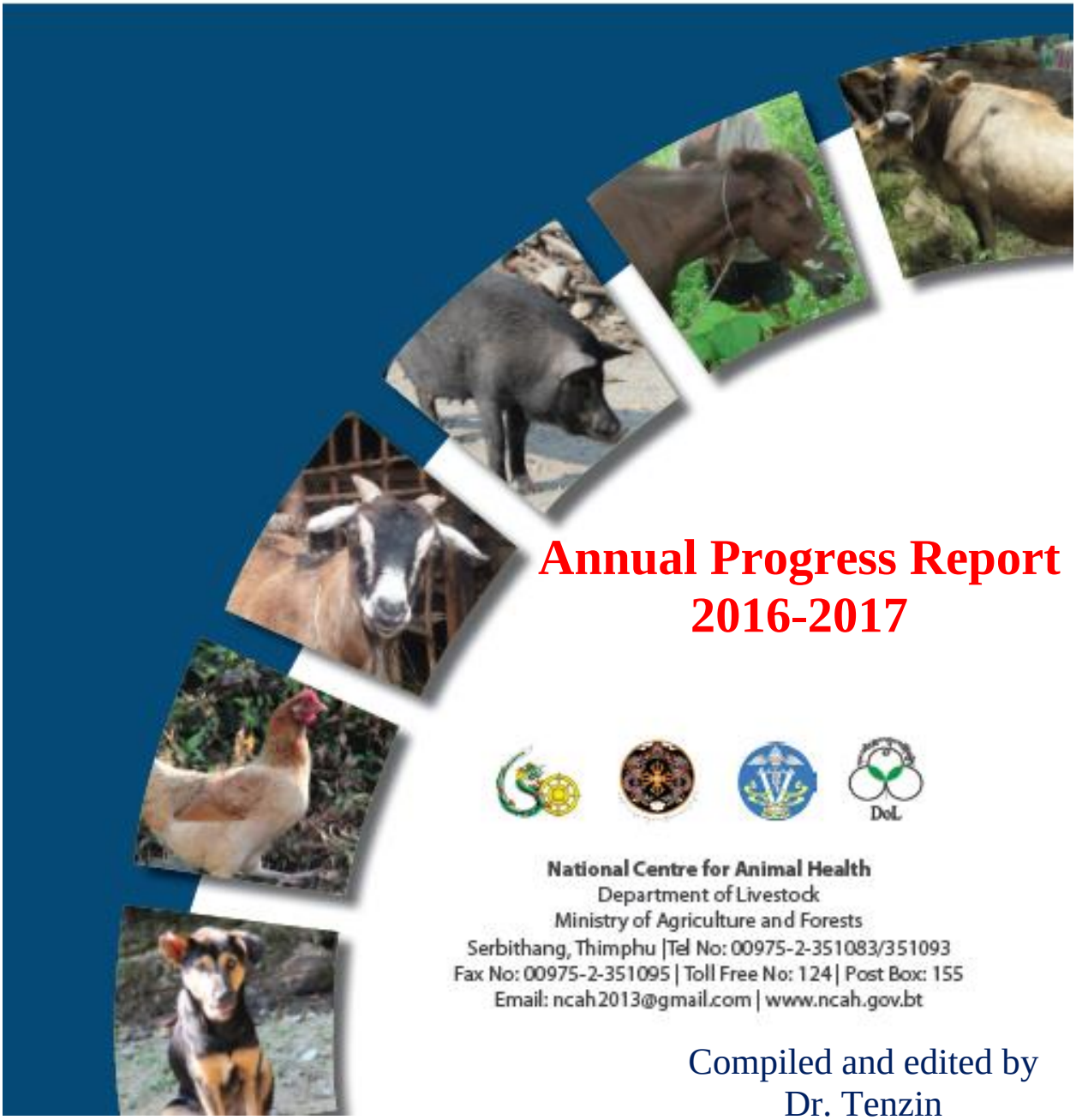
NATIONAL CENTRE for ANIMAL HEALTH



Annual Progress Report 2016-2017

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ROYAL GOVERNMENT OF BHUTAN
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July 26, 2017

FOREWORD

The National Centre for Animal Health, Department of Livestock, Ministry of Agriculture and Forests is pleased to release the Centre's Annual Progress Report for the Financial Year 2016-2017. The report highlights the progress, achievements, and experiences of the centre while undertaking the mandate of animal health services in the country. As the national competent centre for animal health, the centre has a very crucial role to play in supporting the various commodity programs under the livestock sector with the ultimate objective of enhancing livestock production in the country.

I, on behalf of the NCAH management, would like to thank all the Heads of Units and the staff at NCAH for their invaluable contribution in achieving the centre's mandates and more importantly, for documenting all activities undertaken by each unit. I acknowledge their contribution and support in producing this annual report.

I would also like to express my sincere appreciation to all the Regional Directors of RLDCs, the Program Managers, District Livestock Officers, Veterinarians, Farm Managers, and Livestock Extension Officers for their continued support and successful implementation of their animal health programs in their respective Geogs farms/Dzongkhags/Regions. I extend my sincere appreciations to the international partners (OIE, FAO, WHO, HSI, NIHSAD Bhopal, DLD/NIAH Bangkok, FAO Regional Support Unit for SAARC, Kathmandu) for their technical and financial support provided in strengthening implementation of animal health activities in the country. I also extend appreciations to Department of Public Health and BAFRA for their continued support and cooperation in prevention and control of diseases.

I also thank the Director General and the Chiefs of various Divisions under DoL for their continuous guidance and support to NCAH.

Lastly, I extend my appreciation to the Disease Prevention and Control Unit, NCAH for coordinating publication of this document as an annual event.

Tashi Delek

Dr. Kinzang Dukpa
Program Director

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1. Background

The National Centre for Animal Health (NCAH) is located about 12 km away from Thimphu, the capital city of Bhutan. Initially the centre started as a laboratory in 1978 at Chubachu, Thimphu. Later under the aegis of UNDP/FAO project, it was named as Royal Veterinary Diagnostic Laboratory (RVDL) and shifted to Serbithang in 1981. It was subsequently strengthened under EU assistance between 1991 and 1999 and was renamed as Royal Veterinary Epidemiology Centre (RVEC). The centre is responsible for animal disease diagnosis and disease prevention and control program, and providing technical backstopping to the Dzongkhags. In 2005, RVEC was renamed as National Centre for Animal Health (NCAH), and is one of the central programs under the Department of Livestock, Ministry of Agriculture & Forests. The centre has a campus area of 8.8259 acres and has 50 staff.

1.1. Main Mandates

1. To function as national referral laboratory and competent centre for animal health
2. To ensure availability of veterinary drugs, vaccines and equipment
3. To function as an institute for capacity development in animal health

1.2. Functions

1. Develop, implement and evaluate disease prevention and emergency response plans for livestock diseases and zoonoses
2. Support development of policies, strategies and plans for animal health
3. Coordinate, monitor and evaluate disease prevention and control programs
4. Prioritize and conduct research on animal health
5. Liaise with national and international agencies for technical collaboration
6. Plan, coordinate and conduct animal health research in liaison with relevant agencies
7. Maintain and disseminate animal health and epidemiological information, reporting on regular basis
8. Provide referral services on laboratory diagnostic services
9. Support development of capacity in animal health programs
10. Implement, monitor and evaluate management of veterinary drugs, vaccines and equipment at national level
11. Conduct disease surveillance and control activities at national level

1.3. Four major functional units of NCAH

The centre coordinates all national level animal health programs in collaboration with the four Regional Livestock Development Centres and the Dzongkhags. The main functional units are (Figure 1):

- Disease Prevention and Control Unit (DPCU)
- Laboratory Services Unit (LSU)
- Drugs Vaccines and Equipment Unit (DVEU)
- Biological Production and Research Unit (BPRU)

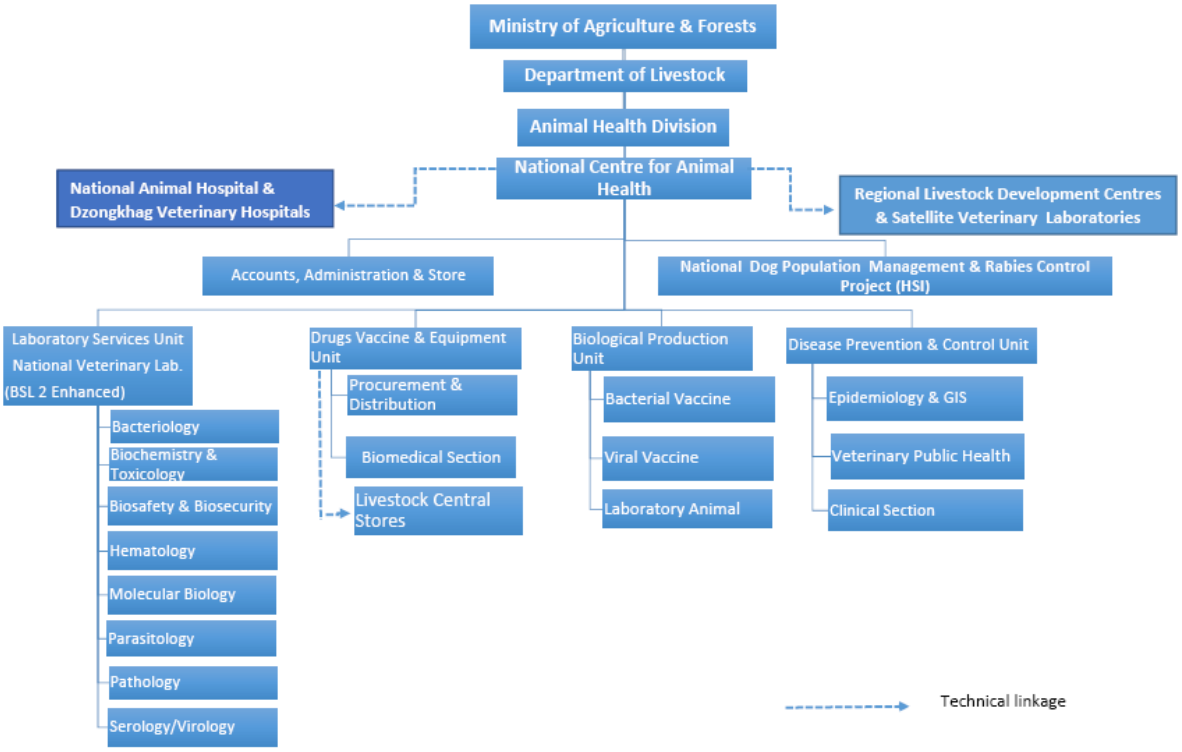


Figure 1: Organogram of NCAH

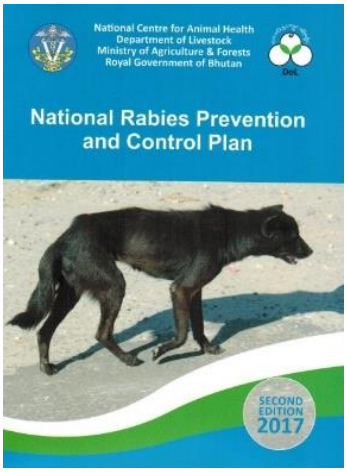
2. Key Achievements of NCAH during (FY 2016-17)

2.1 National Gid Disease Prevention and Control Plan launched

Hon'ble Chairperson of the National Council, Dasho (Dr) Sonam Kinga, Hon'ble Lyonpo Yeshey Dorji, Minister, Ministry of Agriculture and Forests and Hon'ble Lyonpo Damcho Dorji, Minister, Ministry of Foreign Affairs launched the National Gid Disease Prevention and Control Plan coinciding with the first Royal Highland Festival celebrated from October 16-18 at Laya, Gasa. The guideline is being developed with the objective to provide a more strategic and effective approach to dealing with Gid incidences in the country based on the epidemiological knowledge gained and the changing field situation.

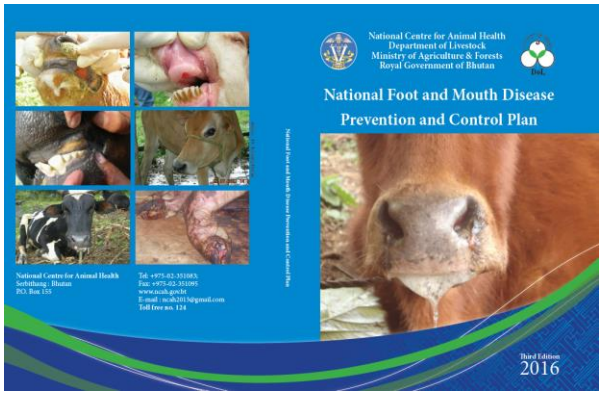
2.2. National Rabies Prevention and Control Plan launched

The National Rabies Prevention and Control Plan was launched by Dasho Secretary, MoAF on 13 June 2017 during National Livestock Conference, Bumthang. This control plan can be used as a reference for the implementation of rabies prevention and control program in the country.



2.3. National Foot and Mouth Disease Prevention and Control Plan launched

The National FMD Prevention and Control Plan was launched by Hon'ble Sonam Lyonpo on 9 November 2016. This control plan can be used as a reference for the implementation of FMD control program in the country.



2.4. Wildlife Disease Surveillance Strategy developed

A draft wildlife disease surveillance strategy plan was developed to conduct disease surveillance at wildlife-livestock-human interface.

2.5. National *Peste des petits ruminant* (PPR) prevention and control plan

A PPR prevention and control plan was developed in line with the global target to eradicate PPR in goats by 2030. Bhutan plan to eliminate PPR by 2021.

2.6. National Veterinary Information System launched

The NCAH have developed online database system to record, manage and analyse Monthly Animal Health Report in the country. The database was launched by Hon'ble Sonam Lyonpo on 9 November 2016.

2.7. Disease outbreak investigation and containment

The NCAH in collaboration with the Regional, Dzongkhag and central agencies have successfully contained rabies outbreak in Trashigang by activating rapid response team (RRT).

Mass dog vaccination campaign

Awareness education to farmers on rabies and importance of dog vaccination

2.8. Strengthened Laboratory Diagnostic Services in the country

- The LSU received and processed 7,122 numbers of various types of samples and conducted 14,531 numbers of tests.

Summary of sample received and test performed

Section	No. of sample	No. of Tests
Parasitology	1382	2474
Hematology	480	2387
Bio-chemistry &Toxicology	318	583
Bacteriology	545	3579
Serology/Virology	3174	4323
Post-mortem	263	224
Histo-Pathology	960	961
Total	7122	14531

- Conducted major livestock disease outbreaks investigation in the country;
- Conducted laboratory assessment, quality assurance audit, proficiency testing and backstopping;
- Developed Laboratory Information Management System (LIMS);
- Signed Joint Research agreement on study on diagnosis and control of Brucellosis in Bhutan with National Institute of Animal Health (NIAH), Japan

2.9. Vaccine production, procurement and distribution

- The unit produced 8690 doses of Classical Swine Fever vaccine and 2300 doses of Anthrax vaccine.
- The unit procured and distributed following vaccines to the Dzongkhags for disease prevention program

Details of vaccines procured during FY 2016-17

Vaccine type	No. of Doses procured
Gumboro (IBD) vaccine	2120000
ND B_1 vaccine	1160000
ND R_2B vaccine	854300
Fowl Pox vaccine	900000
Marek's vaccine	890000
FMD	152500
HSBQ combined	69510
Rabisin vaccine	10000
Raksharab	30000
PPR	4900
DHPPi + L vaccine	900
Total	**6182110**

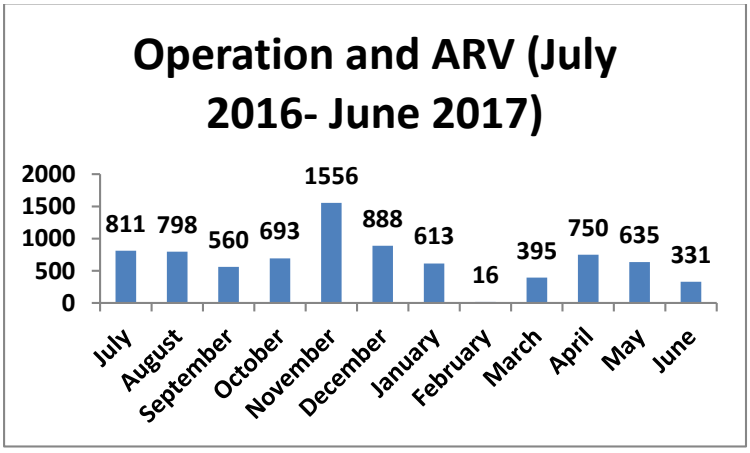
2.10. Procurement and distribution of veterinary medicine and equipment for treatment and disease prevention program

- Regularization of stock of medicines, equipment and non-drug items. Excess stock of medicines worth Nu. 3,054,667.18 million and deficit stock of Nu. 8,41,881.26 million was regularized;
- Monitoring of Essential Veterinary Drug Program
- Procurement of medicines, vaccines and equipment. Total tendered amount for medicines and vaccines for the FY 2016-17 was worth Nu. 31.015 million and the supply order of medicines and vaccines worth Nu. 31.015 million was given to the substantially responsive bidders.
- Verification and inspection of veterinary drugs and equipment
- Distribution of Veterinary Medicines, Equipment and Non-drug Items

2.11. Dog population and management

- A total of 8046 surgeries and vaccination were carried out both in dogs and cats in the field clinics
- The project supported containment of rabies outbreaks in Trashigang through deployment of staff
- In collaboration with other stakeholders, created awareness education on rabies to more than 15,863 students in rabies risk areas during World Rabies Day week

- Conducted CNVR program in Thimphu Thromdey covering 1278 dogs (1250 dogs) and cats during first round (29 July - 19 September 2016) and 655 dogs during second round (24th April - 25 May 2017).



2.12. Capacity building to enhance knowledge and skills

- Conducted a Refresher training for Veterinary laboratory technicians (36 participants) in the country;
- Conducted Laboratory co-ordination Workshop to strengthen co-ordination and linkages of the laboratory networks in the country;
- Conducted Laboratory diagnostic workshop to enhance Rabies testing and control in Bhutan in collaboration with AAHL, Geelong, Australia;
- Conducted training and introduced three diagnostic methods for diagnosis of Brucella infection: culture technique, polymerase chain reaction (PCR) and milk enzyme linked immunosorbent assay (ELISA) in collaboration with NIAH, Japan;
- Conducted training on aflatoxin analysis at National Research Centre for Animal Nutrition, Bumthang;
- Conducted training Workshop on Rabies Risk assessment and economic analysis in collaboration with University of Calgary, Canada;
- Conducted training on Geographical Information System & Global Positioning System to Bhutan One Health Fellows

2.13. Animal Disease Surveillance and Researches

The NCAH have conducted various animal health researches and published the papers in peer reviewed journal.

- First Detection of Extended-Spectrum ß-Lactamase Producing Escherichia coli in Breeder Pigs in Bhutan *(Puspa M Sharma, Katrin Zurfluh, Magdalena Nüesch-Inderbinen, Roger Stephan, Kinzang Dukpa, RB. Gurung., 2017. J Ani Vet Sci 3(1):13-17);*
- Detection of Echinococcus granulosus and Echinococcus ortleppi in Bhutan *(Nirmal Kumar Thapa, Maria Teresa Armua-Fernandez, Dukpa Kinzang, Ratna B. Gurung, Phuntsho Wangdi, Peter Deplazes., 2017. Parasitology International 66: 139–141);*
- Accidental urea poisoning in cattle- Case report *(Nirmal K. Thapa, Tenzinla, Ugyen Pem, Passang Bidha, Phuntsho Namgyal and Prati M Rai., 2017. Bhutan J. Anim. Sci. 1(1): 73-74);*
- Comparative immunological and coprological screening of Fasciolosis in cattle *(SB Chamling Rai , Sangay Lham, and Purna Bdr Rai., 2017. Bhutan J. Anim. Sci. 1(1): 70-72);*
- Knowledge, perceptions and practices of rural communities on anthrax in east-central Bhutan *(Jambay Dorjee, Karma Wangdi, Dawa Dakpa, Tenzin, Hendrickx S., 2017. Bhutan J. Anim. Sci. 1(1): 46-50);*
- Community-based survey during rabies outbreaks in Rangjung town, Trashigang, eastern Bhutan, 2016 *(Tenzin, Jamyang Namgyal, Sangay Letho., 2017. BMC Infectious Diseases 17:281).*
- Biosecurity survey in relation to the risk of HPAI outbreaks in backyard poultry holdings in Thimphu city area, Bhutan *(Tenzin, Chador Wangdi, PB Rai., 2017. BMC Veterinary Research 13:113).*
- Epidemiological Analysis of Dog bites and Human Rabies post exposure prophylaxis in Bhutan, 2009-2012 *(Tenzin, Sonam Wangchuk, Tshering Dorji, Joanna S. McKenzie and Peter D. Jolly., 2017. Bhutan J. Anim. Sci. 1(1): 57-64).*
- Feral pigeon disease surveillance following poultry and wild bird mortality event in Bhutan *(Annie Philips, RB Gurung, Tenzin, Kinzang Dukpa, Karma Rinzin., 2017. Oral presentation during WDA Australasia Conference, Australia)*
- A Case-Control Study of an outbreak of Foot and mouth disease at the herd level in cattle in Samdrup Jongkhar district, south eastern Bhutan (*Lungten, Tenzin, Karoon Chanachai, Tsewang Rabgay.*, 2017. *Oral presentation during 9th TEPHENET Global Scientific Conference, 7-11 August 2017, Bangkok, Thailand.*

3. Disease Prevention and Control Unit

The Disease Prevention and Control Unit act as the focal unit for planning, implementation and monitoring of disease prevention and control programs in the country. The unit has three sections: Epidemiology & GIS section; Veterinary Public Health and Clinical section.

3.1. The main roles of the DPCU

- To formulate, implement and monitor the various nationally coordinated animal disease prevention and control programs in the country
- To formulate animal disease emergency response plans (contingency plans) for trans-boundary emerging animal diseases
- To plan and implement zoonotic disease prevention and control programme through One Health approach in collaboration with the Ministry of Health
- To maintain the livestock diseases information in the country through the online TADinfo database system and analysis and reporting of the data
- It act as the focal agency for contact with international organizations like OIE (World Organization for Animal Health), FAO, WHO, APHCA (Animal Production and Health Commission for Asia Pacific) on all matters of animal health concerns

3.2. Human resources of DPCU

The DPCU is currently manned by the following staff:

- Dr. Tenzin, PLHO (Head)
- Dr. Yoenten Phuentshok, Veterinary Officer
- Karma Dekar, Data Manager

3.3. Key achievements of DPCU for the FY 2016-2017

3.3.1 Development of Animal Disease Prevention and Control Plan

3.3.1.1 National Gid Disease Prevention and Control Plan launched

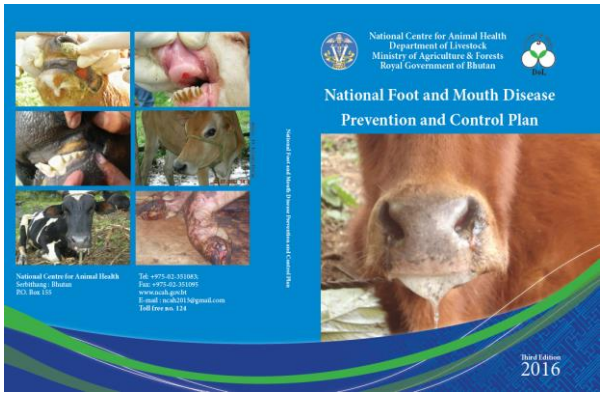
National Gid Disease Prevention and Control Plan was launched coinciding with the first Royal Highland Festival celebrated from October 16-18 at Laya, Gasa. The guideline is being developed with the objective to provide a more strategic and effective approach to dealing with Gid disease incidences in the country based on the epidemiological knowledge gained and the changing field situation.

3.3.1.2 National Rabies Prevention and Control Plan launched

The DPCU in collaboration with other technical experts have developed National Rabies Prevention and Control Plan. The document was launched by Dasho Secretary, MoAF on 13 June 2017 during National Livestock Conference, Bumthang.

3.3.1.3 National Foot and Mouth Disease Prevention and Control Plan launched

The DPCU in collaboration with other technical experts have developed and launched the National FMD Prevention and Control Plan on 9 Novermber 2016. This control plan can be used as a reference for the implementation of FMD control program in the country.



3.3.1.4 Wildlife Disease Surveillance Strategy

A draft wildlife disease surveillance strategy plan was developed to conduct disease surveillance at wildlife-livestock-human interface.

3.3.2 Strengthening of Database Management and Disease Reporting System

- Carried out regular updating and cross checking of TADInfo database
- Two six monthly reports on notifiable animal diseases were compiled and submitted to Office International des Epizootic (OIE) and updated in World Animal Health Information System (WAHIS).
- Immediate notification to WAHIS submitted whenever there was any OIE reportable disease outbreak in the country (e.g. bird flu, PPR)
- E-bulletin: Twenty four number of fortnightly e-bulletin were produced and circulated on important animal disease outbreaks in the country from (July 2016 to June 2017) as readily readable format.
- Carried out regular uploading of news and events, notification, etc. onto the website
- Preparation and submission of centres monthly progress report

3.3.2.1. Developed National Veterinary Information System

The DPCU have developed online database system to record, manage and analyse Monthly Animal Health Report in the country. Henceforth, all animal health related diseases reported in the field including government farms shall be entered online by respective Dzongkhag Veterinary Hospitals and also by other relevant agencies/central farms. The database was launched on 9 November 2016 by Hon'ble Sonam Lyonpo.

3.3.4. Disease outbreak investigation and containment

The DPCU and other technical units of NCAH including the Regional and Dzongkhag stakeholders coordinated the following disease outbreak investigation and containment activities in the country.

- Investigation and containment of Rabies outbreak in Trashigang
- Investigation of Marek's disease and Avian Leukosis complex at Regional Poultry Breeding Centre, Khangkhu, Paro
- Investigation and control of FMD outbreak at Lamgong and Tsento, Paro

3.3.5. Disease Prevention program

3.3.5.1. Foot and Mouth Disease prevention program (campaign) in Chukha Dzongkhag

The DPCU, NCAH have supported Mass FMD vaccination campaign in Chukha during September 2016 and March – April 2017 and in terms of deployment of staffs along with dedicated vehicle to transport vaccination team and also fund support.

3.3.5.2. World Rabies Day

The DPCU, NDPM & RCP of NCAH and DoPH (MoH) have coordinated the World Rabies Week from 28 September 2016 through conduct of awareness education campaign in schools.

3.3.6 Notifiable Disease Status Report

One book on the "Status of the Notifiable Animal Diseases in Bhutan (1996-2016) was published by DPCU, uploaded onto NCAH website and also circulated the soft copy to all the stakeholders.

3.3.7 Other works

The DPCU staff assisted in the implementation of HSI project work

4. Laboratory Services Unit

The Laboratory Services Unit (LSU) is one of the four functional technical units under the National Centre for Animal Health, Serbithang. The unit also has the capacity to undertake rapid diagnosis of emerging infectious disease including the highly pathogenic avian influenza. The unit functions as the National Referral Veterinary Laboratory in the country, equipped with advanced diagnostic facilities such as PCR and ELISA

4.1. Mandates of the LSU

The Laboratory Services Unit (LSU) is one of the four functional technical units under the National Centre for Animal Health, Serbithang. In addition to the routine diagnostic tests, the unit also has the capacity to undertake rapid diagnosis of emerging infectious diseases like the highly pathogenic avian influenza, IBD, NCD and Rabies. The unit also functions as the National Referral Veterinary Laboratory in the country, equipped with advanced diagnostic facilities such as PCR and ELISA.

The main mandates of the Laboratory Services Unit are:

- To provide range of veterinary diagnostic services, support clinical services, animal health programs and One-Health activities in the country;
- To serve as the national referral laboratory for diagnosis of animal diseases in the country;
- To lead/coordinate and conduct laboratory based animal health research activities in the country;

- To develop human resource capacity on advanced veterinary laboratory technology and up-gradation courses for laboratory technicians in collaboration with other relevant institutions;
- To implement and monitor bio-safety measures and good laboratory practices in all veterinary laboratories in the country;
- To backstop regional, satellite and district laboratories in the country;
- To serve as focal laboratory for antimicrobial resistance monitoring in animals in the country
- To participate in regional proficiency testing for specific diagnostic methods;
- To liaise, collaborate and establish efficient laboratory networks with the outside agencies like Food Testing Laboratory, Bhutan Agriculture and Food Regulatory Authority; Clinical Laboratory, Jigme Dorji Wangchuck National Referral Hospital; Royal Centre for Disease Control, Department of Public Health; and Wildlife Clinic, Nature Conservation Division, Department of Forests and Park Services;
- To liaise, collaborate and establish efficient laboratory networks with the international reference laboratories such as OIE and WHO Referral Laboratories;

4.2. Human resources in LSU

The followings are the available human resource in the Laboratory Services Unit as on 30th June 2017 (Table 1).

Table 1: Over all human resource capacity in LSU

Human resource	Sections	Number
Animal Health Specialist-I (Parasitologist)	Parasitology	1
Animal Health Specialist- III (Pathologist)	Pathology	1
Principal Livestock Health Officer	Molecular biology/Microbiology/Immunology	1
Sr. Laboratory Officer*	Serology & Virology/	2
Laboratory Officer	Bacteriology/Molecular/Bio-safety & Bio-security	1
Sr. Laboratory Technician	Parasitology/Serology & Virology /Bacteriology	3
Assistant Laboratory Technician	Serology & Virology/Hematology/Bio-chemistry& Toxicology/Pathology & PM	6
Laboratory Attendant	General	1
Total		16

*one on study leave

4.3. Diagnostic capacities in LSU

The unit has six sections i.e. Bacteriology, Serology/Virology/Molecular biology, Toxicology & Bio-chemistry, Parasitology, Post-mortem and Histo-pathology and Hematology Section. The different sections under the LSU are equipped with advanced diagnostic facilities. The summary of diagnostic tests and capacities available in each section are as follows:

4.3.1 Parasitology Section

The section provides routine diagnostic services for parasitic disease and recommends control guidelines and advisory services to the government livestock farms, dzongkhags and private livestock agencies. It also provides other professional backstopping to RLDCs, SVLs and DVHs/DVLs. Besides the routine activities, the section regularly conducts research and surveillance pertaining to parasitic diseases in collaboration with government farms, RLDCs and the Dzongkhags. The section is also responsible to provide refresher/in-service courses for field staffs and trainings to the farmers with regard to parasitic diseases and control programs.

The Parasitology section is currently manned by the following staff.
Dr. Phuntsho Wangdi, AHS-I
Ms. Pema Tshomo Lab Assistant

The following are the lists of diagnostic services that are being provided:

- Identification of parasites through direct technique;
- Identification of parasites through qualitative tests (Sedimentation and Floatation methods);
- Identification of parasites through quantitative tests (Stoll method);
- Urine sedimentation test for nematodes;
- Skin scraping examination using 10% KOH digestion method;
- Blood parasite examination;
- Pepsin digestion test;
- Fecal culture (simple tube method, culture tube method, Baermann's method);
- Tick identification (stereo-zoom method);
- Recovery of nematode larvae from soil, herbage and identification;
- Prepucial trichomoniasis test and identification of trichomonas;
- Post-mortem recovery of helminths, post mortem worm count;
- Cryptosporidium staining and identification (modified acid fast);
- Microfilaria identification from blood (modified Knott's method);
- Worm staining & preservation;
- Density estimation of flukes;
- ELISA for Fasciola;

4.3.2 Bacteriology Section

The section provides routine diagnostic services for microbial diseases (bacteria & fungi) in the livestock through culture & identifications. The section also has capacity for second stage bio-chemical tests and identification of important bacterial pathogens like salmonella. B. anthracis serotyping of E.coli etc.

The bacteriology section has the following manpower capacity:

1. Ms. Puspa Maya Sharma, Laboratory Officer
2. Mr. Tenzinla, Sr. Laboratory Technician

The section has the following diagnostic capacities:

- Bacterial culture and identification using sheep blood agar, MacConkey agar and other selective media and various bio-chemical tests;
- Fungal culture and identification using Sabouraud agar;
- Staining techniques - Grams, Giemsa, Methylene blue, Ziehl-Neelsen/Acid fast, Leishman, Lactophenol, Spore staining and Capsule staining;
- Species identification of important bacterial pathogens in Bhutan – Salmonella spp., E. coli, Staphylococcus spp., Bacillus anthracis, Clostridium species, Campylobacter species and Streptococcus species;
- Enumeration of bacteria - total aerobic count by pour plate technique and spread plate technique, total coli count by pour plate technique and spread plate technique, Most Probable Number (MPN) technique;
- Detection of Mycobacterium species by acid fast technique;
- Agglutination test (SAT, TAT, Microtitre plate agglutination test);
- Detection of mastitis in milk samples through CMT, Cell count and WST;
- Antimicrobial susceptibility test;
- Intradermal test for TB using PPD

4.3.3 Haematology Section

The section conducts the basic haematological tests to support clinical diagnosis in the animals.
The Haematology section has the human resource capacity as follows:

1. Dr. NK Thapa, AHS-III
2. Ms. Tshewang Dema, Assistant Laboratory Technician

The hematological parameters and tests commonly conducted in this section are:

- Haemoglobin estimation (Hb);
- Packed Cell Volume (PCV);
- Total Red Blood Cell Count (TRBCC);
- Total White Blood Cell Count (TWBCC);
- Differential Leukocyte Count (DLC);
- Erythrocyte Indices – MCV, MCHC and MCH;
- Erythrocyte Sedimentation Rate (ESR);
- Wet film examination for microfilaria and trypanosome;

4.3.4 Bio-chemistry & Toxicology Section

The section conducts basic tests for clinical bio-chemistry in serum and also qualitative analysis of urine to support the clinical diagnosis. The section also conducts basic toxicological tests especially, screening of important mycotoxins in the animal feeds.

The Bio-chemistry and Toxicology sections have the following staff:

1. Dr.NK Thapa, AHS III
2. Ms. Punya Mata, Assistant Laboratory Technician

The following are the diagnostic capacities available in this section:

- Quantitative mycotoxin (Aflatoxin, Ochratoxin, Fumonisin);

- Mineral estimation for Ca, Mg and P;
- Qualitative urine analysis;
- Qualitative and quantitative bio-chemistry;

4.3.5 Molecular biology, Serology & Virology Section

This section is equipped with advanced diagnostic facilities such as real time PCR, ELISA and has the capacity to undertake rapid diagnosis of emerging diseases including the highly pathogenic avian influenza, IBD, NCD and Rabies.
Besides its routine activities, activities and testing samples referred by the Regional/District/Satellite Laboratories in the country, the section is involved actively in disease surveillance activities.

The Molecular biology, Serology and Virology sections are manned by:

1. Dr. RB Gurung, Principal Livestock Health Officer
2. Ms. Puspa Maya Sharma, Laboratory Officer
3. Mr. Purna Bahadur Rai, Sr. Laboratory Technician
4. Mr. Dawa Tshering, Sr. Laboratory Technician
5. Ms. Kelzang Lhamo, Assistant Laboratory Technician

The diagnostic capacities available in this section are:

- Rapid antigen detection tests for AI type A, H5, NDV, IBD, FMD & Rabies;
- FAT for Rabies;
- Antibody ELISA for FMD, Brucellosis, Rabies, NCD, IBD, CSF, IBR, Leptospirosis, CBPP, CCPP, PRRS, JD and PPR;
- Antigen ELISA for CSF and PPR;
- Typing ELISA (sandwich) for FMD;
- Conventional PCR for FMD serotyping;
- Real time PCR for AI Type A, H5N1 and ND
- Agglutination tests - HA/HI for ND and H7N9;
- Slide agglutination test for Salmonella and Mycoplasma;
- RBT for Brucella;

4.3.6 Post-mortem & Pathology Section

The section has PM and Histo-pathology section which provides necropsy service and histo-pathological studies diagnosis.

The section has the human resource capacity as follows:

1. Dr. NK Thapa, AHS-III
2. Ms. Pasang Bida, Assistant Laboratory Technician
3. Ms. Ugyen Pema, Assistant Laboratory Technician

The section is responsible for following diagnostic capacities:

- To conduct post-mortem in poultry, ruminants, canine, feline, equine, swine species and wild animals including reptiles and fish;
- To perform histo-pathological examination through processing and staining techniques (H&E, Grams, ZN, pigment staining and pearls staining);
- To perform immuno-histochemistry for CD and CSF (upgrade)

4.3.7 Bio-safety and Bio-security section

The section is mandated to implement and monitor bio-safety measures and good laboratory practices in all veterinary laboratories in the country. Thus, this section is an aide-de-section for all other sections.
The human resource in this section is as follows:

1. Ms. Puspa Maya Sharma, Laboratory Officer
2. Ms. Pema Tshomo, Lab Assistant

The section is responsible for the following:

- Planning Coordination and Implementation of Biosafety and Bio-security plans
- Technical Support on Biosafety and Biosecurity measures
- In House Training
- Reporting and Monitoring
- Samples referral to collaborating laboratories
- Routine and research laboratory test kits, reagents, consumables procurement

4.4. Key achievements of LSU during FY 2016-17

The total samples received/collected and test performed for each section during this financial year is tabulated below in Table 2.

Table 2: Summary of sample received and test performed

Section	No. of sample	No. of Tests
Parasitology	1382	2474
Hematology	480	2387
Bio-chemistry &Toxicology	318	583
Bacteriology	545	3579
Serology/Virology	3174	4323
Post-mortem	263	224
Histo-Pathology	960	961
Total	7122	14531

A total of 7,122 various laboratory samples were received or collected and 14,531 laboratory tests performed for disease screening and diagnosis during the year.

4.4.1 Achievements of individual sections under LSU

4.4.1.1 Histopathology, Postmortem and Parasitology sections

A total of 263 animal carcasses and 965 tissue samples were received and examined in the pathology section.
In total of about 1382, samples were received and processed by parasitology section.
The details of tests performed by these sections are shown in Table 3.

Table 3: Sample collected and test performed in Pathology and Parasitology sections

Sample		**Test**	
Type	Number	Type	Number
Histopathology			
Organs and tissue	965	H and E staining	960
		Leishman Staining	1
Postmortem			
Carcass	263	Gross pathology	224
Parasitology			
Faeces	1339	Faecal egg count	2431
Skin scrapings	10	10% KoH	10
Intestinal contents	18	Direct smear	18
Sample for fecal culture	15	Fecal culture	15
Total	1382		2474

Significant findings
Histopathology: Common findings were respiratory Infections followed by septicaemic Infection, CSF, catarrhal enteritis, NCD, MD & ALC, Histomonasis, IBD, Parvo viral infection. The section was also able to conduct Histopathological examination of lesions pathognomic of MD & ALC. About 71 nos. of the tissue samples were found to be autolysed.

Postmortem: Swine carcasses were received in highest numbers (123) and avian (123). This section was able to diagnose many specific disease conditions from necropsy such as infectious bursal disease, fowl pox, visceral gout and necrotic enteritis in birds; and E. coli associated enteropathy in piglets and Salmonella in birds.

Parasitology: During the year, the section commonly detected parasitic infestations through the microscopic detection of eggs of Fasciola, Dicrocelium and Ancylostomum. All the detected cases were advised for deworming with appropriate antihelmintic. Wherever the parasitism was found at higher level of endemicity, a periodical prophylaxis was also recommended. Besides, the routine work, research on Taeniid infection in dogs is also being conducted which is still on going.

4.4.1.2 Bacteriology Section

The details of number of samples, test types and numbers of tests performed in bacteriology are as shown in Table 4.

Table 4: Sample and test

Types of specimen	Number	Types of tests	Number	Remarks
Organs	90	Culture	1083	

Milk	25	Gram stain	220
Water	4	Motility	178
Rectal swab	341	Bio-chemical tests	1872
Organs swab	14	Sensitivity test	105
Vaginal swab	1	Serotyping	15
Impression smear	16	Methylene blue stain	16
Ocular swab	1	Spore stain	4
Pus swab	1	Acid fast stain	2
Nasal swab	1	Leishman stain	3
Tracheal swab	1	White side test	8
Whole blood	1	Cell count	7
Urine	1	Pour plate techniques	66
Cultured samples	44	Total	3579
Fresh semen	3		
Diluent	1		
Total	545		

Significant findings

During the year, besides other routine works of the laboratory, as a part of research activites, isolation and identification of Escherichia coli (E. coli) in a strain from faecal samples of pigs from three breeding farms in Bhutan (Yusipang, Lingmethang and Gelephu) were carried out. Screening for ESBL producers sequencing, and antimicrobial susceptibility profiles were determined at university of Zurich, Switzerland.

4.4.1.3 Bio-Chemistry/ Toxicology and Haematology sections

The Bio-Chemistry/Toxicology section performed mycotoxin analysis in animal feeds and mineral estimation in serum sample. The quantitative mycotoxin analysis performed in the feed includes aflatoxin, ochratoxin and fuminosin toxins in the feeds. Minerals such as calcium, magnesium and inorganic phosphorous estimation were performed in the bio-chemistry section.

Basic haematological tests were also conducted to support the clinical diagnosis in the animals.

Details of samples and tests conducted in these sections are presented in Table 5.

Table 5: Bio-Chemistry/Toxicology and Haematology sections

Sample		Test	
Type	Number	Type	Number
Biochemistry and Toxicology			
Feed	244	Aflatoxin	228
		Fuminosin	16
		Ochratoxin	16
Serum	64	Calcium	64
		Magnesium	64
		Phosphorus	64
		Bilirubin	1
Urine	10	Urine biochemistry	130

Total	318		583
Haematology			
Blood	453	PCV	438
		HB g/dl	438
Blood smear	27	DLC	316
		TRCC	125
		TWCC	149
		Direct smear	307
		Knott's test	307
		Hematocrit method	307
Total	480		2387

Significant findings

Mycotoxin analysis detected about 44/244 (1.6%) of animal feeds contained aflatoxin above permissible level. Serum chemistry indicated 26/64(37.5%) of the samples with low calcium, 15/64(23.4%) with low phosphorous, 3/64 (4.7%) low magnesium and 22/64(34.4%) with high magnesium in the submitted samples. 2/10 (20%) of urine samples were detected with haematuria.

Out of 215 blood samples examined for Microfilaria in stray dogs in Thimphu, 56 samples were detected positive.

4.4.1.4 Molecular Biology, Serology and Virology Section

The section performed tests such as rapid tests: Rose Bengal Test for Brucella abortus in bovine, Influenza A antigen, H5 antigen tests in birds, rabies antigen detection test, IBD, NCD and Fluorescence Antibody Test for rabies. The other screening and confirmatory serological tests include Non-Structural Protein Enzyme Linked Immuno-Sorbent Assay (ELISA) for screening against FMD antibody, sandwich ELISA for FMD typing, antigen detection ELISA for CSF and Liquid Phase Blocking ELISA for vaccine efficacy studies. The molecular tests in this section include Multiplex conventional Polymerase Chain Reaction (PCR) for, real-time reverse transcriptase (RT) PCR for Influenza A, H5 & N1 and Newcastle Disease Virus. Details of tests performed and samples are shown in Table 6.

Table 6: Sample and test performed in serology, virology and molecular section

Sample Type	Number	Type of Test	Number
Serum	1560	RBT	503
		Brucella ELISA	924
		FMD NSP(Rapid)	315
		FMD-Sero-typing (O,A,Asia-1)	135
		CSF ELISA	60
		PPR ELISA(Ab)	160
		Mycobacterium paratuberculosis	13
		Mycoplasma mycoides (CBPP)	23
		SAT	23

Tissue/Epithelial/swab	47	ALC ELISA	439
		Salmonella pullorum	23
		IBR ELISA	42
		PRRS ELISA	5
		PPR Rapid	1
		IBD Rapid	4
		PCR (AI,H5,N1)	9
		PCR NDV	28
		AI rapid	5
		Canine parvo virus Rapid	1
Brain	62	FAT	62
		Rapid	29
		RAID test	14
Whey	46	Brucella ELISA	46
Sample referral (Milk, brain, Fresh droppings, epithelial tissue and serum).	1459	NIAH, Bangkok	94
		AAHL, Gelong, Australia	28
		HSADL, Bhopal	19
		Pirbright, UK	14
		Pirbright, UK	1183
		NIAH, Bangkok	121
Total	3174		4323

Significant findings

A highly pathogenic avian influenza A (H5N1) virus was confirmed through PCR in the samples of poultry birds received from Alubari- Wangkha village under Bjacho geog in Chhukha on 10 October 2016. It was also further confirmed at OIE Reference laboratory in India. Rabies was also confirmed by FAT at serology section from the samples received from Samtse, Tashigang, Gelegphu, Orong, Pasakha, Dagana. IBD was also diagnosed by rapid tests in the poultry at NPBC Sarpang.

The section was also engaged in series of sero-monitoring of Brucellosis at NJBC, Samtse ever since the detection of Brucella infection in cows of this farm. In addition to collection of serum samples the section was also engaged in collection of milk samples. The samples were collected on longitudinal series: monthly for three times, quarterly for three times. The collection will continue as six monthly for three times and annually once. This schedule was designed to control the infection and plan future control strategy.

4.4.1.5 Bio-safety and Bio-security section

The section facilitated and regulated various bio-safety and bio-security activities in the laboratory.

Followings are the activities carried out by the section:

- Routine Biosafety works
- Completed Technical Backstopping Missions to Participating Laboratories in Asia, conducted by Australian Animal Health Laboratory-CSIRO
- Completion of BSC testing and certification by ESCO/FAO.
  - ✓ Out of six, five Biosafety cabinets are operational and safe to use.
  - ✓ Out of six, one Biosafety cabinets is operational but not safe to use, needs filter replacement
  - ✓ One Biosafety cabinet in BPU is operational but not safe to use. The unit require new BSC
  - ✓ Fume hood is operational and safe to use
  - ✓ Three laminar flow tested. Two of them are operational and safe to use. One of three failed. This requires replacement
- The section successfully conducted monthly internal auditing for the national laboratory to ensure good bio-safety and bio-security measures are in place.
- Crash course on Bio-safety and Bio-security conducted for regional and national technical staff at NCAH
- Installation of new Biological safety cabinet at post mortem section

4.4.1.6 Clinical services provided

Apart from the laboratory diagnostic services provided, the unit also catered clinical service in and around the locality of Serbithang on call basis.

A month wise clinical services such as vaccination, treatment and spaying/neutering of domestic animals attended by LSU is shown in Table 7.

Table 7: Clinical services provided by LSU during the period (July 2016 to June 2017)

Months	Treatment	Deworming	Vaccination			Sterilization
			SFV	DHHPAI	Rabies	
July	10			1	8	8
August	15	1000		3	21	
September	3	37				9
October	1					
November	4	01				
December	21		14		8	1
January	02				1	
February	3	04			02	06
March	10	03			02	01
April	04	01			1	
May	01				02	
June	04				03	
Total	78	1046	14	04	36	25

Significant findings
Most of the calls were from veterinary hospital, Thimphu. This service is being provided to supplement the services provided by VH, Thimphu and National Animal Hospital, Chubachu, Thimphu. Most commonly attended cases were milk fever, manual removal of retained placenta and immunisation against Rabies, DHHPAI & Swine Fever.

4.5. Others activities

4.5.1 Laboratory standards and safety

- New generator for LSU has been installed to ensure uninterrupted power supply;
- Floors of Post mortem room has been modified.
- Water supply line for laboratory has been restored.

4.5.2. Laboratory assessment, quality assurance audit, proficiency testing and backstopping

"Technical Backstopping Missions to Participating Laboratories in Asia" under project OSRO/GL0/402/USA and LOA/RAP/2016
National Centre for Animal Health (NCAH), Bhutan
Conducted by: John Allen, Andrea Certoma, Australian Animal Health Laboratory - CSIRO
Date conducted: 24 to 28 October 2016

General Observations
This was the first technical backstopping visit conducted to NCAH. Although there had been previous FAO supported technical assessment visits for LMT and for biosafety. The laboratory was also part of an OIE PVS Lab Pathway mission undertaken in Jan 2016 in which John Allen was a team member.

The laboratory does not have ISO 17025 accreditation but is progressively working towards this objective. Actually, at present there is no appointed competent body in Bhutan to accredit laboratories under ISO 17025 but I was informed that this should be established in the near future.

The NCAH Thimphu Bhutan was established in 1968 under the Ministry of Agriculture and Forests. Within the NCAH organizational structure there is a Vaccine Production Unit; Disease Prevention Unit and a Laboratory Services Unit, which has the following sections: Serology, Bacteriology, Pathology, Haematology, Parasitogy, Toxicology/Biochemistry and Virology/PCR. The laboratory also maintains a BSL2+ unit which was established in 2013 with financial support from the Government of India. Diagnostic of anthrax, AI, leptospirosis and brucellosis is to be conducted in the BSL2+. In total the NCAH has 50 staff, 9 of which are veterinarians. The head of the NCAH is Dr Kinzang Dupka, and of the Laboratory Services Unit is Dr Ratna Gurung.

Recommendations

1. Specimen reception
   - Given the current number of diagnostic submissions per year the current system based on a manual log book and a word document file is functional at basic level.
   - However, an improved system needs to be developed to provide a central sample registry point and separate room to receive samples (e.g. in pathology or other suitable place under pathology and/or epidemiology) and record:
     - receipt and condition of samples
     - sample information and follow up of missing information
     - registration of samples with a unique sample number
     - tests required
     - distribution of samples to the laboratories
     - receipt of laboratory results and
     - provision of results report and diagnosis to the client

2. Quality Assurance and documentation
   - There needs to be a whole of laboratory approach and better understanding and acceptance by all staff to implementing improvements in QA. The Quality Manager (Ms Puspa Sharma) is totally committed to enhancing the laboratory's QA and in seeking future ISO 17025 accreditation. Ms Puspa would benefit greatly from more formal training in QA management and from visiting and learning from another laboratory in the region with a strong QA commitment.
   - Through the Director:
     - A QA management committee needs to be established with more staff to receive training and to be involved in undertaking internal audits according to a developed schedule.
   - Identified gaps in written SOPs needed to be completed for:
     - sample processing workflow
     - biosafety, especially uniform procedures for processing samples and waste management, disinfection & autoclaving of waste,
     - sample storage and discard
     - housekeeping e.g. cleaning, reagent preparation, autoclaving
     - improvements in use of test documentation, for example, test coversheets and progressive monitoring sheets to aid in troubleshooting technical problems
     - worksheet including batches of reagents used, control data and result sheets for each test
   - Sample storage records
     - records (book or computer) for where samples are stored at each processing point in each laboratory, and rules for disposal of samples need to be written in SOP.
     - SOP should include appropriate storage for different samples e.g. storing isolates, RNA, serum etc.
     - biosecurity rules for storage of high risk samples: locked freezers or locked rooms
   - Equipment and reagents

  - better documentation of preparation of reagents is required including written procedures, batches, expiry dates and results of any QC and or sterility testing
  - reagents all need batch numbers for identification (A unique number can be assigned by the laboratory if one is not supplied)
  - equipment needs equipment number and maintenance and calibration requirements
  - equipment used, controls used and test performance of controls and any results of inter-laboratory test performance will be needed to comply with ISO 17025

3. Development and Use of internal quality controls (IQC)
   - All tests need to use IQC (test low positive & negative controls) and use progressive monitoring sheets track the IQC results.
     - In conjunction with an external reference control (e.g. from a reference laboratory) for cost efficiency positive field samples (or pools) can be used to produce batches of IQCs for use each time a test is set up.
     - IQC can be used as training aids for assessment of staff competency

4. Training and Biosafety
   - Formalise QA and Biosafety training for all staff through a SOP, with yearly update to SOP, this will ensure new staff or rotating staff are captured in training requirements for each work area and a standard approach to training.
   - Serum samples need to be inactivated at 56oC for 30 mins for biosafety and to enhance test specificity
   - All waste should be autoclaved
   - Autoclave tape should be used every run to indicate autoclaves have reached appropriate temperature
   - Biological indicators should be used to validate autoclave cycles
   - Records of all autoclave runs should be kept including details and results of biological indicators
   - Spills training and availability of spills kit

5. Staff Training
   - Training records need to be developed to demonstrate staff competency in all aspects of laboratory activities, including
     - preparation of reagents
     - performance of tests (use of positive and negative controls can be used to demonstrate this)
     - interpretation and reporting results
     - laboratory safety eg knowledge of appropriate PPE, use of BHCII, disposal of waste, spills training

6. Equipment and Laboratory Spaces
   - Consider moving the quantitative PCR machine into the same room as the conventional PCR to better separate the PCR workflow.
   - Explore whether the open air holes between the PCR extraction room and PCR machine room can be redesigned.

4.5.3. Antibiotic guidelines for animals in Bhutan launched

Antibiotics, a special class of medicines have been used widely in both human and animal medicine for over past 80 years. They also contributed towards meeting the increased demand for food of animal origin. However, its indiscriminate use including in veterinary practice and uncontrolled use as growth promoters in animal feeds has led to emergence of resistant bacteria known as antimicrobial resistance (AMR). This has affected the treatment of infections in both human and animals.

Resistant bacteria especially the zoonotic, arising either in humans, animals or the environment can spread from one species to the other. Therefore, in the current era, AMR has become an important agenda on the human-animal-environment concern. Further, due to globalization, these resistant bacterial pathogens can spread from one country to another making it a global concern. Hence, the need has been felt to preserve the efficacy of antibiotics to safeguard human and animal health and also ensure sustainability of livestock production through their rational use.

World Animal Health Organization (OIE), World Health Organization (WHO) and Food and Agriculture Organization (FAO) are working hand in hand to address such a concern through the tri-partite approach at a global and regional level, we in Bhutan are also pursuing the same agenda at the national level. Thus, the National Centre for Animal Health (NCAH) under DoL has developed Antibiotic Guideline for Livestock in Bhutan in order to promote its rational use for animal health and production.

The guideline is being developed adopting the principles of evidence-based medicine involving the relevant expertise from both within and outside the agency. This guideline will serve as ready reference for choosing the appropriate antibiotics in various infections. Further, this guideline can be used in conjunction with National Veterinary Drug Formulary (NVDF) and Standard Treatment Guidelines for Animals (STGA) developed by NCAH and National Animal Hospital (NAH) under the Department of Livestock (DoL).

The guideline was launched during the Annual Livestock Conference (10-16 June 2017) at Bumthang by Dasho Rinzin Dorji, Secretary, MoAF on 13 June 2017.

4.5.4. Laboratory Information Management System (LIMS)

Laboratory Information Mangement System in the form of online database is an integral part of an efficient delivery of laboratory services be it diagnostic or research activity. However, currently, due to the lack of database and also other real time information sharing system, the laboratory services unit (LSU) had been experiencing inconvenience in terms of managing huge amount of data generated through laboratory activities. The same was discussed during the Laboratory Co-ordination Workshop held during 9th to 10th November 2016. The house recommended the

National Veterinary laboratory/LSU under NCAH to coordinate and produce annual reports with the use of reliable database system. Further, the meeting also recommended for an online Laboratory Information System to facilitate real time reporting, storage and dissemination of report for policy decision. Hence, accordingly the database development is being initiated in order to manage the real time information of the laboratory activities.

4.5.5. Finalization of Bhutan health standards for import of animal commodities

Bhutan is importing large number of animals including dairy cattle, pigs, poultry and goats to enhance livestock production and achieve self-sufficiency in dairy and meat products in the country. Therefore, it is important that the Animal Health sector be well prepared to deliver animal health services and most importantly to prevent incursion of Trans-boundary Animal Diseases (TADs) and other animal diseases in the country. For example, exotic animal diseases such as Porcine Respiratory and Reproductive Syndrome (PRRS) and Foot-rot in sheep were introduced into the country through importation of animals. In addition, due to the geopolitical location of our country, a whole range of animal diseases particularly in cattle are shared with India. It requires huge amount of resource to manage such disease once it becomes endemic within the country. Slaughter and eradication is extremely difficult if not impossible under our condition. Therefore, it is important that a disease control contingency plan be put in effect while importing the animals to prevent introduction or re-introduction of the animal diseases.
Bhutan is endemic to some traditional livestock and poultry diseases. Diseases like
Therefore, Bhutan health standards for animal commodities has been developed and finalized with series of consultation with relevant agencies and also during the Annual Livestock Conference druing June 2017. The standard provides guidelines from the point of import, at quarantine station, conduct of laboratory tests and also follow up at the farms after release. The standard also covers major diseases species wise.

4.5.6. National strategic plan for control and eradication of peste des petits ruminants

The National Strategic Plan (NSP) for eradication of peste des petit ruminants (PPR) for Bhutan was developed as aligned with the Regional Roadmap and Global Control and Eradication Strategy. Implementation of this NSP will benefit in eradication of PPR in Bhutan that will augment ensuring: (i) enhancement of income for small ruminant farmers; (ii) food security; (iii) reduce veterinary health cost; and (iv) Bhutan's participation in global PPR eradication effort. The fund for developing this document was supported by the Food and Agriculture Organization of United Nation (FAO) programme and facilitated by Bhutan Office, Thimphu. The document describes the details of current status of PPR in Bhutan and control strategy with medium term work plan for next five years.

4.5.7. Signing of Joint Research agreement on study on diagnosis and control of Brucellosis in Bhutan

The agreement was signed between the NIAH Japan and NCAH, Serbithang to conduct study on diagnosis and control of Brucellosis in Bhutan. Brucellosis is one of zoonotic diseases with different species of Brucella affecting various host species that includes animals and human. Bhutan has recently detected alarming rate of this disease in government cattle farms, the National Jersey Breeding Centre in Samtse in particular. Diagnosis of this disease requires higher level of technology compared to other common animal diseases.

The national laboratory in Bhutan is equipped with only conventional diagnosis for this disease. There is a need to enhance diagnostic capacity for efficient diagnostic service delivery. One option to enhance this capacity is by collaborating research with other institutions which has more experience on this disease. The National Institute of Animal Health (NIAH), Japan is the ideal institute in the region with vast experience in these areas. The National Centre for Animal Health (NIAH), Department of Livestock and National Institute of Animal Health, Japan has the potential to collaboratively engage in research that will have win-win situation for both the parties. The NIAH will support NCAH for capacity building in the areas of human resource development, enhancement of diagnostic capacity, scientist exchange programme and disease surveillance. On the other hand NIAH, Japan will have access to samples from Bhutan to validate diagnostic kits.

4.5.8. One Health approach to determine Antibiotic Susceptibility profile of Salmonella in human, animals and food products in Bhutan: 2016 AGISAR COUNTRY PROJECTS-Approved by WHO

Salmonella has been recognized as an important zoonotic pathogen of economic significance in animals and humans. Salmonellosis is most common and widely distributed food-borne disease and increasing antimicrobial resistance in non-typhoid Salmonella species has been a serious concern for public health worldwide. Typhoid is listed as notifiable disease in Bhutan and there were 49 confirmed cases of Typhoid in human in 2015. A study on prevalence of Salmonella in imported chicken carcasses in Bhutan showed 13% prevalence. Salmonella Enteritidis dominated with a prevalence of 80.7% and 40 of the 42 isolates harboured two or more resistance determinants. Frequent outbreaks of Salmonellosis has been reported in humans, either through the water sources or from the food items. A recent study concluded the prevalence of Salmonella at 20.3% and 27.1% in imported and locally produced beef and pork respectively. These isolates were not tested for antimicrobial resistance. Thus, the antibiotic susceptibility profile of these organisms is unknown.

Bhutan proposed a pilot study to develop antibiotic susceptibility profile of Salmonella isolates from human, animals and food products of animal origin. The antibiotic susceptibility test (ABST) profiling will be a collaborative work between Ministry of Health, Department of Livestock and Bhutan Agriculture & Food Regulatory Authority. The ABST profile data from samples of human origin will be collected by Clinical Laboratory, Ministry of Health, while the National Centre for Animal Health will generate for animals and environment samples and National Food Testing Laboratory for all food products of animal origin.

The overall objective of the study is to develop ABST profile for Salmonella isolates in Bhutan while enhancing national capacities for laboratory surveillance and antimicrobial resistance monitoring through One Health Approach. This will also enable Bhutan to provide representative and internationally comparable information

that can be used for rational management of antimicrobial use in human and animals.

5. Drugs Vaccine and Equipment Unit

5.1. Main mandates of DVEU

The main mandate of the DVEU is to look after the overall management and co-ordination of Essential Veterinary Drug Program (EVDP) in the country. This mandate is implemented through various functions and activities such as:

- Timely procurement, distribution & storage of veterinary medicines, vaccines & equipment and non-drug items
- Monitoring of drugs, vaccines and equipment supply, stock position, storage at LCS & field levels
- Maintenance of veterinary equipment & cold chain equipment
- Ensure quality control and quality assurance through testing of drugs at the DRA approved laboratories
- Ensure proper management of revolving fund
- Co-ordinate/organize trainings/meetings related to EVDP
- Organize/co-ordinate NVDC meetings
- Liaise with DRA and take follow-up action in regards to drug inspection reports

5.2. Human Resources in DVEU

The DVEU has 4 technical staffs to perform and carry out all the planned activities for the unit as under:

- Dr. Vijay Raika, new Head, DVEU
- Dr. Jambay Dorjee, Head DVEU (transferred to RLDC, Zhemgang in May 2017)
- Ms. Phuntsho Wangmo, Sr. Extension Supervisor
- Mr. Namgay Dorji, Sr. Livestock Production Supervisor
- Ms. Sonam Dolma, Livestock Production Supervisor (on study leave)

5.3. Key achievements of DVEU for FY 2016-17

The DVEU was involved in taking lead role and initiatives in other important activities beside the mandated functions of the unit during the FY 2016-17. The summary of the key initiatives and some of the remarkable achievements for the unit are summarized below:

5.3.1 Rabies Containment in Trashigang

- DVEU supported in immediate sourcing and procurement of Strychinine HCL capsules for emergency use in Rabies outbreak areas in eastern region.
- A total of 2500 Strychinine HCL capsules was sourced and procured amounting to Nu. 0.375 Million.

- Ministerial approvals sought for implementation of revised operation modalities for effective and sustainable use of medicine revolving fund

5.3.2 Regularization of stock of medicines, equipment and non-drug items in LCS, Phuntsholing

- The physical, ledger and database stock verification of medicines, equipment and non-drug items was carried out in LCS, Phuntsholing. Accordingly, the ministerial approval was sought with valid justifications for differences and regularization of the stock differences as under:
- Excess stock of medicines worth Nu. 3,054,667.18 million and deficit stock of Nu. 8,41,881.26 million was regularized

5.3.3 Write-off and disposal of expired and damaged drugs in LCS, Phuntsholing

- Write-off approval for expired medicines in LCS, Phuntsholing worth Nu. 1,90,091.42 million was sought from MoAF and damaged drugs worth of Nu. 0.001 million from DoL
- The expired and damaged drugs were processed for disposal as per the pharmaceutical waste management guidelines
- A DCM load of expired medicines were segregated and incinerated along with MOH medicines in PCAL, Gomtu.

5.3.4 9th NVDC Meeting

- 9th NVDC meeting was conducted at NCAH, Serbithang.

5.4. Routine Achievements of DVEU for FY 2016-2017

5.4.1. Procurement of medicines, vaccines and equipment during FY 2016-17

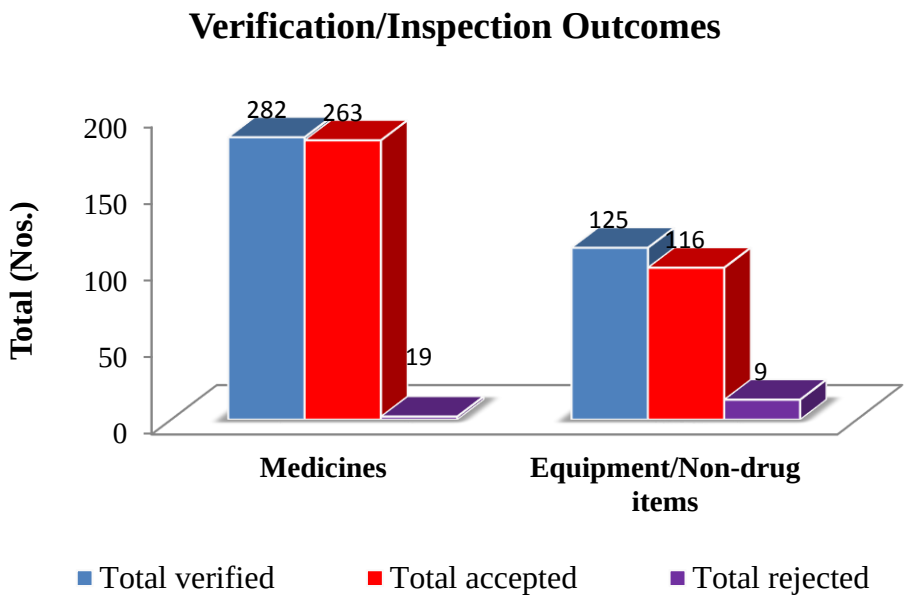
- Fast track tendering and procurement for veterinary medicines and vaccines for the FY 2016-17 was completed by June 2016 as per the revised EVDP management cycle
- Normal tendering and procurement of veterinary equipment and non-drug items was done and completed by November 2016.
- Total tendered amount for medicines and vaccines for the FY 2016-17 was worth Nu. 31.015 million and the supply order of medicines and vaccines worth Nu. 31.015 million was given to the substantially responsive bidders.

Category	Total Tendered	Total Selected	Total Not Quoted

	Nos.	%	Nos.	%	Nos.	%
Veterinary medicines	199	88.1	171	85.9	28	14.1
Vaccines & biological	10	4.4	10	100	0	0
Aquatic drugs	13	5.8	5	38.5	8	61.5
Wildlife medicines	4	1.7	0	0	4	100

5.4.2. Verification and inspection of veterinary drugs and equipment

- A total of 17 verification/inspection visits were conducted by the verification team during the FY 2016-17 in order to inspect the newly arrived consignments of veterinary medicines, equipment and non-drug items in LCS, Phuntsholing and NCAH, Serbithang
- Verifications and inspections were carried out for both RGOB and GoI funded medicines/equipment/non-drug items
- Total nos. of individual medicine, equipment and non-drug item verified/inspected and recommendations made are graphically represented below:



5.4.3. Distribution of Veterinary Medicines, Equipment and Non-drug Items

- As per the revised modality for distribution of veterinary medicines, equipment and non-drug items, the mass distribution was done two times in a year i.e. during November 2016 and May 2017
- Distribution was done up to the DVH point for Dzongkhags and till the respective Central Farms and Agencies premises

- Ad hoc and emergency distribution of medicines and equipment was done throughout the year as and when the requirements were submitted to the DVEU by the respective units
- The summary of the total amount (In Million) of medicines, equipment and non-drug items distributed to various Dzongkhags, Farms, Central Agencies and Non-departmental Agencies are tabulated below which are inclusive of 2 times mass distributions and ad hoc or emergency distributions:

A. Amount of Medicines Distributed during FY 2016-17 (In Million)

Agency	1st Lot	2nd Lot	Adhoc/Emergency	Total
Dzongkhags	13883024.15	5722850.56	442046.7	20047921.41
CFs/CAs	3183553.91	960570.37	130237.44	4274361.72
Non-DA	0.000	0.000	142310.2	142310.2
Total	17066578.06	6683420.93	714594.34	24464593.33

*****CFs=Central Farms, CAs=Central Agencies, Non-DA=Non-departmental Agency***

B. Amount of Equipment/Non-drug Items Distributed during FY 2015-16 (In Million)

Agency	1st Lot Distribution	2nd Lot Distribution	Ad hoc/Emergency Distribution	Total Distributed
Dzongkhags	1725688.15	3393219.29	2891.75	5121799.19
CFs/CAs	940316.88	1819568.3	2400	2762285.18
Non-Dept Agency	0.000	0.000	52417.2	52417.2
Total	2666005.03	5212787.59	52417.2	7931209.82

*****CFs=Central Farms, CAs=Central Agencies, Non-DA=Non-departmental Agency***

Schedule of bill payments and penalties deducted for delay in supply and un-supplied items during FY 2016-17

- The unit levied liquidity damages for delay in the supply of items and penalties for un-supplied items to the suppliers. The summary of the schedule of penalties deducted for delay in supply and un-supplied items for the FY 2015-16 from various suppliers is tabulated below:

Sl. No.	Quarter Period	Bill Amount (Nu in Millions)	Amount of Penalty Deducted (Nu in Millions)
1	July 2016 - September 2016	3435513.03	2306

2	October 2016 - December 2016	14062336.17	135154
3	January 2017 - March 2017	10426977.93	177327
4	April 2017 - June 2017	6638699.43	159761
Total		**34563526.56**	**474548**

***Inclusive of project deposit works, procurement of vaccines and other drugs for departmental and non-departmental agencies*

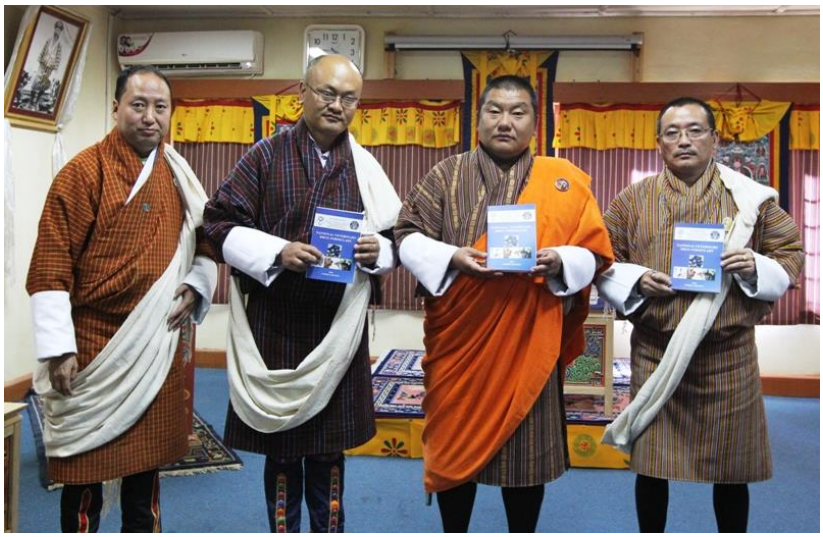
- The schedule of bill payments and penalties deducted and shown above are inclusive of penalties deducted for previous year's un-supplied items and those liquidity damages which were missed from deduction in the previous years.

5.4.4. Key Issues and Way Forward

- Some life-saving/essential drugs and equipments not being quoted by the suppliers
- No rational indenting for veterinary equipment and non-drug items vis-à-vis budget availability
- Over-stocking of expired drugs in LCS and RLDCs
- Weak internal mobilization of nearing expiry drugs and acute shortage drugs
- Weak monitoring and reporting system for EVDP - 2-monthly and 4-monthly monitoring and reporting system for EVDP still not being implemented by the field units
- Lack of robust database for EVDP – G2C database still at system enhancement phase

Other

The National Veterinary Drug Formulary document was launched by HE Sonam Lyonpo on 9 October 2016 at NCAH, Serbithang.



6. Biological Production Unit

6.1 Main mandates of BPU

The unit is primarily responsible for the production of viral and bacterial vaccines and other biological. The unit also imports vaccines which are not produced within the country for distribution to the field. The unit is also responsible to provide technical support and monitor the cold chain facilities in the field to ensure the effective storage of vaccine and veterinary biologicals.

6.2. Human resource of BPU

The unit is currently staffed with the following officials:

1. Dr. Vijay Raika, Principal Animal Health Officer (Head)
2. Harka Bahadur Tamang, Sr. L.H.S
3. Migma, Sr. Lab.Technician
4. Karma Choki, Asst. Lab.Technician
5. Mr. Karna Bahadur Tamang, Lab.Attendant

6.3. Key achievements of BPU during FY 2016-17

6.3.1. Vaccines production and procurement

The unit produced three batches of Classical Swine Fever vaccine totalling to 8690 doses and 2300 doses of Anthrax vaccine.

The unit received 10000 doses of Rabisin vaccine from OIE in January 2017 for the distribution to Rabies Endemic Dzongkhags. All 10000 doses of vaccine have so far been distributed to Dzongkhags viz.Trashigang, Samdrupjongkhar, Samtse, Sarpang, Dagana, Chukha and Tsirang respectively.

The unit procured the following vaccines worth Nu. 4373701.00 eventhough the approved budget for procurement of vaccines for FY 2016-17 was just 3.3 M only. The additional amount of Nu.1073701.00 was met from the budget of DVEU.

For poultry vaccines alone; Nu. 1387110.00 was spent and the rest Nu.2986591.00 for other vaccines like Foot & Mouth, Anti-rabies, HSBQ and PPR.

Table 17: Details of vaccines procured during FY 2016-17

Vaccine type	No. of Doses procured
Gumboro (IBD) vaccine	2120000
ND B_1 vaccine	1160000
ND R_2B vaccine	854300
Fowl Pox vaccine	900000
Marek's vaccine	890000

FMD	152500
HSBQ combined	69510
Rabisin vaccine	10000
Raksharab	30000
PPR	4900
DHPPi + L vaccine	900
Total	**6182110**

6.3.2. Vaccine distribution

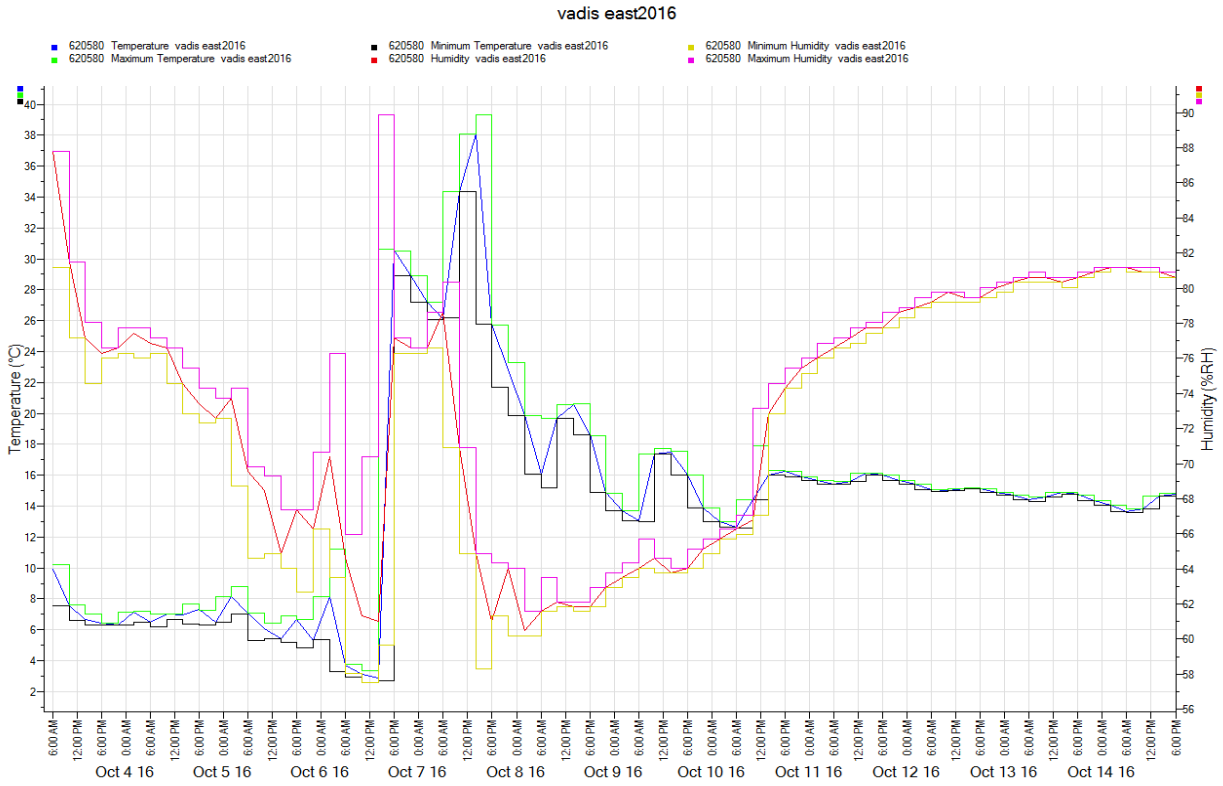
The Biological Production Unit carried out the routine vaccine distribution as mandated twice a year.
During the distribution it was ensured that:

- The vaccines are delivered to the destination
- The temperature of the refrigerated van is well maintained throughout the travel using data logger
- Monitoring of the cold chain equipments (refrigerators) in all the DVHs (as per standard format attached)are done
- Monitoring of the vaccine stock ,usages ,expiry etc (as per standard format attached)are done
- Issues if any are discussed with the In-Charge,DVH related to vaccines

The unit carried out the first quarter vaccine distribution in early October 2016 starting from October 3 to 14, 2016. The distribution was done as quickly as possible as the refrigerated van has to be run continuously to maintain the required optimum temeprature throughout.

Temperature of the refrigerated van

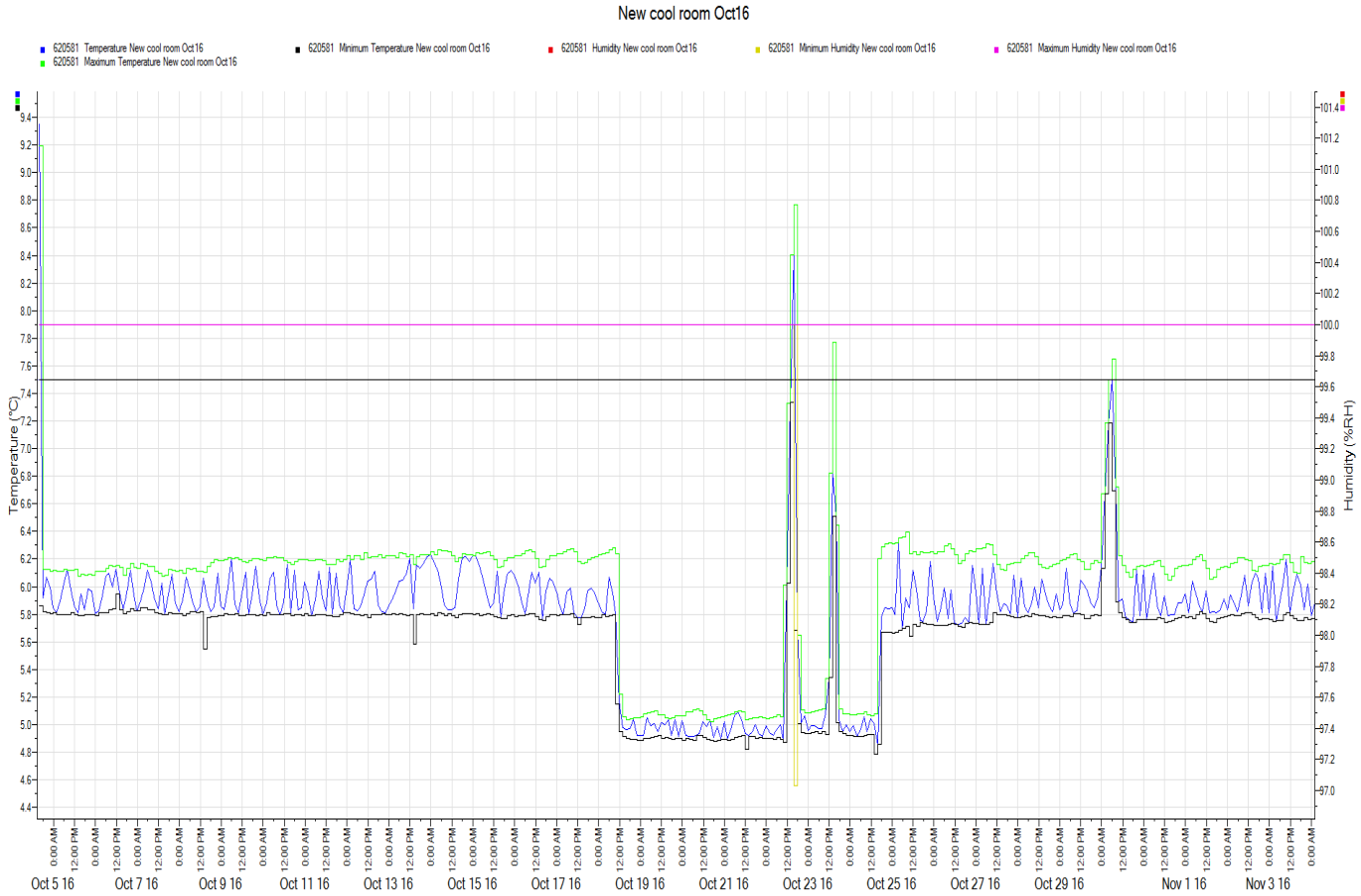
Graph indicating the maintenance of cold chain during the period of distribution



Similarly, the subsequent second quarter vaccine distribution was done in the second week of May 2017 commencing from May 10 to 20, 2017.

Apart from the routine distribution, the Ad-hoc and emergency distributions were done as and when demand received from Dzonghag Veterinary Hospitals, Central Units including private poultry farms.

Temperature of the vaccine storage room using data logger



The graph above indicates the temperature recordings of the vaccine storage room for the period from October 5 to November 3, 2016 and shows that the cold chain of vaccine is maintained within the receommended temperature of +2 to 8^{0}Celsius at all times.

All the vaccines that are produced in-house and or procured from outside are stored in the cool room on arrival until the final distribution.

The unit have distributed various vaccines to different livestock centres in the country (see Annexure 1)

6.3.3. Other activities

- Actively involved in the evaluation of tender for Veterinary drugs and vaccines for the FY 2017-18 from June 19 to 28, 2017 at NCAH conference hall, Serbithang.

7. National Dog population Management and Rabies Control Project

The National Dog Population Management and Rabies Control Project was launched in 2009, and has completed a total of 2 phase with the 3rd phase in its first year. Duirng the first phase (September 2009 – June 2012), 35,689 dogs were covered under CNVR program. The term of phase two was July 2012 – June 2015, sterilizing and vaccinating approximately 25,128 dogs and cats. In phase 2 the Community Animal Birth Control Program (CABC) was initiated in order to sustain dog population management (DPM) throughout Bhutan. As per the 2015 National Survey Conducted, the national coverage as of May 2015 stands at 64.1% in urban areas and 44.7% in rural areas.

NDPM & RCP has come a long way for sustainable DPM in Bhutan. However, much needs to be accomplished in terms of streamlining CABC and ensuring on-going impact before the project can be entirely handed over to the RGOB by HSI due to which the project has been extended by a further three years (November 2015 to June 2018).

NDPM & RCP is a collaborative effort of Royal Government of Bhutan (Department of Livestock) and Humane Society International (HSI) with a 50-50 partnership, with funds flowing in both cash and kind in the last 6 years of its launch in 2009.

The NDPM & RCP, NCAH under DoL, MoAF is in it's the 3rd phase (2015-2018) as per the MoU signed between DoL and HSI on 9th November 2015. The partnership is based on 65% contribution from RGoB in cash and 35% contribution from HSI which are all in-kind.

The Project Management Unit (PMU) of NDPM & RCP is located in National Centre for Animal Health, Serbithang with the following staff:

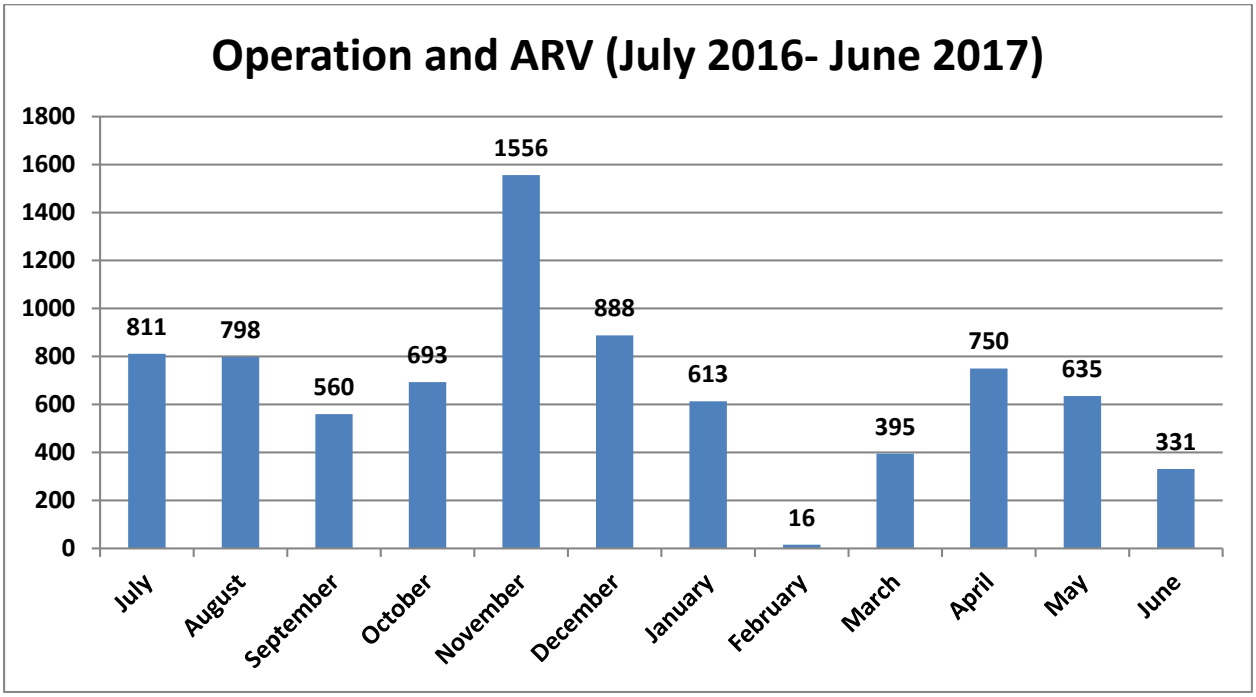
- Dr Kinzang Dukpa, Project Director
- Dr Hiruka Mahat, Project Coordinator

The PMU is in constant touch with the HSI Asia office based in Ahmedabad, India with the focal person - Dr Rajesh Kumar Pandey, HSI Coordinator.

7.1. Key achievements of the NDPM & RCP during FY 2016-2017

7.1.1. Dog population Management

The main mandate of the project is to carry out high volume low cost CNVR based on the concept that community takes ownership of the programme and brings in dogs to the field clinic for sterilization and rabies vaccinations. The project supports all 20 Dzongkhags during campaign through staff (Animal Welfare Officers) deployment, providing modest working lunch and drugs and equipments. From July 2016 till June 2017 a total of 8046 surgeries and vaccination were carried out both in dogs and cats in the field clinics.


Operation and ARV (July 2016- June 2017)
1800
1600
1400
1200
1000
800
600
400
200
0
811
798
560
693
1556
888
613
16
395
750
635
331
July
August
September
October
November
December
January
February
March
April
May
June

Fund support (Working Lunch) by NDPM & RCP for Dog Population Management (DPM)

The PMU, NDPM & RCP, and DPCU provided financial support to implement mass scale CABC program in the Dzongkhags. The following table shows the fund support to different Dzongkhags for working lunch and refreshment during CABC in the fiscal year 2016-17:

Sl. No	Dzongkhag	Amount
1	Tashi Yangtse	Nu. 35000/-
2	Trashigang	Nu. 80000/
3	Haa	Nu. 60000/
4	Paro	Nu. 50000/
5	Lhuntshe	Nu. 30000/
6	Samdrup Jongkhar	Nu. 30000/
7	Phuentsholing	Nu. 25000/
8	Punakha	Nu. 20000/
9	Pemagatshel	Nu. 69000/
10	Thimphu	Nu. 120000/
	TOTAL	Nu: 519,000/-

Staff (AWOs) deployment (support) from PMU for different activities

Time line	Dzongkhag	Purpose
June 2016	Tashigang & Tashi Yangtse	Support to CABC
July 2016	Mongar	Support to CABC
August 2016	Thimphu Thromde	Support to CABC
September 2016	Thimphu Thromde	Support to CABC
October 2016	Paro	Support to CABC
November 2016	Tashigang and Lhuntshe	Rabies Containment and Vaccination
December 2016	Mongar and S/Jongkhar	Support to CABC
January 2017	S/J and Nganglam	
February 2017	Phuentsholing	
March	Punakha/	
April	Wangdi	
May	Haa	
June	Thimphu	

7.1.2. Mass Dog Rabies Vaccination Campaign

Mass Sterilization and Vaccination Campaign: Thimphu Thromde

29 July to 19 September 2016

From 2013 onwards, the DOL and Thimphu Thromde have been carrying out mass sterilization and vaccination campaign to reduce the size of FR dog population and to address the problem arising due to increasing FR dog population.

A total of 1278 dogs and cats (1250 dogs) were sterilized and neutered during FY 2016-17.

2nd Round Mass Sterilization and Vaccination Campaign 24th April to 25 May 2017

In the second round of campaign a total of 655 dogs were sterilized and vaccinated.

Audit of the Project Accounts and Technical Progress by Royal Audit

The financial auditing of the project for the financial yeas 2014-15 and 2015 to 2016 was under taken by the Royal Audit Authority. The audit was carried for a period of 2 weeks. The auditing went on smoothly without any memos.

7.1.4. Observing World Rabies Day: 28th September 2016

In celebration of the interdependence of human and animal health, 2016's theme was Vaccinate Educate and Eliminate.

Activities Undertaken

Bhutan has been observing the World Rabies Day ever since its inception in 2007. Bhutan joined the rest of the world to observe 10th World Rabies Day with the theme "Educate. Vaccinate. Eliminate". The programme was being jointly organized by Department of Livestock, Ministry of Agriculture and Forests (MOAF) and Department of Public Health, Ministry of Health (MOH). Bhutan observed National Rabies Week from 28th September to 3rd October 2016. During the rabies week, the following activities were undertaken:

Awareness education to the public through short message service (SMS).

The SMS was delivered using mobile network. The content of the message was:

September 28 is World Rabies Day. Vaccinate your dogs to prevent rabies. Wash animals' bite wound with soap and water and visit hospital for advice.

Class room education for primary students

An awareness on rabies prevention and control (short talk and discussions) targeting the primary student (class PP to VI) was given in the schools in the rabies high risk areas (schools in southern Bhutan). The coordinators were identified for each dzongkhag

to lead the education campaign and accordingly the power point presentation for the class room education was prepared to target students of class six and below.

Distribution of rabies education materials

For the high schools, the rabies education materials on rabies were emailed to the school health coordinators. The health coordinators in their respective school have delivered the presentation. The world rabies day banners were used along with the posters in the districts identified for the world rabies day.

Key Achievements:

The class room teaching on Rabies was carried out in selected schools situated in rabies endemic areas in the following Dzongkhags: Samtse, Chukha, Dagana, Sarpang, Pemagatshel and Samdrup Jongkhar. Along with the awareness talk, other printed awareness material on how to avoid dog bites and responsible pet ownership were distributed.

A total of 15,863 students and 1,132 attended the awareness presentation on rabies.

8. Animal Disease Surveillance and Researches

8.1. First Detection of Extended-Spectrum ß-Lactamase Producing Escherichia coli in Breeder Pigs in Bhutan

Puspa M Sharma [a], Katrin Zurfluh [b], Magdalena Nüesch-Inderbinen [b], Roger Stephan [b], Kinzang Dukpa [a], Ratna B. Gurung [a]

a National Centre for Animal Health, Department of Livestock, Ministry of Agriculture & Forests, Serbithang, Babesa Thimphu, Bhutan; b Institute for Food Safety and Hygiene, University of Zürich, Winterthurerstrasse 272, 8057 Zürich, Switzerland.

Published in ARC Journal of Animal and Veterinary Sciences (AJAVS) Volume 3, Issue 1, 2017, PP 13-17

Abstract
This study investigated the occurrence of extended-spectrum ß-lactamase (ESBL) producing Escherichia coli (E. coli) in a strain collection of E. coli originating from faecal samples of pigs from three breeding farms in Bhutan (Yusipang, Lingmethang and Gelephu).. Screening for ESBL producers was done using chromogenic selective agar plates. ESBL genes (blaESBL) were identified using polymerase chain reaction (PCR) and sequencing. Isolates with blaCTX-M-15 were classified according to their phylogenetic group and multilocus sequence type (MLST). Antimicrobial susceptibility profiles were determined by the agar diffusion method. Two (2.4%) of the 83 E. coli strains were ESBL producers (CTX-M-15). The two isolates were multidrug resistant (MDR) and belonged to sequence type (ST) ST156 and 4173, respectively. This is the first study to detect and characterize ESBL-producing E. coli in breeding pigs in Bhutan.

8.2. Detection of Echinococcus granulosus and Echinococcus ortleppi in Bhutan

Nirmal Kumar Thapa [a], Maria Teresa Armua-Fernandez [b], Dukpa Kinzang [a], Ratna B. Gurung [a], Phuntsho Wangdi [a], Peter Deplazes [b],

a National Centre for Animal Health, Serbithang, Thimphu, Bhutan; b Institute of Parasitology, University of Zurich, Zurich, Switzerland

Published in Parasitology International 66 (2017) 139–141

Abstract
In this pilot study, fecal samples were collected from community dogs around slaughterhouses and from the city of Thimphu (n= 138) as well as from carnivores in the forests area around a farm in Bhutan (n=28). Samples were analyzed microscopically for the presence of taeniid eggs by the floatation and sieving method. Further molecular analyses of 20 samples of community dogs positive for taeniid eggs confirmed 10 Echinococcusgranulosussensulato and one Taenia hydatigena case. From14 environmental fecal samples fromthe forest area positive for taeniid eggs, one contained

E. granulosus s.l., six T. hydatigena and one Taeniataeniaeformis DNA. In the remaining samples considered positive for taeniid eggs, no molecular confirmation could be achieved. Additionally, Echinococcus cysts were collected from locally slaughtered cattle and imported cattle organs. Seven Echinococcus cysts (one fertile) from the local animals and 35 (four fertile) from imported cattle organs were confirmed as E. granulosus (G1–3) by PCR/sequencing. One Echinococcus cyst each from a local animal and from an imported cattle organ (both fertile) were confirmed to be Echinococcusortleppi (G5). Sterile Echinococcus cysts were also collected from local yaks (n = 10), and all revealed to be E. granulosus (G1–G3). Hospital records of cystic echinococcosis in humans and the presence of Echinococcus spp. in dogs and ungulates indicate the existence of local transmission for both E. ortleppi and E. granulosus in Bhutan.

8.3. Accidental urea poisoning in cattle: Case report

Nirmal K. Thapa [1], Tenzinla [1], Ugyen Pem [1], Passang Bidha [1], Phuntsho Namgyal [2] and Prati M Rai [3]

1National Centre for Animal Health, Department of Livestock, MoAF, Serbithang,
2Dzongkhag Veterinary Hospital, Department of Livestock, MoAF Thimphu,
3RNR Extension Centre, Department of Livestock, MoAF Khasardapchu
Published in Bhutan J. Anim. Sci. 1(1): 73-74.

Abstract
This paper presents a case report on urea poisoning in cattle that occurred due to accidental feeding of fertilizer urea to five cattle at Nesikha village, Mewanggewog (block), under Thimphu Dzongkhag (district) where all five animals died. Due to lack of facilities and also the kits in the field, detailed lab tests could not be conducted except post-mortem examination and histopathology. The diagnosis was made mainly based on the history of the owner. In the animal husbandry practices in Bhutan, urea is used as feed supplement along with the paddy straw after treatment with the certain formulation. Further, the urea is also used in the form of fertilizer for dressing the pasture. In addition, fertilizer urea is also used commonly in agricultural activities including horticulture hence, there is every chance of such accidental poisoning in animals. This case report is aimed at creating awareness to the animal health workers and also guide to attempt treatment in such poisonings in animals.

8.4. Comparative immunological and coprological screening of Fasciolosis in cattle

SB Chamling Rai , Sangay Lham, AND Purna Bdr Rai
National Centre for Animal Health, Department of Livestock, MoAF, Serbithang, Bhutan
Published in Bhutan J. Anim. Sci. 1(1): 70-72.

Abstract
The main objectives of this study were to establish comparative advantage of immunological screening over coprological screening of Fasciolosis in cattle, find the true prevalence rate of Fasciolosis in cattle, and establish the cost-effectiveness of post-screening treatment over current unsystematic treatment practice. A total of 228 faecal

and serum samples were collected from one Geog each of three Dzongkhags and two government cattle farms. The immunological testing was carried out using Pourqueir ELISA screening kit for Fasciola f2 antibodies. Sedimentation method followed by Stoll method was used for coprological testing. The study revealed an extremely significant difference ($p \leq 0.01$) in the results between the types of tests. The study detected Fasciola prevalence rate of 42.5% (95%CI: 36.09-49.25) and 18% (95%CI: 13.5-23.72) by immunological and coprological screenings, respectively indicating that the immunological method is more sensitive than coprological screening. Coprological screening two weeks post-screening treatment of positive animals with triclabendazole (TCBZ) in one study location showed 100% clearing of infestation. This indicates cost-effectiveness of "test and treat" approach to bovine Fasciolosis control. Thus, the early immune-diagnosis of bovine fasciolosis using the specific f2 antigen could be an ideal alternative to the current faecal egg count method.

8.5. Knowledge, perceptions and practices of rural communities on anthrax in east-central Bhutan

Dorjee J [1], Wangdi K [2], Dakpa D [3], Tenzin T [1], Hendrickx S [4]

1National Centre for Animal Health, Department of Livestock, MoAF, Serbithang, Bhutan
2Regional Livestock Development Centre, Department of Livestock, MoAF, Zhemgang
3RNR-Research & Development Centre, Department of Livestock, MoAF Jakar, Bhutan
4International Livestock Research Institute, Maputo, Mozambique
Published in Bhutan J Ani Sc.1(1):46-50.

Abstract

The objectives of the study were to assess the communities' knowledge, perceptions and practices about anthrax and identify preferred channel of information/communication by the communities about anthrax in east-central Bhutan. The participatory epidemiological (PE) tools were used for the study. A village was the sampling unit and a total of 18 villages were selected for the study. PE techniques that were used with the communities included participatory mapping, simple ranking, seasonal calendars, proportional piling, matrix scoring, transect walks and probing. At least one semi-structured interview involving 6 to 16 people was held in each village. In addition, the key informants were interviewed after every group session. The results showed that cattle were the most important livestock species reared and Foot and Mouth Disease and anthrax were perceived to be the most important livestock diseases in the communities. The proportional piling scores indicated that the median scores (with range) for the sick, recovered and death due to anthrax were 17 (5-22), 2 (0-5) and 14 (5-20), respectively. The communities perceived anthrax as a fatal disease but had limited knowledge on the disease epidemiology and the risks to animals and humans. The most preferred channel of communication for awareness was mobile phone while social mobilization including TV and radio were the most preferred source for information. This study finding indicated the need to reinforce the community knowledge about anthrax through awareness education in Bhutan.

8.6. Community-based survey during rabies outbreaks in Rangjung town, Trashigang, eastern Bhutan, 2016

Tenzin Tenzin[1], Jamyang Namgyal [2] and Sangay Letho [3]

[1]Disease Prevention and Control Unit, National Centre for Animal Health, Department of Livestock, Thimphu, Bhutan; [2]District Veterinary Hospital, Department of Livestock, Trashigang, Bhutan. [3]Regional Livestock Development Centre, Department of Livestock, Khangma, Trashigang, Bhutan.

Published in BMC Infectious Diseases (2017) 17:281 DOI 10.1186/s12879-017-2393-x

Abstract

Background: Rabies is a highly fatal disease transmitted through the bite of a rabid animal. Human deaths can be prevented by prompt administering of rabies vaccine and rabies immunoglobulin following the exposure. An assessment of community knowledge, awareness and practices on rabies is important during outbreak to understand their preparedness and target educational messages and response activities by the rapid response team.

Methods: A rabies outbreak has occurred in Rangjung town, eastern Bhutan on 4 October 2016. A rapid response team was activated to investigate outbreak and to establish a control program. A community-based questionnaire survey was conducted from 20 to 21 October 2016 to assess the community knowledge of rabies to guide outbreak preparedness and also target educational messages and response activities by the RRT.

Results: A total of 67 respondents were interviewed, of which 61% were female and 39% male. All the respondents have heard of rabies (100%), have knowledge on source of rabies (dog) and its mode of transmission in animals and humans. Most (61%) respondents were aware and also indicated that they would wash the animal bite wound with soap and water and seek medical care on the same day of exposure (100%). Majority (94%) of the respondents have indicated that they would report to the government agencies if they see any suspected rabid dogs in the community and suggested various control measures for dog population management and rabies in Rangjung including neutering procedure and mass dog vaccination. Although only few (10%) of the respondents households owned dogs and cats, but 50% of them have indicated that their dogs were allowed to roam outside the home premises posing risk of contracting rabies through rabid dog bites.

Conclusions: Although this study indicates a high level of knowledge and awareness on rabies among the community, there exists some knowledge gaps about rabies and therefore, an awareness education should be focused on the source of rabies and rabies virus transmission route to reduce public concern on nonexposure events thereby reducing the cost on unnecessary postexposure treatment.

8.7. Biosecurity survey in relation to the risk of HPAI outbreaks in backyard poultry holdings in Thimphu city area, Bhutan

Tenzin Tenzin[1], Chador Wangdi [2] and Purna Bdr Rai [3]

[1]Disease Prevention and Control Unit, National Centre for Animal Health, Department of Livestock, Thimphu, Bhutan; [2]Bhutan Agriculture and Food Regulatory Authority, Ministry of Agriculture & Forests, Thimphu, Bhutan. [3]Laboratory Service Unit, National Centre for Animal Health, Department of Livestock, Thimphu, Bhutan.

Published in BMC Veterinary Research (2017) 13:113. DOI 10.1186/s12917-017-1033-4

Abstract

Background: A questionnaire survey was conducted to assess the biosecurity and other practices of backyard poultry holdings and knowledge and practices of poultry keepers following an outbreak of highly pathogenic avian influenza (H5N1) virus in poultry in Thimphu city area, Bhutan.

Results: The study identified 62 backyard poultry holdings in 12 settlement areas, and the owners were subsequently interviewed. The birds are kept in a low-input low-output system, fed locally available scavenging feed base, and supplemented with food scraps and some grain. Although the birds are housed at night in a small coop to protect them against theft and predators, they are let loose during the day to scavenge in the homestead surroundings. This invariably results in mixing with other poultry birds within the settlement and wild birds, creating favorable conditions for disease spread within and between flocks. Moreover, the poultry keepers have a low level of knowledge and awareness related to the importance of biosecurity measures, as well as veterinary care of the birds and reporting systems. Of particular concern is that sick birds within backyard holdings may not be detected rapidly, resulting in silent spread of disease and increased risk of humans contacting the virus (e.g. HPAI) from infected poultry. Nevertheless, all the respondents have indicated that they know and practice hand washing using soap and water after handling poultry and poultry products, but rarely use face-masks and hand gloves while handling poultry or cleaning poultry house.

Conclusions: This study highlights the importance of educating poultry keepers to improve the housing and management systems of poultry farming within the backyard holdings in the Thimphu city area in order to prevent future disease outbreaks.

8.8. Epidemiological Analysis of Dog bites and Human Rabies post exposure prophylaxis in Bhutan, 2009-2012

Tenzin Tenzin[1] Sonam Wangchuk [2], Tshering Dorji [2], Joanna S. McKenzie [3] and Peter D. Jolly[3]

[1]Disease Prevention and Control Unit, National Centre for Animal Health, Department of Livestock, Serbithang, Thimphu, Bhutan; [2]Royal Centre for Disease Control, Department of Public Health, Ministry of Health, Serbithang, Thimphu, Bhutan; [3]Institute of Veterinary, Animal and Biomedical Sciences, Massey University, New Zealand
Published in Bhutan J Ani Sc.1(1):57-64.

Abstract

Dog bites in humans and expenditure on anti-rabies treatment is a public health problem in Bhutan. In this study we describe the epidemiology of dog bites and the use of anti-rabies vaccine as post-exposure prophylaxis (PEP) in people in Bhutan over a period of four years (2009–2012). Dog-bite and PEP-treatment data for 18,813 patients were retrieved from 34 health centres and conducted descriptive analysis. Multivariable logistic regression analysis was performed to find out the risk factors for in-complete course of PEP.

Dog-bite incidents in humans was found to be higher in males than females (P<0.001) and more common in children than adults (P<0.001). Males (n=10,924; 59.19%) received more PEP courses than females (n=7,849; 41.81%) across all age groups (P<0.001). The median age of both dog bite and PEP-treatment recipients was 20 years (range <1 to 93 years) and the modal age was 6 years. Children, particularly those of 5–14 years age group were exposed to animal bites and also received more PEP treatments than people in other age groups. Rabies PEP treatment was provided throughout the year and the number of cases increased significantly (P < 0.001) from less than 1500 cases in 2009 to over 7000 cases in 2012.

Of the18,813 patients that received PEP, 57.12% (n=10,746) received an in-complete course (less than 5 doses). Multivariable logistics regression analysis indicated that males and adult age group of patients were less likely to complete PEP than females and children. Patients with animal bite injury were less likely to complete PEP than non-bite exposure indicating risk of rabies infection if exposure animal is rabid, and patients reported to medical centres in rabies endemic (south Bhutan) were more likely to complete PEP course than in rabies free interior Bhutan.

This study provides valuable information on the epidemiology of dog bites and PEP treatment in humans for informed policy decision on dog population management, public health risk communication to reduce dog-bite incidents and expenditure on PEP treatment in Bhutan.

8.9. A Case-Control Study of an outbreak of Foot and mouth disease at the herd level in cattle in Samdrup Jongkhar district, south eastern Bhutan

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Accepted for oral presentation during 9th TEPHENET Global Scientific Conference, 7-11 August 2017, Bangkok, Thailand.

Abstract

Foot and mouth disease (FMD) is an infectious viral disease that affects all the cloven-hoofed animals and can result in high impact to the economy of the infected countries. Using a case-control study design, we identified household level risk factors for FMD outbreaks in Samdrup Jongkhar district, south eastern Bhutan. Twenty six households that had experienced FMD outbreak and diagnosed as FMD in cattle between January 2012 and December 2015 were defined as case. Two household that own cattle per one case household within the same village were selected as control (n=52). The data related to the management and environmental factors were collected using questionnaire survey during November and December 2016. A univariable and multivariable logistic regression model were built to identify risk factors of FMD. The adjusted odds of FMD outbreak occurrence was 3.91 times (95% confidence interval [CI]: 1.31-11.67) greater in the households that have larger herd size (>5 cattle) when compared to smaller size (<5 cattle). Similarly, the occurrence of FMD was significantly higher [adjusted odds ratio: 7.50; 95% CI: 2.16-26.03) in those herds that have not vaccinated against FMD than those of vaccinated herd. Therefore, FMD control strategy such as bi-annual vaccination is still an effective tool to prevent FMD outbreak. Further study should be conducted to explore why large herd size have higher chance of infection with FMD.

8.10. Feral pigeon disease surveillance following poultry and wild bird mortality event in Bhutan

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Accepted for oral presentation during Australasian Wildlife Disease Association Conference (WDA Australasia Conference), September 2017

Abstract

It is now widely recognized that pathogens can be transmitted between wildlife and agricultural or human hosts through the wildlife-livestock-human interface. Wild birds including feral pigeons (*Columba livia*) are known hosts for a number of emerging viral diseases including influenza A virus and Newcastle Disease virus. Due to the high

numbers of feral pigeons that live and interact with humans and poultry in urban and rural areas in Bhutan, there is an associated risk of pathogen transmission and potentially disease. In October 2016, an avian mortality event involving feral pigeons, other wild bird species, and poultry occurred at multiple locations in Chukha, Bhutan. A small number of feral pigeon samples were confirmed to be PCR negative to HPAI and Newcastle Disease whereas poultry samples were positive to HPAI. In January 2017 we conducted pathogen surveillance of high-risk feral pigeon populations in identified high-risk areas in Bhutan. Preliminary results of cloacal and oro-pharangeal swabs collected are PCR negative to HPAI and Newcastle Disease. This study is the start of a risk-based approach to HPAI wild bird surveillance in Bhutan. Results of this study, and future passive and active wild bird disease surveillance, provide the basis of an understanding of transmission risks to other wild bird populations, livestock and humans in Bhutan. Risk mitigation measures including biosecurity recommendations can then be developed and refined.

8.11. A retrospective case-control study of an outbreak of Newcastle Disease in poultry in Pemagatshel district, eastern Bhutan

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Abstract

Newcstale Disease (NCD) is an acute infectious viral disease of domestic poultry and other species of birds that cause high mortality. Using a case control study design, we identified farm level risk factors for NCD outbreaks in Pemagatshel district, eastern Bhutan. Thirty households that experienced an NCD outbreaks in 2014 and 2016 were identified as case. For each case two controls were selected from the same village that reported the disease in the same month. The data related to management and environmental factors were collected using standard survey questionnaire during February and March 2017. A univariable and multivariable logistic regression model were built to identify risk factors of NCD. The odd of NCD occurrences in a farm that mixed with the wild bird was 13.08 times (95% confidence interval [CI]: (2.96-57.78) more than that of those farm that are not mixed with the wild bird. Significant higher odds (adjusted odd ratio: 10.66; 95%CI: 2.3-49.5) of the disease was reported in the farm that are having larger flock size (>10) comparing to smaller farm (<10). The farm which are nearer to the road are 3.85 times (95% CI: 0.95-15.63) more likely to experinace an outbeak than those that are far from the road.Those farms that clean the poultry shed and have the knowledge on need for the vaccinations of the poultry bird were found to be protective against NCD (OR: 0.16 (95%CI: 0.04-0.66) and 0.16 (95% CI: 0.03-0.79), respectively. Therefore, improving the farm biosecurity and the management of husbandry practices would reduce the chances of contacting the poultry with infectious diseases. The poultry farming awareness education needs to be provided to the farmers.

8.12. Status of animal and human Leptospirosis in Bhutan from a study undertaken during 2014-2015

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Proceedings of 4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology and Health, Melbourne, Australia, December 3-7, 2016

Abstract

Leptospirosis is an acute zoonotic infection caused by spirochete bacteria belonging to genus Leptospira and there are several serogroups and serovars affecting human and animals. Typical signs of leptospirosis in cattle are abortion, stillbirth, weak new born calf, sudden milk drop and infertility. The illness in human may occur in two phases. The signs in first phase are high fever, headache, chills, muscle ache, vomiting, abdominal pain and diarrhoea.

In the late spring of 2015, an unusual rate of abortion was reported in Jersey and Friesian cross cows from one cattle farm. In one month eight animals simultaneously aborted during second and third trimester of gestation. Paired sera samples were collected 14 days apart. First set of sera samples were collected soon after the abortion (n = 7) and subjected to microscopic agglutination test (MAT) against the panel of Hardjo, Pomona and Lai like serovars. During January 2014 to May 2016 a total number of 183 blood samples from human patients with the history of signs associated with leptospirosis were collected and tested using IgM ELISA (Panbio® and SD Inc). These samples included 26 individuals working in the cattle farm that reported abortion.

Paired sera test for seven cows revealed ≥ 4-fold rise in MAT titre against at least one serovar of Leptospira. A sudden drop in milk production was also observed at the onset of abortion in the farm. Out of 183 human samples tested, 10.93% (20/183) were found positive for IgM antibodies against Leptospira spp (Panbio unit ≥ 11, n = 12, for Panbio® kit and OD ≥ 0.75, n = 8 for Standard Diagnostic kit).

The study also found that the sera from two farm workers had high level of IgM antibodies. Leptospirosis can significantly reduce farm profitability due to loss of calves and drop in milk production. Findings on the exposure of farm worker clearly suggest importance of farm biosecurity and occupational health safety. Among human samples one reactive person in every 100 persons is a concern for Bhutanese public health. For the animal part of study, although gold standard MAT was used isolation of organism in future from clinical sample will provide more information on infecting serovars in Bhutan.

8.13. Veterinary Public Health importance of Echinococcus granulosus in Bhutan

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Abstract

This study aims to characterize the Taeniid eggs from community/stray/free roaming dogs from areas where the human cases were registered and also retrospectively genotyped the hydatid cysts collected from human cystic echinoccocus patients over a period of one year (2015-2016). The dog fecal samples were collected from areas where human cases of cystic echinoccocus were known to occur. The places sampled included Paro, (n=28; western part of Bhutan), Bumthang (n=37; Central part of Bhutan) and Phobjikha (n=11; West central part of Bhutan). Faecal samples were analysed microscopically for positive and negative Taeniid eggs. Further the samples were subjected to multiplex polymerase chain reaction test using targets in mitochondrial DNA for identification of morphologically indistinguishable eggs of Taeniid tapeworms as described by Trachsel et al (2007). Also a total of nine human cysts samples were retrieved from Jigme Dorji Wangchuk National Referral Hospital, histopathology unit from cystic echinoccocus patients (2015-2016). Genomic DNA was extracted from each sample (n=9) using tissue protocol described in Qiagen Mini Kit (Qiagen, Hilden, Germany). All samples were subjected to polymerase chain reaction test using primer pair for Echinococcus granulosus "sheep strain" as described by Štefanić et al (2004) at Institute of Parasitology, University of Zurich.

In this study, E. granulosus sensu stricto (s.s.) genotypes G1 and G3 was detected in 17% (13/76) of the faecal samples from community dogs. The sequence analysis of the DNA targeted from nine human cystic echinoccocus patients from Bhutan revealed presence of, Echinococcus granulosus s.s. This study presented the preliminary findings of Echinococcosis in human and dogs. The extended part of this study may be carried out to confirm the commonness of these strains in dogs and human.

8.14. Investigation of Takin mortality at Motithang Takin Preserve

The National Centre for Animal Health (NCAH), Serbithang was reported of sudden death of two takins on January 26, 2017 at Motithang Takin Preserve. A joint team comprising of officials from NCAH, Serbithang; Wildlife Clinic, Taba; and National Animal Hospital (NAH), Chubachu visited the Preserve to provide all possible intervention. While providing all possible interventions, unfortunately, within a span of one week time 22 takins died with similar signs and symptoms of illness. The clinical signs included respiratory signs with grunting and animals were anorexic. Postmortem findings from NCAH, Serbithang did not indicate involvement of any infectious agent of either bacterial or viral origin. Lesions in the lung tissues revealed that the animal had struggled to get more oxygen into the lungs. Liver tissues also revealed toxic damage and degeneration. The samples referred

to NIAH, Bangkok to test with latest diagnostic technology did not detect any possible infectious pathogen. In absence of involvement of any infectious agent, the focus of investigation may incline to the involvement of some kind of toxic substance other than carbamate and organophosphate the animals may have had accessed.

8.15. Antimicrobial resistance (AMR) status in animals in Bhutan

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Poster presentation at SAARC conference on the Third Sub regional meeting of South Asia (7-8 May 2017) and Sixth SAARC Chief Veterinary Officers Meeting (9-10th May 2017), Thimphu, Bhutan

Abstract
AMR is a global concern requiring a one health approach for control. Antimicrobial usages in animal production has been considered as one of the contributing factors for AMR. The review on the articles on AMR in animals in Bhutan depicts the presence of MDR Salmonella in both imported and locally produced chicken carcasses. However, the resistance profile have been found to be different in the salmonella in imported (Nalidixic acid, Amoxicillin and Cephalexin) and locally produced and processed chicken carcasses (Tetracycline, Trimethoprin&Amoxycillin). The study also found the emergence of ESBL producing E. coli in two of the three Government Pig Breeding Farms (Regional Pig & Poultry Breeding Centre, Lingmethang& National Piggery Research Centre, Gelephu) which are of public health significance.
Therefore, there is a need for stringent regulation for import of chicken and also proper monitoring of antimicrobials in the poultry farms in the country. Further, there is also a need for proper monitoring of antimicrobial usages in the pig farms.

8.2. Animal Health Surveillance/Researches (on-going)

The following animal health surveillance/researches is ongoing the data presented are preliminary.

8.2.1 Sero-monitoring of Bovine Brucellosis in government cattle farms, Bhutan

Objective: To establish sero-prevalence of Bovine Brucellosis in government cattle farms

Study design: All government cattle farms were included in the study. Semi-structured questionnaire was developed. Sample size was calculated using Epitools software, AusVet, Australia.

Methodology: Required information was collected in semi-structured questionnaire, blood samples were collected from identified animals. Serum was separated from each blood sample, labeled, stored in cool places and transported to National Centre for Animal Health, Serbithang for analysis. The samples were tested by ELISA.

Results: Mean prevalence percentage of Brucellosis in infected government cattle farms was 13.75 ± 10.85. National Jersey Breeding Centre, Samtse was reported with highest

prevalence of Brucellosis (24.6%) followed by Regional Mithun Breeding Farm, Zhemgang (2.9%). All other six farms were reported to be sero-negative.

8.2.2. Study on Taenia infection in dogs in Bhutan

Bhutan has a large population of free-roaming dogs which is a concern for the general public, including tourists. A diverse range of zoonotic infections, including parasitic, bacterial, viral and fungal diseases, can be transmitted from dogs to humans. Like in other countries, eggs of Taenia and Toxocara spp. have been found in dogs during routine faecal microscopy in laboratories in Bhutan. Besides, the dogs have been found to be acting as definitive hosts for Taenia multiceps in yaks causing gid disease and also cystic echinococcosis in humans. Human cases of cystic echinococcosis have been recorded in the surgical records of JDWNRH. Therefore, the study aimed to study the Taenia infection and their molecular characterization in dogs in Bhutan. The environmental sampling have been initiated in all the Dzongkhags and the study is ongoing.

8.2.3. Study on Taenia multiceps infection in yak dogs in Merak-Sakteng and Bumdeling

Coenurosis or Gid is a disease of the central nervous system in yaks and other ruminents, caused by Coenurus cerebralis, the larval stage of a canine tapeworm *Taenia multiceps*. In Bhutan, yak dogs are considered as the principle definitive host responsible for transmission of Gid disease in yaks. Yak herdsmen use dogs to control and protect yaks from wild carnivores and in the process yaks get infected by grazing on pastures contaminated by yak dogs faeces infested with eggs of *T.multiceps*. Gid disease is reported in yak rearing Dzongkhags of Haa, Paro, Thimphu, Gasa, and Bumthang but was brought under control in Wangdue. However, the disease has not been reported from other yak rearing areas in eastern Dzongkhags of Trashigang, Tashiyangtse and Lhuentse. In order to find out presence/absence of gid causing parasites (*T.multiceps*) in yak dog and stray dogs in Merak-Sakteng and Bumdeling yak rearing areas, yak dog/stray fecal sample collection and laboratory analysis is being initiated. A molecular analysis will be conducted to find out the presence/absence of *T.multiceps* in the taenia positive samples. In addition, a questionnaire survey has been conducted among the yak herders to corroborate the laboratory findings. The findings from this study will guide policy decision on gid control program in the country.

9. Human Resource & Capacity Development

The following training/workshop were organized by NCAH during the FY 2016-17 to enhance the capacity of the livestock and medical professions.

9.1. Training workshop organized incountry

The NCAH organized various incountry training, workshop and seminar as follows.

9.1.1 Review and planning workshop

National Centre for Animal Health, Serbithang conducted the review and planning workshop on 19th July 2016. The main objective of the workshop was to review the plan activities of the fiscal year 2015- 2016 and to plan the work activities for the FY 2016 – 2017. After the presentation of the review work by the respective unit in charges, Program Director and the chairman of the meeting commended on the very successful implementation and congratulated all the staff involved for each activities. On the work plan, the chairman cautioned to plan only those activities which has approved budget and can be completed by the end of the fiscal year. The staffs were reminded that from the coming year, all the performance evaluation will be strictly based on the successful completion of the work plan submitted. The meeting was attended by all the staffs of the Centre, National Animal Hospital and two officials from the Department.

9.1.2 Refresher Training for Veterinary Laboratory Technicians

One of the main mandates of the Laboratory services unit (LSU) under NCAH is capacity building in animal health including the diagnostic technologies. Further, in order to keep in pace with diagnostic services for the emerging and re-emerging diseases in the country, the knowledge and skills of the lab technicians of the country needs to be upgraded from time to time. Hence, Refresher training for Veterinary laboratory technicians was held from 7th to 8th Nov 2016 at the National centre for Animal Health, Serbithang with the objectives of upgrading the skills of the lab technicians in the country.

About 36 participants took part representing from National centre for Animal Health, Regional Livestock Development Centres, Satellite veterinary laboratories and Dzongkhag Veterinary Laboratories. The refresher training course mainly discussed on issues on the Standard operating procedures. Besides, the technicians were also sensitized on the new advance diagnostic technologies.

9.1.3 National Laboratory Coordination Workshop

For the effective delivery of animal health services in the country, one of the main activities is to have a well-co-ordinated networking linkages of the diagnostic facilities. Over the period of time, it was felt that there is weak co-ordination among the veterinary laboratories in the country. Hence, the urgent need was felt to revamp the linkages among the national, regional and dzongkhag laboratories in the country. A two day Laboratory Co-ordination Workshop was held at NCAH serbithang, w.e.f. 9th to 10th November 2016 with the objective of strengthening co-ordination and linkages of the laboratory networks in the country. Hon'ble Minister for Agriculture & Forests, HE Yeshey Dorji graced the inauguration session of the meeting. During the inaugural session, HE also launched the National FMD prevention & control guidelines, National Veterinary Drug Formulary, online VIS database and Pet registration. About 49 participants representing from DOL, HQ, National Animal Hospital, National Centre for Animal Health (NCAH), Regional Livestock Development Centres (RLDCS), Satellite Veterinary Laboratories (SVLS) and Dzongkhag Veterinary Laboratories (DVLs) took part in the workshop. Various issues regarding the co-ordination/networking of laboratory activities were discussed and resolved during the workshop.

9.1.4 Laboratory diagnostic workshop to enhance rabies testing

The workshop on Laboratory diagnostic workshop to enhance Rabies testing and control in Bhutan was conducted at LSU from 24 October - 4 November, 2016. The workshop was funded by Crawford fund, Victoria, Australia. The training was conducted by the team from Australian Animal Health Laboratory, Geelong, Australia comprising of Dr John David Allen, Program Leader and Ms Andrea Fabiana Certoma, Senior Experimental Researcher. The team also conducted FAO supported Technical Backstopping of National Laboratory at National Centre for Animal Health, Serbithang. The technical backstopping was done mainly to assess laboratory diagnostic capacity at NCAH and point out some important issues for further improvement. The assessment also would help to augment through the process of preparing National Laboratory for ISO 17025 certification.

The team provided training on affordable and robust rabies diagnsotic assay-Rabies Immunoperoxidase Antigen Detection (RIAD) test. The participants were from LSU, RLDCs and SVLs.

9.1.5 Strengthening Brucellosis diagnosis

During October 19-22, 2016, the Brucellosis research scientists from National Institute of Animal Health, Japan (Dr Makoto Osaki and Dr Yuichi Ueno) visited National Centre for Animal Health, Serbithang. The collaboration is aimed at strengthening diagnostic capacity for Brucellosis at NCAH. The collaboration also includes exchange of visiting scientist between the two institutes to learn more from each other. During their four days visit, introduction of three diagnostic methods for diagnosis of Brucella infection: culture technique, polymerase chain reaction (PCR) and milk enzyme linked immunosorbent assay (ELISA) were conducted to the technicians of LSU. Once National Laboratory at NCAH becomes proficient with these three diagnostic methods, the test methods will be extended to other laboratories in Bhutan.

9.1.6 Training on aflatoxin analysis at National Research Centre for Animal Nutrition, Bumthang

Laboratory Service Unit under the National Centre for Animal Health (NCAH), Serbithang is the apex institution for animal disease diagnosis, animal health research and animal feed analysis for toxin content. The National Research Centre for Animal Nutrition (NRCAN), Bumthang is the apex institution for research and development of animal feed and fodder in terms of nutrition quality, fodder/grass species quality and compounded animal feed in the country. Although the NRCAN has advanced expertise in analysing animal feed and fodder quality, the aflatoxin analysis aspect of animal feed had been recognized as one of the components to be improved. Thus, with the availability of aflatoxin analysis expertise at NCAH, the NRCAN requested NCAH, Serbithang to train staffs working at animal nutrition laboratory. A two member team from NCAH visited Bumthang and trained two staffs on total aflatoxin analysis in compounded animal feed.

Ms Rinchen Wangmo and Mr Rinzin Namgay, LPS from Animal Nutrition Laboratory were provided hands on training on the analysis of aflatoxin in animal feed. On the first day the trainers demonstrated analysis with standards and unknown sample. On the second day the trainees were asked to run experiment independently. The results were examined and evaluated.

The trainees were able to perform the test confidently and produced highly accurate result as demonstrated by the R2 value of 0.9932. The trainees were able to calculated aflatoxin level in unknown sample using pre-formatted excel spread sheet provided by the manufacturer of assay kit.

The trainers are of the opinion that the staffs trained at NRCAN can confidently perform aflatoxin test (total) after this training. However, they were asked to contact National Centre for Animal Health, Serbithang for any trouble shooting in future. As though few recommendations as follows were provided to improve laboratory capacity building, future compliance to some essential aspects of analysis and implementation:

1. The assay requires some specific equipment such as water distillation unit to produce distilled water and incubator that runs at 24°C (room temperature) to incubate assay plate. The training this time used distilled water that was taken from NCAH, Serbithang and the hot air oven was adjusted to the temperature of 24°C for incubating assay plate. Therefore, for regular delivery of diagnostic service in future, the Centre needs to buy one unit each of incubator and distillation plant. The equipment may not necessarily be expensive and high output capacity/volume.
2. The Centre currently has only one test kit out of which 25% of the kit was used during training. Therefore, the Centre may procure at least two new test kits from Romar Laboratory for total aflatoxin analysis
3. The staffs who are currently working in laboratory section did not have required level of laboratory experience. However, it was evident that they were found very enthusiastic to take laboratory works and deliver service. These staffs deserve short training courses on laboratory analysis of animal feed in future.
4. The test employs handling of fairly small volume of reagents all along the test procedure. Handling of such small volume requires high precision micropipette and corresponding pipette tips. The Centre had only one micropipette without adjustable volume. Therefore, the Centre may procure one number of adjustable 200µl micropipette and tips.
5. Establish an equipment calibration schedule and explore least cost options especially for pipette calibrations including using the gravimetric method for local calibration using a calibrated 5 decimal point balance situated in the Bhutan Standards Authority to avoid sending pipettes to India.

9.1.7. MaX Online Training

The Human Resource Officer for the Department of Livestock conducted training on 'Managing for eXcellence' - MaX online system at the conference hall of National Centre for Animal Health (NCAH), Serbithang on Friday, 21st April 2017. MaX online system is launched by the Royal Civil Service Commission to ensure easy access for monitoring while facilitating discipline in planning and evaluation of performance within the stipulated schedule with enhanced accountability to both supervisors and supervisee. The training was attended by P and S level employees of NCAH and Livestock Products Value Addition Centre (LPVAC).

9.1.8. Training Workshop on Rabies Risk assessment and economic analysis

The National Centre for Animal Health (NCAH) in collaboration with the Department of Ecosystem and Public Health, Faculty of Veterinary Medicine, University of Calgary has conducted a 2 day training workshop on Animal Health Economics, wildlife disease surveillance and Risk assessment for rabies at NCAH, Serbithang from 24th to 25th April, 2017. The training workshop was attended by officials from the Department of Livestock, Department of Forests and Park Services and BAFRA.

9.1.9 Training on Geographical Information System & Global Positioning System

Dr. Tenzin, NCAH conducted Training on GIS and Spatial Data Analysis using public domain software - Quantum GIS, GPS, and GeoDA for for Bhutan One Health Fellows and other relevant stakeholders in the country during 25-29 Oct 2016. The training was funded and organized Bhutan OH Fellowship Program, Massey University, New Zealand.

9.2. Ex-country training/workshop/meeting attended

The list of various meeting/training/workshop attended by NCAH staffs is presented in the annexure.

10. Visitors to NCAH, Serbithang during FY 2016-17

10.1. Visit of Thai Government officials, DLD to NCAH

Three member delegation lead by the Director of National Institute of Animal Health (NIAH), Department of Livestock Development, Thailand visited NCAH, Serbithang on 28th September 2016. The delegates from both the country agreed for laboratory twining on Brucellosis. The institute involved in twinning project will be National Institute of Animal Health (NIAH), Bangkok (parent lab) and National Centre for Animal Health (NCAH), Serbithang (candidate lab). The meeting agreed to jointly prepare twinning project proposal, exchange the document between two institutes for comments, review and finalize. NCAH also shared interest to collaborate with NIAH for laboratory capacity building on poultry diseases and vaccine production.

10.2. Senior Researcher from National Institute of Infectious Diseases, Japan visited NCAH, Serbithang

Dr. Yoshihiro Kaku, Senior Researcher from the National Institute of Infectious Diseases, Japan visited NCAH on 19th July 2016. The officials from both the institutions discussed on the technical collaboration, laboratory diagnostic capacity building and surveillance of various zoonotic diseases such as rabies, anthrax and bat ecology to understand existence of virus of potential zoonotic significance. Senior Researcher also visited the Laboratory Service Unit to get idea on the diagnostic capacity at the Centre. In the afternoon he visited the Royal Centre for Disease Control under the Department of Public health for similar discussion on research collaboration.

Annexure

Annexure 1. Details of vaccines distributed to various livestock centres in the country (July 2016-June 2017)

Sl.No.	Name of Dzongkhags/ Central Units	Locally Produced		Imported									
		Anthrax	SF	FMD Oil	HSBQ	IBD	Fowl Pox	ND B_1	ND R_2B	Marek's	RabisinRak sharab	DHPPi + L	PPR
	Dzongkhags												
1	Bumthang			9000	1980	2600	5000		1000		1250		
2	Chhukha		500	4250	750	130000	12000	59400	18000		670		
3	Dagana		200	22400	7440	26000	6000	16800	11600		3150		
4	Gasa			1500	300						150	5	
5	Haa			3000	600		5000		3000		1100	25	
6	Lhuentse			6000	6990	18000	3000	6000	12000		200	1	
7	Mongar			12200	7200	133800		56600	30300		1400	10	
8	Paro		360	9500	3720	35000	20000	20000	17000		1500	189	
9	Pemagatshel		200	4900	5100	34000	14000	14000	13000	3000	1600		
10	Punakha			8000	2010	40000	20000	20000	20000			25	
11	Samdrup Jongkhar			8000	7020	60000	20000	20000	20000	20000	5500	30	
12	Samtse			45000	9300	166000	15000	40000	20000		5820		2900
13	Sarpang		800	17000	14070	758000	290000	220000	250000		1100		
14	Thimphu			14850	2010	33200	15000	11800	8600		600		
15	Trashigang			20000	20010	10000		5000	5000		4600	50	
16	Trashiyangtse			5000	2010	7000	8000	5000	2000		2100		
17	Trongsa			5000	2520	17400	1000	5800	10700		300	16	
18	Tsirang		1000	8600	2010	120000	20000	100000	50000		800	20	2000
19	Wangdue Phodrang		50	16000	6510	41000	14000	18000	32000		250	135	
20	Zhemgang			8300	420	6000	2000	7000	4000		200		
	Central Units												
21	NDDRC, Yusipang			250									
22	BSF, Bumthang												

23	NJBC, Samtse	200		500	300								
24	NNBF, Trashiyangphu				270								
25	NPoDC, Sarpang					68000	30000	32000	22000	250000			
26	RPBC, Yusipang		650	500									
27	NSBC, Bumthang												
28	NPiDC, Gelephu		2500	950									
29	Calf Rearing Centre,Wangkha			350	240								
30	RPPBC, Lingmethang		1000	50		10000	13000	3600	7000	90000			
31	RMBF, Arong												
32	RMBF, Wangdigang												
33	RPBC, Paro					3000		2000		30000			
34	National Animal Hospital			100		1600		600			3800	255	
35	Private Poultry Farm					98800	10000	85600	14700	150000			
36	RLP, Zhemgang												
37	RLDC Wangdue												
38	RLDC Tsimasham										2500	125	
39	RLDC Zhemgang											50	
40	RLDC Kanglung			1000	210	27000		9000	9000		500		
41	NDPM & RCP (HSI)										3000		
42	Local Use / Campaign										2000		
43	CNR, Lobeysa					1000	1000	600	1000				
	Total doses Distributed	**200**	**7260**	**232200**	**102990**	**1847400**	**524000**	**758800**	**581900**	**543000**	**44090**	**936**	**4900**

Annexure 2. Ex-country training/workshop/meeting attended

Table 22: List of NCAH staffs who have attended ex-country training/workshop/meeting during FY 2016-17

Name	EID. No	Position Title	Course title	Institute	Country	Start Date	End Date	Duration (days)	Funding Agency
Lokay Thapa	9207079	Livestock Production Officer	3rd Regional Roadmap Meeting on the PCP-FMD for SAARC Member States	Colombo	Sri Lanka	14 Dec 2016	16 Dec 2016	3 days	FAO/OIE
Dr. Tenzin	2001032	Principal Livestock Health Officer	First Meeting on SAARC EpiNet Forum	New Delhi	India	27 Feb 2017	28 Feb 2017	2 days	FAO
Dr. Vijay Raika	9411039	Principal Livestock Health Officer	South Asia Pandemic Preparedness Tabletop Exercise	Maldives	Maldives	19 Jul 2016	21 Jul 2016	3 days	Skoll Global Threats Fund
Dr. Vijay Raika	9411039	Principal Livestock Health Officer	4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology and Health	Melbourne	Australia	3 Dec 2016	7 Dec 2016	5 days	FAO
Dr. Ratna Bdr. Gurung	9603028	Principal Livestock Health Officer	4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology and Health	Melbourne	Australia	3 Dec 2016	7 Dec 2016	5 days	FAO
Dr. Kinzang Dukpa	9603005	Program Director	4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology and Health	Melbourne	Australia	3 Dec 2016	7 Dec 2016	5 days	FAO
Puspa Maya Sharma	20140103185	Laboratory Officer	Regional Workshop on the Application of Laboratory Mapping Tool	Bangkok	Thailand	1 August 2016	5 August 2016	5 days	FAO
Dr. Tenzin	2001032	Principal Livestock Health Officer	WHO Rabies Expert Meeting	Bangkok	Thailand	26 April 2017	28 April 2017	3 days	WHO
Dawa Tshering	9901014	Sr Lab Technician III	Training on Laboratory Diagnosis of Brucella by ELISA	National Institute of Animal Health	Japan	13 Sep 2016	17 Sep 2016	5 days	National Institute of Animal Health, Japan
Purna Bdr Rai	8806138	Sr Lab Technician III	Training on Laboratory Diagnosis of Brucella by ELISA	National Institute of Animal Health	Japan	13 Sep 2016	17 Sep 2016	5 days	National Institute of Animal Health, Japan
Dr. Nirmal Kumar Thapa	9302007	Specialist III	Workshop on Development and Implementation of National Action Plan on Antimicrobial Resistance (NAP-AMR) for Countries in South-East Asia Region	Bangkok	Thailand	31 August 2016	2 Sep 2016	3 days	WHO
Dr. Kinzang Dukpa	9603005	Program Director	Visit to meet the Head, Key Researchers and Technical Staff at National Institute of Infectious Diseases to discuss on Zoonoses	National Institute of Infectious Diseases (NIID), Toyama	Japan	14 Sep 2016	17 Sep 2016	4 days	Expenses for Airfare, Food and Accomodation by NIID, Japan and 20% DSA by RGoB Budget 11.02, NCAH, Serbithang

Tenzinla	9901013	Sr. Laboratory Technician III	Participate in Scrub Typhus Training	Armed Force Research Institute of Medical Science(AFRIMS), Bangkok	Thailand	24 Oct 2016	28 Oct 2016	5 days	AFRIMS
Puspa Maya Sharma	20140103185	Laboratory Officer	Training on Molecular Characterization of Pathogenic Swine Escherichia coli from Government pig farms of Bhutan	University of Zurich, Institute of Parasitology	Switzerland	24 Oct 2016	23 Nov 2016	29 days	University of Zurich, Institute of Parasitology
Dr. Jambay Dorjee	9901055	Speacilaist III	5ht Global Animal Health Conference 2016-Improve Market Access for Authorised Veterinary Medicines	New Delhi	India	17 Nov 2016	17 Nov 2016	1 day	DIA, Washington, Basel Branch, Switzerland
Dr. Kinzang Dukpa	9603005	Program Director	85th General Session of the World Assembly of Delegates of the OIE	Paris	France	21 May 2017	26 May 2017	6 days	RGoB Budget Head 11.02-Travel Outside Bhutan, DoL, HQ and NCAH, Serbithang
Dr. Kinzang Dukpa	9603005	Program Director	7th Senior Executive Leadership Program (SELP-7) at Phuentsholing	Royal institute for Governance and Strategic Studies (RIGSS), Phuntsholing	Phuentsholing	2 Oct 2016	1 Nov 2016	30 days	RIGSS, Phuntsholing
Dr. Ratna Bdr. Gurung	9603028	Principal Livestock Health Officer	Workshop on "Enhancing Joint Collaborative Efforts for Lab Preparedness"	Bangkok	Thailand	8 Feb 2017	10 Feb 2017	2 days	FAO
Dr. Tenzin	2001032	Principal Livestock Health Officer	Designing Workshop for the South Asia EpiNet website using the Hubnet Saftware Applications	Kathmandu	Nepal	26 June 2017	28 June 2017	3 days	FAO

Annexure 3. Budget expenditure statement as of 30 June 2017

FIN. ITEM CODE	OB JECT CODE	TITLE	Budget Alocation			Expenditure			Balance	% Achivement
			CURRENT	CAPITAL	Total	CURRENT	CAPITAL	Total		
		DIRECTION SERVICES (NCAH)								
		OPERATION & MANAGEMENT SERVICES								
0001		RGOB Financing								
	01.01	Pay and Allowances	14,867,000.00		14,867,000.00	13,796,610.00	0.00	13,796,610.00	1,070,390.00	
	02.01	Other Personnel Emoluments	441,000.00		441,000.00	441,000.00		441,000.00	0.00	
	11.01	Travel - Incountry	2,037,000.00		2,037,000.00	2,037,000.00		2,037,000.00	0.00	
	12.01	Utilities -Telephones, Telex, Fax, E-mail, Internet	330,000.00		330,000.00	330,000.00		330,000.00	0.00	
	12.02	Utilities -Telegram, Wireless Transmission, Postage	11,000.00		11,000.00	6,584.64		6,584.64	4,415.36	
	12.03	Utilities - Electricity, Water, Sewerage	327,000.00		327,000.00	326,827.00		326,827.00	173.00	
	12.05	Utilities - Fuelwood	20,000.00		20,000.00	19,991.00		19,991.00	9.00	
	14.01	S & M - Office Supplies, Printing, Publications	170,000.00		170,000.00	165,017.00		165,017.00	4,983.00	
	14.06	S & M - Uniforms, Extension Kits, Linens	50,000.00		50,000.00	40,850.00		40,850.00	9,150.00	
	15.01	Maintenance of Property - Buildings	100,000.00		100,000.00	98,016.75		98,016.75	1,983.25	
	15.02	Maintenance of Property - Vehicles	1,057,000.00		1,057,000.00	1,055,653.67		1,055,653.67	1,346.33	
	15.07	Maintenance of Property - Computers	50,000.00		50,000.00	50,000.00		50,000.00	0.00	
	15.09	Maintenance of Property - Water supply, Sewerage, Playfield	37,000.00		37,000.00	35,690.00		35,690.00	1,310.00	
	17.01	Op. Exp. - Advertising	70,000.00		70,000.00	70,000.00		70,000.00	0.00	
	17.02	Op. Exp. - Taxes, Duties, Royalties, Handling Charges, Bank Charges	93,000.00		93,000.00	92,804.50		92,804.50	195.50	
	17.08	Op. Exp. - Incountry Meetings and Celebrations	100,000.00		100,000.00	100,000.00		100,000.00	0.00	
	24.03	Contributions - Provident Fund	1,391,000.00		1,391,000.00	1,197,492.00		1,197,492.00	193,508.00	
	25.01	Retirement Benefits	113,000.00		113,000.00	112,466.00		112,466.00	534.00	
	54.03	Computer & Peripherals		90,000.00	90,000.00		89,600.00	89,600.00	400.00	
		TOTAL SUB-ACTIVITY	**21,264,000.00**	**0.00**	**21,151,000.00**	**19,976,002.56**	**89,600.00**	**20,065,602.56**	**1,288,397.44**	
		OIE GENERAL SESSION & CONFERENCE								
0001		RGOB Financing								
	11.02	Travel - Outside Bhutan	250,000.00		250,000.00	0.00	224,638.00	224,638.00	25,362.00	
		TOTAL SUB-ACTIVITY	**250,000.00**	**0.00**	**250,000.00**	**0.00**	**224,638.00**	**224,638.00**	**25,362.00**	
		RENOVATION OF OFFICE WATER SUPPLY								

0001		RGOB Financing								
	51.06	Exp. on Structure - Water Supply & Sanitation		750,000.00	750,000.00	0.00	748,488.00	748,488.00	1,512.00	
		TOTAL SUB-ACTIVITY	**0.00**	**750,000.00**	**750,000.00**	**0.00**	**748,488.00**	**748,488.00**	**1,512.00**	
		TOTAL ACTIVITY	**21,514,000.00**	**750,000.00**	**22,151,000.00**	**19,976,002.56**	**1,062,726.00**	**21,038,728.56**	**1,315,271.44**	**94.98**
		PROCUREMENT , DISTRIBUTION, AND MANAGEMENT OF VETENARY DRUGS, VACCINES AND EQUIPMENT								
		PROCUREMENT, DISTRIBUTION AND MANAGEMENT OF VETERINARY MEDICINES, VACCINES & EQUIPMENT								
0001		RGOB Financing								
	11.01	Travel - Incountry	430,000.00		430,000.00	430,000.00		430,000.00	0.00	
	14.01	S & M - Office Supplies, Printing, Publications	0.00		0.00	0.00		0.00	0.00	
	14.02	S & M - Medicines & Laboratory Consumables	27,000,000.00		27,000,000.00	26,804,333.93		26,804,333.93	195,666.07	
	15.07	Maintenance of Property - Computers	50,000.00		50,000.00	48,500.00		48,500.00	1,500.00	
	17.01	Op. Exp. - Advertising	60,000.00		60,000.00	47,521.00		47,521.00	12,479.00	
	17.03	Op. Exp. - Transportation	110,000.00		110,000.00	101,262.00		101,262.00	8,738.00	
	52.07	Plant & Equipt. - Hospital/Lab. Equipment		4,000,000.00	4,000,000.00		3,995,969.70	3,995,969.70	4,030.30	
		TOTAL SUB-ACTIVITY	**27,650,000.00**	**4,000,000.00**	**31,650,000.00**	**27,431,616.93**	**3,995,969.70**	**31,427,586.63**	**222,413.37**	
		ORGANIZE AND CONDUCT IN-COUNTRY EVD TRAININGS								
0001		RGOB Financing								
	17.08	Op. Exp. - Incountry Meetings and Celebrations	200,000.00		200,000.00	200,000.00		200,000.00	0.00	
		TOTAL SUB-ACTIVITY	**200,000.00**	**0.00**	**200,000.00**	**200,000.00**	**0.00**	**200,000.00**	**0.00**	
		STRENGTHENING & ENHANCEMENT OF DRUGS, VACCINES AND EQUIPMENT DELIVERY SERVICES								
0001		RGOB Financing								
	11.01	Travel - Incountry	200,000.00		200,000.00	200,000.00		200,000.00	0.00	
		TOTAL SUB-ACTIVITY	**200,000.00**	**0.00**	**200,000.00**	**200,000.00**	**0.00**	**200,000.00**	**0.00**	
		TOTAL ACTIVITY	**28,050,000.00**	**4,000,000.00**	**32,050,000.00**	**27,831,616.93**	**3,995,969.70**	**31,827,586.63**	**222,413.37**	**99.31**
		LABORATORY SERVICE UNIT								
		TEST KITS VALIDATION AND TEST STANDARDIZATION FOR SEROLOGY AND MOLECULAR								

0001		RGOB Financing								
	11.01	Travel - Incountry	90,000.00		90,000.00	90,000.00		90,000.00	0.00	
	14.02	S & M - Medicines & Laboratory Consumables	50,000.00		50,000.00	21,594.00		21,594.00	28,406.00	
		TOTAL SUB-ACTIVITY	**140,000.00**	**0.00**	**140,000.00**	**111,594.00**	**0.00**	**111,594.00**	**28,406.00**	
		EMERGENCY FIELD VISIT, SAMPLE COLLECTION								
0001		RGOB Financing								
	11.01	Travel - Incountry	90,000.00		90,000.00	89,887.00		89,887.00	113.00	
		TOTAL SUB-ACTIVITY	**90,000.00**	**0.00**	**90,000.00**	**89,887.00**	**0.00**	**89,887.00**	**113.00**	
		PROVIDING REFERRAL LABORATORY DIAGNOSTIC SERVICES TO CLIENTS								
0001		RGOB Financing								
	11.01	Travel - Incountry	385,000.00		385,000.00	385,000.00		385,000.00	0.00	
	14.01	S & M - Office Supplies, Printing, Publications	130,000.00		130,000.00	130,000.00		130,000.00	0.00	
	14.02	S & M - Medicines & Laboratory Consumables	500,000.00		500,000.00	467,572.80		467,572.80	32,427.20	
	52.07	Plant & Equipt. - Hospital/Lab. Equipment		350,000.00	350,000.00		142,075.20	142,075.20	207,924.80	
		TOTAL SUB-ACTIVITY	**1,015,000.00**	**350,000.00**	**1,365,000.00**	**982,572.80**	**142,075.20**	**1,124,648.00**	**240,352.00**	
		STRENGTHENING AND ENHANCEMENT OF LABORATORY DIAGNOSTIC CAPACITIES								
0001		RGOB Financing								
	11.01	Travel - Incountry	372,000.00		372,000.00	371,260.00		371,260.00	740.00	
	14.01	S & M - Office Supplies, Printing, Publications	0.00		0.00			0.00	0.00	
	14.02	S & M - Medicines & Laboratory Consumables	200,000.00		200,000.00			0.00	200,000.00	
		TOTAL SUB-ACTIVITY	**572,000.00**	**0.00**	**572,000.00**	**371,260.00**	**0.00**	**371,260.00**	**200,740.00**	
		MAJOR LIVESTOCK DISEASE SURVEILLANCE/SURVEY								
0001		RGOB Financing								
	11.01	Travel - Incountry	240,000.00		240,000.00	240,000.00		240,000.00	0.00	
	14.01	S & M - Office Supplies, Printing, Publications	56,000.00		56,000.00	56,000.00		56,000.00	0.00	
	14.02	S & M - Medicines & Laboratory Consumables	150,000.00		150,000.00	81,411.00		81,411.00	68,589.00	
		TOTAL SUB-ACTIVITY	**446,000.00**	**0.00**	**446,000.00**	**377,411.00**	**0.00**	**377,411.00**	**68,589.00**	
		LABORATORY SKILL ENHANCEMENT								
0001		RGOB Financing								

	11.01	Travel - Incountry	200,000.00		200,000.00	200,000.00		200,000.00	0.00	
	14.01	S & M - Office Supplies, Printing, Publications	0.00		0.00			0.00	0.00	
		TOTAL SUB-ACTIVITY	**200,000.00**	**0.00**	**200,000.00**	**200,000.00**	**0.00**	**200,000.00**	**0.00**	
		COORDINATION AND IMPLEMENTATION OF BIOSAFETY AND BIO-SECURITY PROGRAMMES								
0001		RGOB Financing								
	14.01	S & M - Office Supplies, Printing, Publications	21,000.00		21,000.00	20,200.00		20,200.00	800.00	
	14.02	S & M - Medicines & Laboratory Consumables	70,000.00		70,000.00	63,845.00		63,845.00	6,155.00	
	15.05	Maintenance of Property - Equipment	250,000.00		250,000.00	245,648.50		245,648.50	4,351.50	
		TOTAL SUB-ACTIVITY	**341,000.00**	**0.00**	**341,000.00**	**329,693.50**	**0.00**	**329,693.50**	**11,306.50**	
		MONITORING AND REPORTING								
0001		RGOB Financing								
	12.02	Utilities -Telegram, Wireless Transmission, Postage	50,000.00		50,000.00	4,637.60		4,637.60	45,362.40	
	17.02	Op. Exp. - Taxes, Duties, Royalties, Handling Charges, Bank Charges	50,000.00		50,000.00			0.00	50,000.00	
	55.01	Professional Services		150,000.00	150,000.00	0.00	59,283.00	59,283.00	90,717.00	
		TOTAL SUB-ACTIVITY	**100,000.00**	**150,000.00**	**250,000.00**	**4,637.60**	**59,283.00**	**63,920.60**	**186,079.40**	
		LABORATORY INFRASTRUCTURE & MAINTENANCE								
0001		RGOB Financing								
	51.05	Exp. on Structure - Drainage Systems	0.00	150,000.00	150,000.00		85,990.00	85,990.00	64,010.00	
		TOTAL SUB-ACTIVITY	**0.00**	**150,000.00**	**150,000.00**	**0.00**	**85,990.00**	**85,990.00**	**64,010.00**	
		TOTAL ACTIVITY	**2,904,000.00**	**650,000.00**	**3,554,000.00**	**2,467,055.90**	**287,348.20**	**2,754,404.10**	**799,595.90**	**77.50**
		DISEASE PREVENTION AND CONTROL UNIT								
		NATIONAL FOOT AND MOUTH DISEASE PREVENTION & CONTROL								
0001		RGOB Financing								
	11.01	Travel - Incountry	150,000.00		150,000.00	150,000.00		150,000.00	0.00	
	17.08	Op. Exp. - Incountry Meetings and Celebrations	100,000.00		100,000.00	100,000.00		100,000.00	0.00	
		TOTAL SUB-ACTIVITY	**250,000.00**	**0.00**	**250,000.00**	**250,000.00**	**0.00**	**250,000.00**	**0.00**	
		NATIONAL AVIAN INFLUENZA (BIRD FLU) PREVENTION & CONTROL								
0001		RGOB Financing								
	11.01	Travel - Incountry	130,000.00		130,000.00	129,851.00		129,851.00	149.00	

	17.01	Op. Exp. - Advertising	19,000.00		19,000.00	14,350.00		14,350.00	4,650.00	
		TOTAL SUB-ACTIVITY	**149,000.00**	**0.00**	**149,000.00**	**144,201.00**	**0.00**	**144,201.00**	**4,799.00**	
		NATIONAL GID DISEASE PREVENTION & CONTROL								
0001		RGOB Financing								
	11.01	Travel - Incountry	160,000.00		160,000.00	159,495.00		159,495.00	505.00	
	14.02	S & M - Medicines & Laboratory Consumables	50,000.00		50,000.00	49,881.00		49,881.00	119.00	
	17.09	Op. Exp. - Survey/Census	125,000.00		125,000.00	121,931.00		121,931.00	3,069.00	
		TOTAL SUB-ACTIVITY	**335,000.00**	**0.00**	**335,000.00**	**331,307.00**	**0.00**	**331,307.00**	**3,693.00**	
		NATIONAL RABIES PREVENTION & CONTROL								
0001		RGOB Financing								
	11.01	Travel - Incountry	90,000.00		90,000.00	90,000.00		90,000.00	0.00	
	17.09	Op. Exp. - Survey/Census	120,000.00		120,000.00	120,000.00		120,000.00	0.00	
		TOTAL SUB-ACTIVITY	**210,000.00**	**0.00**	210,000.00	**210,000.00**	**0.00**	**210,000.00**	**0.00**	
		ANIMAL HEALTH RESEARCH ON ZOONOTIC DISEASES								
0001		RGOB Financing								
	17.09	Op. Exp. - Survey/Census	100,000.00		100,000.00	99,508.00		99,508.00	492.00	
		TOTAL SUB-ACTIVITY	**100,000.00**	**0.00**	**100,000.00**	**99,508.00**	**0.00**	**99,508.00**	**492.00**	
		ANIMAL HEALTH INFORMATION SYSTEM								
0001		RGOB Financing								
	14.01	S & M - Office Supplies, Printing, Publications	80,000.00		80,000.00	80,000.00		80,000.00	0.00	
	55.01	Professional Services		100,000.00	100,000.00		99,500.00	99,500.00	500.00	
		TOTAL SUB-ACTIVITY	**80,000.00**	**100,000.00**	**180,000.00**	**80,000.00**	**99,500.00**	**179,500.00**	**500.00**	
		TOTAL ACTIVITY	**1,124,000.00**	**100,000.00**	**1,224,000.00**	**1,115,016.00**	**99,500.00**	**1,214,516.00**	**9,484.00**	**99.23**
		BIOLOGICAL PRODUCTION UNIT								
		PRODUCTION OF ANIMAL VACCINES								
0001		RGOB Financing								
	14.02	S & M - Medicines & Laboratory Consumables	150,000.00		150,000.00	150,000.00		150,000.00	0.00	
	14.05	S & M - Animal Feeds	180,000.00		180,000.00	133,879.00		133,879.00	46,121.00	
		TOTAL SUB-ACTIVITY	**330,000.00**	**0.00**	**330,000.00**	**283,879.00**	**0.00**	**283,879.00**	**46,121.00**	

		PROCUREMENT OF ANIMAL AND POULTRY VACCINES								
0001		RGOB Financing								
	14.02	S & M - Medicines & Laboratory Consumables	3,300,000.00		3,300,000.00	3,300,000.00		3,300,000.00	0.00	
		TOTAL SUB-ACTIVITY	**3,300,000.00**	**0.00**	**3,300,000.00**	**3,300,000.00**	**0.00**	**3,300,000.00**	**0.00**	
		DISTRIBUTION OF VACCINES								
0001		RGOB Financing								
	11.01	Travel - Incountry	150,000.00		150,000.00	150,000.00		150,000.00	0.00	
		TOTAL SUB-ACTIVITY	**150,000.00**	**0.00**	**150,000.00**	**150,000.00**	**0.00**	**150,000.00**	**0.00**	
		PROCUREMENT OF COLD CHAIN EQUIPMENT								
0001		RGOB Financing								
	52.07	Plant & Equipt. - Hospital/Lab. Equipment	0.00	250,000.00	250,000.00		250,000.00	250,000.00	0.00	
		TOTAL SUB-ACTIVITY	0.00	250,000.00	250,000.00	0.00	250,000.00	250,000.00	0.00	
		CONDUCT FIELD STUDY/RESEARCH RELATED TO VETERINARY DRUGS								
0001		RGOB Financing								
	11.01	Travel - Incountry	100,000.00		100,000.00	100,000.00		100,000.00	0.00	
		TOTAL SUB-ACTIVITY	**100,000.00**	**0.00**	**100,000.00**	**100,000.00**	**0.00**	**100,000.00**	**0.00**	
		TOTAL ACTIVITY	**3,880,000.00**	**250,000.00**	**4,130,000.00**	**3,833,879.00**	**250,000.00**	**4,083,879.00**	**46,121.00**	**98.88**
		NATIONAL DOG POPULATION MANAGEMENT & RABIES COUNTROL PROGRAM								
		OPERATIONAL AND MANAGEMENT SERVICE								
0002		RGOB Contribution								
	12.01	Utilities -Telephones, Telex, Fax, E-mail, Internet	51,000.00		51,000.00	45,695.00		45,695.00	5,305.00	
	14.01	S & M - Office Supplies, Printing, Publications	80,000.00		80,000.00	75,251.00		75,251.00	4,749.00	
	15.02	Maintenance of Property - Vehicles	594,000.00		594,000.00	592,938.42		592,938.42	1,061.58	
		TOTAL SUB-ACTIVITY	**725,000.00**	**0.00**	**725,000.00**	**713,884.42**	**0.00**	**713,884.42**	**11,115.58**	
		MASS RABIES VACCINATION CAMPAIGN								
0002		RGOB Contribution								
	11.01	Travel - Incountry	195,000.00		195,000.00	194,651.00		194,651.00	349.00	

	14.02	S & M - Medicines & Laboratory Consumables	50,000.00		50,000.00	20,000.00		20,000.00	30,000.00	
	17.01	Op. Exp. - Advertising	36,000.00		36,000.00	35,400.00		35,400.00	600.00	
	17.08	Op. Exp. - Incountry Meetings and Celebrations	69,000.00		69,000.00	67,855.00		67,855.00	1,145.00	
		TOTAL SUB-ACTIVITY	**350,000.00**	**0.00**	**350,000.00**	**317,906.00**	**0.00**	**317,906.00**	**32,094.00**	
		OBSERVATION OF WORLD RABIES DAY AND AWARENESS CAMPAIGN								
0002		RGOB Contribution								
	11.01	Travel - Incountry	59,000.00		59,000.00	58,700.00		58,700.00	300.00	
	14.01	S & M - Office Supplies, Printing, Publications	68,000.00		68,000.00	67,680.00		67,680.00	320.00	
	17.08	Op. Exp. - Incountry Meetings and Celebrations	128,000.00		128,000.00	124,574.00		124,574.00	3,426.00	
		TOTAL SUB-ACTIVITY	**255,000.00**	**0.00**	**255,000.00**	**250,954.00**	**0.00**	**250,954.00**	**4,046.00**	
		RESERCH COMPONENT : SPILL OVER INFECTION RESERCH AND PUBLICATION								
0002		RGOB Contribution								
	11.01	Travel - Incountry	180,000.00		180,000.00	176,895.00		176,895.00	3,105.00	
	14.01	S & M - Office Supplies, Printing, Publications	50,000.00		50,000.00	23,800.00		23,800.00	26,200.00	
		TOTAL SUB-ACTIVITY	**230,000.00**	**0.00**	**230,000.00**	**200,695.00**	**0.00**	**200,695.00**	**29,305.00**	
		IMPLEMENTATION OF CABC								
0002		RGOB Contribution								
	11.01	Travel - Incountry	426,000.00		426,000.00	426,000.00		426,000.00	0.00	
	14.01	S & M - Office Supplies, Printing, Publications	100,000.00		100,000.00	72,712.00		72,712.00	27,288.00	
	14.02	S & M - Medicines & Laboratory Consumables	200,000.00		200,000.00	158,325.00		158,325.00	41,675.00	
	17.03	Op. Exp. - Transportation	90,000.00		90,000.00	78,965.00		78,965.00	11,035.00	
		TOTAL SUB-ACTIVITY	**816,000.00**	**0.00**	**816,000.00**	**736,002.00**	**0.00**	**736,002.00**	**79,998.00**	
		KAP SURVEY AND M&E FOR CNVR								
0002		RGOB Contribution								
	17.09	Op. Exp. - Survey/Census	450,000.00		450,000.00	450,000.00		450,000.00	0.00	
		TOTAL SUB-ACTIVITY	**450,000.00**	**0.00**	**450,000.00**	**450,000.00**	**0.00**	**450,000.00**	**0.00**	
		NATIONAL LEVEL WORKSHOP ON DOG POPULATION MANAGEMENT AND RABIES CONTROL								
0002		RGOB Contribution								

	17.08	Op. Exp. - Incountry Meetings and Celebrations	0.00		0.00			0.00	0.00	
		TOTAL SUB-ACTIVITY	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	
		TOTAL ACTIVITY	**2,826,000.00**	**0.00**	**2,826,000.00**	**2,669,441.42**	**0.00**	**2,669,441.42**	**156,558.58**	**94.46**
		TOTAL OUTPUT	**60,298,000.00**	**5,750,000.00**	**65,935,000.00**	**57,893,011.81**	**5,695,543.90**	**63,588,555.71**	**2,549,444.29**	**96.44**

Annexure 4. List of Staff at NCAH as of June 30 2017

Sl. No.	Name List of Staff	Position Title	EID No.	P/L	Remarks
Veterinary Doctors					
1	Dr. Kinzang Dukpa	Program Director	9603005	P1	
2	Dr. Phuntsho Wangdi	Specialist I (Animal Health)	8202026	ES 1	
3	Dr. N.K. Thapa	Specialist III (Animal Health)	9302007	ES 3	
4	Dr. R B Gurung	Principal Livestock Health Officer	9603028	P1	
5	Dr. Vijay Raika	Principal Livestock Health Officer	9411039	P1	
6	Dr. Tenzin	Principal Livestock Health Officer	2001032	P1	
7	Dr. Hiruka Mahat	Dy. Chief Veterinary Officer	200501113	P2	
8	Dr. Yoenten Phuentshok	Veterinary Officer	201201031	P4	
Technical Staff					
9	Sangay Tenzin	Sr. Laboratory Officer	200801020	P3	**EOL**
10	Puspa Maya Sharma	Laboratory Officer	20140103185	P4	
11	Purna Bdr. Rai	Sr. Laboratory Technician II	8806138	SS3	
12	Harka Bdr. Tamang	Sr. Livestock Health Supervisor II	8307007	SS3	
13	Sonam Dorji	Sr. Livestock Health Supervisor II	8106010	SS3	
14	Namgay Dorji	Sr. Livestock Health Supervisor II	200208011	SS3	
15	Migma	Sr. Laboratory Technician II	9801103	SS3	
16	Phuntsho Wangmo	Sr. Extension Supervisor III	200308065	SS4	
17	Tenzinla	Sr. Laboratory Technician III	9901013	SS4	
18	Dawa Tshering	Sr. Laboratory Technician III	9901014	SS4	
19	Sonam Dolma	Livestock Production Supervisor II	201007343	S2	**Study leave**
20	Ugyen Pema	Asstt. Laboratory Technician I	2109009	S2	
21	Punya Mata Sanyasi	Asstt. Laboratory Technician I	200206009	S2	
22	Kelzang Lhamo	Asstt. Laboratory Technician I	200310013	S2	
23	Tshewang Dema	Asstt. Laboratory Technician I	200407360	S2	
24	Karma Choki	Asstt. Laboratory Technician I	2108008	S2	

25	Pasang Bida	Asstt. Laboratory Technician I	2109008	S2	
26	Pema Tshomo	Laboratory Assistant I	200507358	S4	
Administrative Section					
27	Pari Chhetri	Accounts Assistant IV	9709051	SS3	
28	Tshewang Dakpa	Accounts Assistant III	8712024	SS4	
29	Karma Dekar	Sr. Administrative Assistant IV	9507009	S1	
30	Tashi Penjor	Sr. Technician III	8602072	S2	
31	Kuenzang Dorji	Store Keeper	200610025	S4	
32	Pemo	Sr. Telephone Operator II	9904051	O1	
33	Phuntsho Choden	Administrative Asst II	200712003	S4	
Drivers					
34	Penjor	Driver	9906003	O1	
35	Tashi Gayleg	Driver	2006039	O1	
36	Pema Wangdi	Driver	2106032	O1	
37	Sangay Tshering	Driver	9902017	O1	
38	Rinchen Tshering	Driver	9903019	O1	
39	Tshewang Rinzin	Driver	201108012	O3	
Attendants					
40	Sonam	Night Guard	ESP		
41	Karna Kumar Tamang	Sweeper	ESP		
42	Karma Phuntsho	Lab Animal Attendant	ESP		
43	Sangay Nidup	Lab Attendant	ESP		
Total Staff Strength:				**43staff**	

Annexure 5: Staff transferred to and from NCAH, Serbithang

1. Dr. S B Chamling Rai, Specialist II (out)
2. Dr. Jambay Dorjee, Specialist III (out)
3. Lokey Thapa, Sr. Livestock Production Officer (out)
4. Yeshey Tshering, Sr. Extension Supervisor II (out)
5. Sangay Lham, Sr. Laboratory Technician II (out)
6. Youdon, Accounts Assistant IV (out)
7. Choki Wangmo, Accounts Assistant IV (out)
8. Dr. Yoenten Phuentshok, Veterinary Officer (in)
9. Pari Chhetri, Accounts Assistant IV (in)
10. Tshering Dem Tamang, Lab Officer (resigned)
11. Tshering Dema, Lib asst (resigned)

Annexure 6: Promotion acquired during the FY 2016-2017

1. Dr. Tenzin, Principal Livestock Health Officer (P1A)
2. Harka Bdr Tamang, Sr. Livestock Health Supervisor II
3. Sonam Dorji, Sr. Livestock Health Supervisor II
4. Sangay Lham, Sr. Laboratory Technician II
5. Dr. Hiruka Mahat, Dy. Chief Veterinary Officer

6. Migma, Sr. Laboratory Technician II
7. Phuntsho Choden, Administrative Assistant II
8. Tshewang Rinzin, Driver II

Annexure 7: Details of Infrastructure

Sl. No	Class of Building	No. of Unit
1	Office building (Administrative Block)	1
2	Laboratory	2
3	Vaccine Production building	1
4	Old Laboratory building (Store)	1
5	Generator House	1
6	Refrigerator Workshop	1
7	Small animal house	1
8	Sheep shed	1
9	Garage	1
10	Animal potency test	1
11	Guard house	1
12	Res. Quarter, Class II	3
13	Res. Quarter, Class III	1
14	Res. quarter, Class IV	4
15	Drivers quarter	2
16	Res. quarter, old hostel	5

Annexure 8: Details of vehicle

Sl. No.	Type of vehicle/ Machinery	Make/Model	Date of Purchase	Registration. No.	Stationed at	Present condition
1	Eicher Bus	Indian/2010	2009	BG-1-A0612	NCAH	Running
2	Scorpio Pick up (Double cabin)	Indian/2008	2008	BG-1-A1601	NCAH	Running
3	Bolero Pick up (Single cabin)	Indian/2008	2008	BG-1-A1602	NCAH	Running
4	Scorpio Pick up (Double cabin)	Indian/2008	2008	BG-1-A1603	NCAH	Running
5	Bike (Bajaj pulsar)	Bajaj Co.2008	2008	BG-2-A0217	NCAH	Running
6	Toyota Hilux (Refrigerator Van)	Japan/2010	2010	BG-1-A1887	NCAH	Running
7	Toyota Hilux (Virgo)	Bangkok	2013	BG-1-A2290	HSI Project	Running
8	Toyota Hilux (Virgo)	Bangkok	2013	BG-1-A2291	HSI Project	Running
9	Bolero	Mahindra, India	2011	BG-1-A1952	HSI Project	Running
10.	Air Force Ambulance	Mahindra, India	2009	BG-1-A1812	HSI Project	Running

Annexure 9: Vehicle Expenditure for maintenance and spare parts

Sl. No	Vehicle No.	Funding	Cost (Nu.)
1	BG-1-A1601	RGoB	Nu. 1,13,535.00
2	BG-1-A1602	RGoB	Nu. 95,210.00
3	BG-1-A1603	RGoB	Nu. 89,024.00
4	BG-1-A1887	RGoB	Nu. 23,495.00
5	BG-1-A0612	RGoB	Nu. 40,755.00
6	BG-1-A2291	HSI Project	Nu. 65,658.00
	BG-1-A2290	HSI Project	Nu. 68,566.00
	BG-1-A1952	HSI Project	Nu. 1,66,791.00
Total Amount:			**Nu. 6,63,034.00**

Annexure 10: Construction & Renovation works carried out

Sl. No.	Name of work	Funding	Cost, Nu.
1	Maintenance and repair works	RGoB	Nu.11,30,164.09
2.	Drinking water supply works	RGoB	Nu. 6,85,630.35
3.	Repair and maintenance of lab equipment	RGoB	Nu. 74,100.00

Annexure 11: Other important works coordinated by Administrative section

1. Installation and cable laying of Generator- Nu. 1,29,580.00

Happy Reading and Tashi Delek!