteins of *Peste des petits ruminants*. Proceedings page 54-55. XXVIII Annual Convention and International Conference on 'Challenges and Opportunities in Animal Health at the Face of Globalization and Climate Change'. 30th October - 1st Nov 2014, DUVASU, Mathura (U.P.), India. Best Paper Oral Presentation Award 2014

Patent Filed

Sengupta, PP, Ligi, M, Balamurugan, V and Rahman, H. Competitive Inhibition ELISA (CI-ELISA) for diagnosis of trypanosomosis in animals (Patent application No. 370/CHE/2015).

MISCELLANEOUS

Institute Management Committee(IMC)

Name	Designation	
Dr. H. Rahman	Director, NIVEDI, Bengaluru.	Chairman
Dr. Gaya Prasad	ADG (AH), ICAR, New Delhi.	ICAR Representative
Dr. R. Bhatta	Director, NIANP, Bengaluru.	Member
Dr. K.P. Ramesha	Principal Scientist, Southern Region Station, NDRI, Bengaluru.	Member
Dr. B. R. Shome	Principal Scientist, NIVEDI, Bengaluru.	Member
Dr. A. N. Shylesha	Principal Scientist, NBAIR, Bengaluru.	Member
Dr. D.M. Das	Director, Department of Animal Husbandry & Veterinary Services, Govt. of Karnataka.	Member
Dr. D. Venkateshwarulu	Director, Animal Husbandry Department, Govt. of Andhra Pradesh, Hyderabad.	Member
Dr. Yathiraj.S.	Dean, Veterinary College, KVAFSU, Bengaluru.	Member
Dr. M. Muddurange Gowda	Village & post Kannamangala Taluq-Doddaballapura, Dist. Bengaluru Rural District.	Non-official Member
Mrs.V. Shubha Reddy	No.80 B, Village-Kurubarahally,Taluq-Gauribidanur, District, Chikkaballapura-581208.	Non-official Member
Mr. A. Srinivasamurthy	F & AO, ICAR-IIHR, Bengaluru.	Member
Mr. B. Riyaz Ahmed	AO, ICAR-NIVEDI, Bengaluru.	Member Secretary

The IMC meeting of the Institute was conducted on 19.02.2015

Research Advisory Committee (RAC)

Name	Designation	
Dr. M. P. Yadav	Ex Director and Vice Chancellor, IVRI, Izatnagar and VC, SVPUA&T, Meerut.	Chairman
Dr. Mruthyunjaya	Former National Director, NAIP, New Delhi.	Member
Dr. Gaya Prasad	ADG (AH), ICAR, New Delhi	Member
Dr. H. K. Pradhan	Ex Joint Director, ICAR-NIHSAD, Bhopal.	Member
Dr. S.C. Dubey	Ex Joint Director, ICAR-NIHSAD, Bhopal.	Member
Dr. D. Swarup	Ex Director, ICAR-CIRG, Makhdoom.	Member
Dr. Anil Rai	Head, CABI, ICAR-IASRI, New Delhi.	Member
Dr. H. Rahman	Director, ICAR-NIVEDI, Bengaluru	Member
Dr. D. Hemadri	Principal Scientist, ICAR-NIVEDI, Bengaluru.	Member Secretary

Institute Research Committee (IRC)

Name	Designation	
Dr. H.Rahman	Director, ICAR-NIVEDI, Bengaluru.	Chairman
Dr. K. Prabhudas	Former Project Director, ICAR-NIVEDI, Bengaluru.	Member
Dr. V.D.P. Rao	Former Professor & Head, GBPUAT, Pantnagar.	Member
Dr. M. Gopinath Rao	Prof. & Head, Dept of Agriculture Statistics, UAS, Bengaluru.	Member
Dr. Lalith Achoth	Prof & Head, Dairy Economics and Business Management, KVAFSU, Bidar.	Member
Dr. P.P. Sengupta	Principal Scientist. ICAR-NIVEDI, Bengaluru .	Member Secretary

The IRC meeting of the Institute was conducted on 31.05.2014

Institutional Animal Ethics Committee (IAEC)

Name	Designation	
Dr. H. Rahman	Director, ICAR-NIVEDI, Bengaluru	Chairman
Dr. S. G. Ramachandra	Chief Research Scientist, IISc, Bengaluru	CPCSEA Nominee
Dr. Susan Mini Jason	Veterinarian	Link Nominee
Dr. D. Prahallada	Social activist	Non Scientific socially aware member
Dr. Vishwanath Bahagwat	Research Scientist, Himalaya Drug Company	Scientist outside the institute
Dr. M.R. Gajendragad	Principal Scientist, ICAR-NIVEDI, Bengaluru	Member
Dr. Divakar Hemadri	Principal Scientist, ICAR-NIVEDI, Bengaluru	Member
Dr. P.P. Sengupta	Principal Scientist, ICAR-NIVEDI, Bengaluru	Member
Dr.P. Krishnamoorthy	Scientist, ICAR-NIVEDI, Bengaluru	Member Secretary

Institute Bio-Safety Committee (IBSC)

Name	Designation	
Dr. H. Rahman	Director, ICAR-NIVEDI, Bengaluru	Chairman
Dr. M.D. Venkatesha	Joint Director, IAH&VB, Bengaluru	Member
Dr. S. G. Ramachandra,	PRS, IISc, Bengaluru	Member
Dr. S. Srinivas	MO, ICAR-IVRI, Bengaluru	Member
Dr. M.R. Gajendragad,	Principal Scientist, ICAR-NIVEDI, Bengaluru	Member
Dr. (Mrs.) R.Shome	Principal Scientist, ICAR-NIVEDI, Bengaluru	Member
Dr. P.P. Sengupta	Principal Scientist, ICAR-NIVEDI, Bengaluru	Member Secretary
Dr. G.S. Desai	Senior Scientist, ICAR-NIVEDI, Bengaluru	Bio-safety Officer (from 13.08.2014)

RFD ACHIEVEMENTS

Annual Performance Evaluation Report of RFD of NIVEDI (2013-14)

S. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent	Very Good	Good	Fair	Poor		Raw score	Weighted score		
							100%	90%	80%	70%	60%					
1.	Epidemiology of economically important livestock diseases	74	Collection, collation and formatting of data on livestock diseases and risk parameters	Updates made	Number	30	5300	5200	5100	5000	4900	5214	91.4	27.4	100.3	-
			Sero-surveillance of diseases	Screening of sera-samples	Number	26	5200	5100	5000	4900	4800	11106	100	26.0	217.8	More number of sera samples has been received during the period under report
			Forecasting of diseases of livestock	Diseases forecasted	Number	18	15	14	13	12	11	15	100	18.0	107	Every month fifteen livestock diseases were forecasted
2.	Assessing the economic impact of important diseases of livestock	15	Quantification of losses	Diseases studied	Number	15	2	1	0	0	0	1	90	13.5	100	-

3.	Efficient Functioningof theRFD System*	3	Timely submission ofDraftfor Approval 13-14	On-time submission	Date	2	15/5/13	16/5/13	17/5/13	20/5/13	21/5/13	27/4/13	100	2	-	-
			Timely submission ofResultsfor 12-13	On-time submission	Date	1	01/5/13	02/5/13	05/5/13	06/5/13	07/5/13	23/4/13	100	1	-	-
4.	Administrative reforms	4	Implement ISO 9001as per the approved action plan	% implementation	%	2	100	95	90	85	80	0	0	0	-	Internal audit completed. External audit (Stage I) completed. External audit (Stage II) is in progress.
			Prepare an action plan for innovation	On-time submission	Date	2	30/7/13	10/8/13	20/8/13	30/8/13	10/9/13	26/7/13	100	2	-	-
5.	Improving Internal Efficiency /responsiveness/Service deliveryof Ministry/ Department*	4	Implementation of Sevottam	Independent Audit of Implementation of Citizen's Charter	%	2	100	95	90	85	80	100	100	2	-	-
				Independent Audit of implementation of public grievance redressal system	%	2	100	95	90	85	80	100	100	2	-	-

Total composite score: 93.5
Rating : Very Good

Distinguished Visitors

1. Shri Radha Mohan Singh, Union Minister for Agriculture, Govt. of India
2. Shri D.V. Sadananda Gowda, Union Minister for Law and Justice, Govt. of India.
3. Shri T. B. Jayachandra, Minister for Law, Justice & Human Rights, Parliamentary Affairs & Legislation, Animal Husbandry, Govt of Karnataka.
4. Shri S. R. Vishwanath, Members of Legislative Assembly, Karnataka.
5. Shri Appaji Nadagouda, Members of Legislative Assembly, Karnataka.
6. Shri M. Rajanna, Members of Legislative Assembly, Karnataka.
7. Dr. S. Ayyappan, Secretary, DARE & DG, ICAR, New Delhi.
8. Dr. K.M.L. Pathak, DDG (AS), ICAR, New Delhi.
9. Dr. N.K. Krishna Kumar, DDG (Hort), ICAR, New Delhi.
10. Dr. R. K. Singh, Director, IVRI, Izatnagar.
11. Padma Bhushan Dr. M. Mahadevappa, Former Chairman, ASRB, ICAR, New Delhi.
12. Dr. C. Renukaprasad, Vice Chancellor, KVAFSU, Bidar, Karnataka.
13. Dr. K.M. Bujarbaruah, Vice Chancellor, AAU, Jorhat, Assam.
14. Dr. Robin White, Chief of Staff, USDA - APHIS -IS, USA.
15. Mr. Scott D. Saxe, Country Director, USDA - APHIS, New Delhi.
16. Dr. Amy Delgado, Veterinary Epidemiologist, USDA - APHIS -IS, USA.
17. Dr. Cynthia Johnson, Veterinary Epidemiologist, USDA - APHIS -IS, USA.
18. Dr. Kayla Laserson, Country Director, CDC-India, New Delhi.
19. Dr. Henry Walke, Chief, Bacterial Special Pathogens Branch, CDC, Atlanta, USA.
20. Dr. B. Pattnaik, Director, PD-FMD, Mukteshwar.
21. Dr. DK Agarwal, Assistant Director General (National Fund), ICAR, New Delhi.
22. Dr. Abraham Verghese, Director, NBAIR, Bengaluru.
23. Dr. Raghavendra Bhatta, Director, NIANP, Bengaluru.
24. Dr. V.M. Patil, Director, NRC on Camel, Bikaner.
25. Dr. G. Prasad, ADG (AH), ICAR, New Delhi.
26. Dr. C. S. Prasad, Former Vice Chancellor, MAFSU, Nagpur.
27. Dr. K.T. Sampath, Former Director, NIANP, Bengaluru.
28. Dr. Darshan Shankar, Vice Chancellor, Trans Disciplinary University, Bengaluru.
29. Dr. Sandeep Shastri, Pro Vice-Chancellor, Jain University, Bengaluru.
30. Dr. Peter Mertens, Professor, Pribright, UK.
31. Dr. Bethan V. Purse, Ecological Modeler, CEH, Wallingford, UK.

Staff Position during 2014-2015

S.No	Name	Designation
1	Dr. H. Rahman	Director
	Scientific Staff	
1	Dr. M.R.Gajendragad	Principal Scientist
2	Dr. B.R. Shome	Principal Scientist
3	Dr.(Mrs) Rajeswari Shome	Principal Scientist
4	Dr. Divakar Hemadri	Principal Scientist
5	Dr. P.P. Sengupta	Principal Scientist
6	Dr. Gururao S. Desai	Senior Scientist
7	Dr. V. Balamurugan	Senior Scientist
8	Dr. S.S. Patil	Senior Scientist
9	Dr. Sathish B. Shivachandra	Senior Scientist
10	Dr. G. Govindaraj	Scientist
11	Dr. K.P. Suresh	Scientist
12	Dr. P. Krishnamoorthy	Scientist
13	Dr. (Mrs) R. Sridevi	Scientist
14	Dr. Mohd Mudassar Chanda	Scientist
15	Dr. Jagadish Hiremath	Scientist (study leave)
16	Dr. M. Nagalingam	Scientist (study leave)
17	Dr. G.B. Manjunatha Reddy	Scientist
	Technical staff	
1	Dr. Yogisharadhya R	Senior Technical Officer
2	Dr. Awadhesh Prajapati	Senior Technical Officer
	Administrative Staff	
1	Mr. B.Riyaz Ahmed	Admin Officer
2	Mr. Rajeevalochana	Asst Admin Officer
3	Mr. R.K. Babu	AF & AO
4	Mr. M. Lakshmiah	Assistant
5	Mrs. A. Saranya	Steno Grade-III
6	Mr. K. Vijayaraj	StenoGrade-III
7	Mrs. G.C. Sridevi	LDC
8	Mr. L. Gangadareshwara	LDC
	Supporting Staff	
1	Mr. Ramu	Skilled Support Staff
2	Mr. H. Shivaramiah	Skilled Support Staff
3	Mr. B. Hanumantharaju	Skilled Support Staff

Joining

- Dr. Gururao S. Desai, Senior Scientist (Veterinary Microbiology) transferred from ICAR-IVRI, Izatnagar and joined this Institute on 2nd May 2014.
- Dr. Sathish B. Shivachandra, Senior Scientist (Veterinary Microbiology) transferred from ICAR-IVRI, Mukteshwar and joined this Institute on 12th January 2015.
- Shri. K. Vijayaraj joined as Stenographer Gr.III on 4th June 2014.

Transfer

- Shri. N. Narayanaswamy, Assistant, transferred to ICAR-NAAIR, Bengaluru and relieved on 2nd February 2015.

Resignation

- Ms. R. Rekha Priyadarshini, LDC resigned from service on 23rd February 2015.

Revenue

Details of Revenue Generated (2013-14)

S.No	Type Activity	Amount (in Rs.)
1	Sale of diagnostic kits	706455
2	Training	135050
3	Schemes	339454
4	Interest on Term Deposits	1444056
5	Miscellaneous receipts	28957442
	Total	30282457

Budget

Statement of Budget Allocation and Expenditure (2014-15)

Major Heads	Plan (INR in lakh)		Non Plan (INR in lakh)	
	Revised estimate	Expenditure	Revised estimate	Expenditure
Grant-in-Aid-Capital	220.00	217.28	20.00	17.66
Grant-in-Aid-Salaries	0.00	0.00	350.00	350.95
Grant-in-Aid-General	220.00	214.07	166.84	159.18
	440.00	431.35	536.84	527.79

NIVEDI ACTIVITIES

An interactive meeting with M/S Intervet (MSD Animal Health) India Pvt Ltd under the Chairmanship of Dr. K.M.L. Pathak, DDG (AS) at ICAR Krishi Bhavan, New Delhi on 1st April, 2014.

Discussion with Dr D Kathiresan, Dean and Dr Ravindran, Assistant Professor, CVSc&AH, Selesih, Mizoram on the progress of DBT-Twinning IBR Project by Dr. S.S. Patil, Senior Scientist on 1st April 2014.

Dr. N. Sheila Rao, Honorary Treasurer, Compassion Unlimited Plus Action (CUPA), Bengaluru delivered a lecture on Animal Welfare on the occasion of 12th World Veterinary Day on 26th April 2014.

Dr. Bethan Purse, Ecological Modeller, Centre for Ecology and Hydrology, Edinburgh University, UK delivered a lecture on Understanding Impact of Environment Change on Vector-Borne Diseases on 22nd May, 2014.

Institute foundation day was celebrated on 1st July, 2014 at Yelahanka campus and Dr. H. Rahman, Director hoisted the Institute flag and addressed the staff members.

ICAR Foundation day was celebrated as Farmers Day on 16th July, 2014. Tribal farmers from Soligaradoddi and Muthathi, Mandya district, Karnataka participated in the function.

Dr. G.S. Desai, Senior Scientist, visited KVK Hiriyur Chitradurga 22nd July 2014 and conducted workshop to address livestock management during adverse weather conditions

Dr. G.S. Desai, Senior Scientist, visited Taralabalu KVK Davanagere 23rd July 2014 and conducted workshop to address livestock management during adverse weather conditions

PDFMD and NIVEDI jointly organized one day workshop on Economic impact of FMD and its control in India at NIVEDI, Bengaluru on 31st July, 2014. NIVEDI scientists and officials from 10 states and one union territory participated in the review workshop.

NIVEDI, Bengaluru and Sardar Krushinagar Dantiwada Agricultural University (SDAU) jointly organized Mid-Term review meet on DBT-Network Project on Brucellosis at Ahmedabad on 8th August, 2014.

68th Independence Day was celebrated on 15th August, 2014 and Dr.H. Rahman, Director hoisted the National flag.

Dr. P.P. Sengupta, Principal Scientist, Dr. P. Krishnamoorthy, Scientist and Dr. Yogisharadaya, STO visited the Krishi Vigyan Kendra, Gulbarga and interacted with farmers on 27th August, 2014.

Scientists and STO's from NIVEDI, Bengaluru attended five days training programme on Geospatial Technologies for Veterinary Epidemiology and Disease Informatics organized by Indian Institute of Remote Sensing (IIRS), Dehradun during 8-12th September, 2014.

Hindi Saptah was celebrated during 15-20th September, 2014 by conducting various events like debate, quiz, extempore speech, etc., in Hindi.

Dr.B.R. Shome and Dr. Rajeswari Shome conducted Brucellosis training programme on 22nd September, 2014 at Agartala, Tripura under Brucellosis–Control Program.

A workshop on Information and Communication Technology Tools in Rabies Prevention and Control was organized on 29th September, 2014 on the occasion of World Rabies Day.

Dr. H. Rahman, Director initiated the cleanliness campaign under Swachh Bharat Mission launched by Hon'ble Prime Minister of India on 2nd October 2014.

Scientists and Staff members participated in the ICAR South Zone Sports Meet organized by IIHR, Bengaluru held at Sri Kanteerava Stadium, Bengaluru during 13-17thOctober, 2014.

Dr. Scott S. Sindelar and Mrs. Deepa, USDA, India visited NIVEDI on 18th October, 2014 and had discussion with Director and Scientists.

Evaluation of kits developed under DBT Network project on Brucellosis by Dr. Giri Polavarapu, PI, Subproject Brucellosis Diagnosis-3, Hyderabad on 27th October, 2014.

Kannada Rajyotsava Day was celebrated on 1st November 2014 at NIVEDI, Bengaluru.

Scientists and Staffs participated and exhibited various institute technologies developed in the Krishi Mela 2014 held at GKVK, UAS, Bengaluru during 19th -21st November, 2014.

NIVEDI and Jawaharlal Nehru University (JNU) jointly organized annual review meet of DBT sponsored Network Project on Brucellosis at JNU, New Delhi on 21st-22nd November, 2014.

Interactive meet cum Training Programme under DBT-ADSAHD during 25-27th February 2015 at Veterinary College, AAU, Khnapara, Guwahati, Assam.

Dr. Sridevi. R, Scientist and Dr. Rajiv, Epidemiologists interacted with Duck Farmer in Chennithala Panchayat, Kerala on 27th February, 2015.

Brucellosis awareness programme was organised at Jakkur village, Bengaluru by Dr. Rajeswari Shome, Principal Scientist on 9th March, 2015.

The International Women's Day celebrated at NIVEDI, Bengaluru on 9th March 2015.

Dr. D. Hemadri, Principal Scientist and Dr. P. Krishnamoorthy, Scientist participated as an external expert committee members for surveillance of FMD vaccination programme in Tavarekere, Bengaluru on 19th March, 2015.

Dr. B.R. Shome, Principal Scientist and Dr. S.S. Patil, Senior Scientist participated as an external expert committee members for surveillance of FMD vaccination programme in Kolar district on 19th March 2015.

Brucellosis sensitization training for artificial inseminators at KMF office, Chickkaballapur organized by Dr. Rajeswari Shome, Principal Scientist on 27th March 2015.