Animal Health Laboratories in Bangladesh: *Current status*

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&
OIE focal person
Bangladesh
Introduction of Bangladesh

Total land area about 1,47,570 Sq.Km; Total population is around 160 million; GDP growth rate around 8%; Fast growing economy in the world; Per capita income US$ 1827.00
Importance of Livestock in Bangladesh

- Livestock sector is an integral part of agriculture
- Livestock meets the demands of animal proteins (meat, milk and eggs)
- A source of ready cash for the villagers
- Contributes in self employment and women empowerment
- About 75% of total population directly/indirectly engaged in livestock husbandry
Livestock at a glance

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Cattle</td>
<td>24.86 million</td>
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</tr>
<tr>
<td>Buffalo</td>
<td>1.48 million</td>
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<tr>
<td>Goat</td>
<td>26.1 million</td>
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<tr>
<td>Sheep</td>
<td>3.46 million</td>
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<tr>
<td>Chickens</td>
<td>282.14 million</td>
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<tr>
<td>Ducks</td>
<td>55.85 million</td>
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<table>
<thead>
<tr>
<th></th>
<th>Milk (m.m. ton)</th>
<th>Meat (m.m. ton)</th>
<th>Egg (million)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>9.41</td>
<td>7.26</td>
<td>15520.0</td>
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Bangladesh is self sufficient in meat production (120gm/head/day)
State Veterinary Services

State Veterinary services is
- Under Ministry of Fisheries and Livestock
- Regulated by Department of Livestock Services with 5 wing (directorate): Administration, Extension, Research, Production and Training.
- Laboratory activities is under Research and Training

<table>
<thead>
<tr>
<th>Set up of Department of Livestock Services</th>
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<tbody>
<tr>
<td>Directorate</td>
<td>05</td>
</tr>
<tr>
<td>Districts HQ</td>
<td>64</td>
</tr>
<tr>
<td>Upazilla HQ</td>
<td>491</td>
</tr>
<tr>
<td>Metropolitan Thana</td>
<td>9</td>
</tr>
<tr>
<td>Central Diseases Investigation Lab</td>
<td>01</td>
</tr>
<tr>
<td>Distric Veterinary Hospital with lab</td>
<td>64</td>
</tr>
<tr>
<td>FDILs</td>
<td>09</td>
</tr>
<tr>
<td>Vaccine Production Lab</td>
<td>01 (produce 17 vaccines)</td>
</tr>
<tr>
<td>Epidemiology unit</td>
<td>01</td>
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Animal Health Laboratories in Bangladesh

<table>
<thead>
<tr>
<th>Laboratory Type</th>
<th>Number</th>
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<tbody>
<tr>
<td>Central Diseases Investigation Lab (CDIL)</td>
<td>01</td>
</tr>
<tr>
<td>Field Disease Investigation Laboratories (FDIL)</td>
<td>09</td>
</tr>
<tr>
<td>District Veterinary Hospital with lab</td>
<td>64</td>
</tr>
<tr>
<td>Vaccine Production Lab</td>
<td>01 (produce 17 vaccines)</td>
</tr>
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<td>Epidemiology unit</td>
<td>01</td>
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- **CDIL**: Central Diseases Investigation Lab
- **FDIL**: Field Disease Investigation Laboratories
- **Vaccine lab is at Dhaka**
- **In each District Centre there is District Vet Hospital**
- **In addition there is one Pathology lab, one Toxicology lab, one Ectoparasitology lab and one endoparasitology lab at Dhaka**
Laboratory Activities related setup

- There are setup with Veterinarians at Upazilla level (sub-district level)
- Veterinarians are engaged with initial disease diagnosis, treatment and extension services.
- If, necessary they send samples to lab for confirmatory diagnosis.
- If there is any outbreak, they report to the higher authority for investigation and lab become engaged for epidemiological investigation thereof with the help of EPI unit of DLS and/or donor agencies.
- Laboratory and epi unit contribute in control activities/strategy development
Laboratory Activities

➢ Among the Laboratories, CDIL act as the National & Central Animal health laboratory.

➢ CDIL is linked with other laboratories (District Veterinary hospital, FDILs) and Upazilla setup

➢ Even livestock stake holders can communicate directly to CDIL or other labs

➢ Labs reports diseases (other than notifiable diseases) directly to the stake holders

➢ In case of notifiable diseases, reported to CVO, Bangladesh for reporting to OIE
Laboratory work flow

- Diseases reports are sent to EPI unit
- EPI unit and CDIL/other labs contribute in epidemiological investigation.

Disease investigation/diagnosis and reporting system
Lab Facilities

Bacteriology: Culture, isolation & Identification, AMR, AST, Staining & microscopy, Biochemical test and molecular detection, Rapid test kit

Serology: ELISA, HA & HI, Plate agglutination

Parasitology: Hemoprotozoa, Gastro-intestinal parasite by direct smear and floatation or sedimentation method

Virology: Only molecular detection by PCR & qPCR. Rapid kit based diagnosis (Culture, Isolation id under progress)

➢ CDIL has SOP for each test
➢ CDIL has facilities of Biosafety level II
➢ CDIL has facilities of record keeping and reporting
➢ CDIL is well equipped with lab instruments
Lab Facilities

**FDILS**
- Bacteriology: Culture, Identification, Staining & microscopy,
- Serology: HA & HI, Plate agglutination
- Parasitology: Hemoprotezoa, Gastro-intestinal parasite by direct smear and floatation or sedimentation method
- Necropsy

**Dist. Vet hospitals**
- Bacteriology: Staining & microscopy,
- Necropsy
- Parasitology: Gastro-intestinal parasite by direct smear and microscopy
## Status of Animal Health Laboratories

<table>
<thead>
<tr>
<th>Name</th>
<th>status</th>
<th>Accreditation status</th>
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<tbody>
<tr>
<td>CDIL</td>
<td>National Central Lab</td>
<td>Not accredited <em>(preparing to apply for accreditation)</em></td>
</tr>
<tr>
<td>FDIL</td>
<td>Regional lab</td>
<td>Not accredited</td>
</tr>
<tr>
<td>District Veterinary Hospital</td>
<td>Peripheral lab</td>
<td>Not accredited</td>
</tr>
<tr>
<td>QC lab, DLS</td>
<td>On process of establishment</td>
<td>Needs help from regional, international level for accreditation, GLP, Biosafety and biosecurity</td>
</tr>
<tr>
<td>Bangladesh Livestock Research Institute (BLRI)</td>
<td>Research lab for innovation (Vaccine)</td>
<td>Not accredited?</td>
</tr>
<tr>
<td>National Reference lab for AIV</td>
<td>RL</td>
<td>Not accredited?</td>
</tr>
<tr>
<td>National Reference lab for PPR</td>
<td>RL</td>
<td>Not accredited?</td>
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Stakeholders

➢ Livestock rearer throughout the country
➢ Bangladesh National Zoo
➢ Other Zoo/Safari
➢ Military Farms
➢ BGB Farms
➢ Police Academy farms
➢ Dog squad of Army, BGB, RAB, Police and other
➢ Samples from District, Upazilla and other Livestock Offices
➢ Bango Bhaban and Gono Bhaban
➢ Export and Import items
➢ Others
CDIL at a glance

Established: 1957
Address: 48, Kazi Alauddin Road, Dhaka-1000
One Two storied building
(Total 12000 sqft)
Manpower: 15
One vehicle for sample transportation
One incinerator
Services

- Disease diagnosis
- Disease outbreak investigation
- Microbial Analysis of Export & Import Items
- Assistance in research work
- Training
Disease diagnosis

Based on

- Necropsy
- Culture
- Biochemical
- Staining & microscopy
- Histopathology
- Serology
- Molecular biology (PCR, RT-PCR and Real time PCR)
Viral Diseases

- CDIL have facilities for diagnosis of AIV, FMDV, PPR, SRDs, CSF, ND, IB, IBD, Avian Leukosis, ILT, IBH, Avian respiratory diseases using PCR&/or real time PCR.

- For serological approach, there are ELISA facilities for AIV, FMDV, PPRV, ND, IB, Avian Retro virus.

- CDIL also conduct HA and HI test.

- Rapid detection of AIV, MG, Canine Parvo virus
Bacterial Diseases

- Bacterial disease detection is based on Culture, biochemical test, staining and microscopy.
- Culture free detection method (Staining & microscopy and/or PCR) is applied for Anthrax, TB, brucellosis (Rapid test & RBT).
- Thus facilities are available for Anthrax, BQ, Pasteurellosis, Salmonellosis, TB, Brucellosis.

- CDIL regularly conduct AST for bacterial diseases.
- It also conducting AMR test by disc diffusion method as well as PCR.
Other diseases

CDIL also have facilities to detect hemoproteozoan parasites (Babesia, Theileria, anaplasma, Trypanosoma, Avian plasmodia) based on Staining and microscopy.

Mastitis detection based on CMT and cultural techniques.

Steroid detection in fattened cattle based on ELISA

Recently introduced Somatic cell counter for detection of sub-clinical mastitis.
Export & Import Items

- Some test facilities for Export and import sample are available.
- Small ruminant respiratory diseases by multiplex q-RT-PCR and ELISA.
- Screening of avian respiratory diseases (ND, AIV, IBV, ILT, IC, MG, aMPV) by PCR and RT-PCR.
- Regular screening of AIV type-A in imported day old chicks.
- Microbial analysis of meat, frozen foods, sweets, leather, bully sticks, feather, duck down, dried ear, tail hair, omasum, horn, hoof, bone.
Collaborative Projects

✓ Vet Lab network project with IAEA-FAO
✓ AMR detection project with FAO
✓ Anthrax detection project with CDC-Atlanta
✓ Rabies detection strengthening project with CDC-Atlanta
✓ Liaison with different national and international labs.
✓ Network between laboratories home and abroad (FDIL, BLRI, BAU, CVASU, icddr,b, IEDCR, IAEA, CDC) although not black and white
✓ PREDIC-II study for emerging disease detection
Training

• CDIL Provides training for FDIL and LRI Scientists, Field officers and Staffs, University Intern Students.
• MS students also work in CDIL
  ➢ Sample collection, preparation, transportation and preservation
  ➢ ELISA, PCR, RT-PCR, bio-safety & biosecurity
  ➢ Anthrax sample collection, handling and transportation
  ➢ Anthrax detection by PCR and staining
  ➢ Different staining protocol
  ➢ Performing necropsy of birds and small animals
  ➢ Performing HI, HA tests
  ➢ Diagnosis of parasitic diseases
Recent developments

➢ Application of multiplex qPCR for Small ruminant Respiratory disease detection
➢ Application of PCR for avian respiratory disease detection
➢ Identification of meat of different species
➢ AMR testing and detection of anti-microbial resistance gene in E. coli using PCR techniques
➢ In a recent ongoing study, 108 E. coli isolates were tested for AST from 164 samples collected, of which 50% isolates ESBL-resistant.
➢ Partial renovation of the Lab
➢ H9 Survey at Breeder farm
➢ H5 Vaccination monitoring for new vaccines
➢ Classical Swain Fever detected
Recent developments

- CDIL has dedicated incinerator for waste disposal
- Installed online power backup for Molecular lab
- Conduct yearly calibration of few biosafety cabinet
- Developing efficiency for in-lab calibration of micropipettes
- Installed new qPCR machine
- Collected ATCC strains
- Conduct yearly Bio-risk assessment
- Scientists and staffs participates in biosafety and biosecurity training
- Lab has biosafety and risk assessment team
- Lab is updating the existing SOPs to be used
- Lab has different forms
UTILIZING EXISTING SURVEILLANCE PLATFORMS TO ESTABLISH A SUSTAINABLE AMR NATIONAL SURVEILLANCE AND MONITORING SYSTEM IN BANGLADESH

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3. Food Safety and Quality Unit, Food and Agriculture Organization of the United Nations, Rome, Italy
4. International Centre for Diarrheal Disease Research, Bangladesh, Dhaka, Bangladesh

Abstract

A national surveillance system for avian influenza (AI) monitoring was adapted for inclusion of active poultry AMR surveillance programme by the Department of Livestock Services (DLS) in Bangladesh with technical support from the Food and Agriculture Organization of the United Nations (FAO). To make the AMR surveillance system efficient and sustainable, existing human and financial resources are being used for a low-cost longitudinal AMR monitoring system rather than relying on external support or cross-sectional studies. Extended spectrum β-lactamase (ESBL)-resistant Escherichia coli (E. coli) identified through the disk diffusion antimicrobial sensitivity testing (AST) method were selected as the indicator bacteria for AMR in the first phase of surveillance.

Introduction

Although the usage of significant amounts of OIE and WHO critically important antibiotics in livestock production is well recognized, the impact of antimicrobial usage (AMU) on antimicrobial resistance (AMR) in Bangladesh is still poorly characterized. Furthermore, no standard surveillance system is in place to monitor AMR over time. As a result, impact of changes in AMR policy and AMU practices cannot be assessed. Within the poultry sector specifically, there is limited data to assess the magnitude of AMR burden in poultry and to increase awareness amongst frontline veterinarians on the public health impacts of inappropriate AMU. Recognizing that available government human and laboratory resources for animal surveillance activities are limited due to existing activities, a AMR monitoring and surveillance system was needed which would not require additional field sampling staff, sampling expense, or additional lab staffing.

Methods

To achieve the desired efficiency target of no additional staff recruitment or expense for either field sampling or laboratory staff, the AMR monitoring and surveillance system for poultry was integrated with the ongoing AI Sink Surveillance programme which monitors influenza virus circulation within the urban live bird markets (LBM) of Dhaka. The following steps were utilized to design and initiate the AMR Sink Surveillance programme:

1. Poultry AMR surveillance guideline and standard operating procedures (SOP) for sample collection and laboratory testing of antimicrobial sensitivity were developed.
2. Utilizing existing Market Environment Surveillance Officers (MESOs) within the Government of Bangladesh who were already collecting samples for the national AI Sink Surveillance programme were cross-trained by FAO in the sampling method for AMR surveillance. Two scientific officers of the government of Central Disease Investigation Laboratory (CDIL) were trained at the ioddr microbiology laboratory on bacterial culture and antimicrobial sensitivity testing (AST) using the disk diffusion method.
3. Sample collection was initiated in March 2016. Within each LBM visited by the MESO, one broiler and one Sowai breed viscera with intact caeca are selected and placed in a resorbable plastic quart bags. The collected caecal samples are then delivered with sample submission form in cooler box with pre-chilled ice pack to the Central Disease Investigation Laboratory (CDIL) within 24 hours.
4. Caecal samples are processed and cultured according to the SOP for the isolation of Escherichia coli and tested for resistance to 15 commonly antibiotics through the disk diffusion method. ESBL producers were characterized at initial screening test level using disk diffusion method with ceftazidime (30µg) and cefotaxime (30µg) antibiotic disks.
5. To improve data management and minimize classification errors of zone of inhibition (ZOI) readings, an information management system was developed by FAO for managing all sample and test result data, including automatic classification of ZOI readings based on established standards.

Results

Each month MESOs collect 48 poultry caecal samples from 24 LBMs in Dhaka and sent to DLS Central Disease Investigation Laboratory for bacterial culture and AST at no additional cost compared to the previous AI surveillance programme. Thus far 164 caecal samples have been collected and 44 isolates of E. coli have been successfully isolated. Of those, 23 (52%) were ESBL-resistant.

Conclusions

Bangladesh has demonstrated that it is possible to successfully establish an AMR monitoring and surveillance system in poultry when human and laboratory resources are limited. In the case of Bangladesh, integration with the existing avian influenza Sink Surveillance programme enabled initiation of the AMR surveillance system with no additional sampling or staffing costs. The surveillance findings are reported by DLS to stakeholders on a regular basis to assess impact of AMU interventions as well as to inform policy and practice. Efforts are underway to further mainstream surveillance efforts such that all costs for the surveillance system can be borne within a realistic government budget.
Recent Achievements

➢ Successfully completed both the serological and molecular proficiency test (PT) for PPRV with IAEA lab and obtained absolute score

➢ Participated in PT for AIV -2019 with AAHL
Certificate of Successful Participation

This is to certify that the

Central Disease Investigation Laboratory

has participated in the 2018 proficiency test on **diagnosis of Peste des Petits Ruminants by serological methods** and obtained a perfect score

**Score: 100%**

The Animal Production and Health Laboratory of the Joint FAO/IAEA Division would like to congratulate the laboratory team for this significant result.

Dr. Giovanni Cattoli  
Laboratory Head  
Animal Production and Health Laboratory  
Seibersdorf/ Vienna, Austria

December 2018

Certificate of Successful Participation

This is to certify that the

Central Disease Investigation Laboratory

has participated in the 2018 proficiency test on **diagnosis of Peste des Petits Ruminants by molecular methods (nucleic acid detection)** and obtained a perfect score

**Score: 100%**

The Animal Production and Health Laboratory of the Joint FAO/IAEA Division would like to congratulate the laboratory team for this significant result.

Dr. Giovanni Cattoli  
Laboratory Head  
Animal Production and Health Laboratory  
Seibersdorf/ Vienna, Austria

December 2018
Needs regarding sustainability and accreditation

1. Human Resources needs more training to improve lab expertise as well as GLP.
2. Calibrations services need to be developed
3. Improvements in software based record keeping (software development)
4. Renovations
5. Development of virology lab (culture, isolation)
6. Fund
• Some pictures
Necropsy

DUCK PLAGUE

Gross lesion of AI in chicken

Clinical signs of AI in Chicken
Bacteriology
Thanks for patience hearing