



Strengthening laboratory network for early and rapid diagnosis of transboundary animal and zoonotic diseases in Botswana

The challenge

Transboundary animal diseases (TADs) such as foot and mouth disease, Newcastle disease, peste des petits ruminants, African swine fever and contagious bovine pleuropneumonia, as well as animal diseases that can spread to humans – known as zoonotic diseases – such as avian influenza, Rift Valley fever rabies, tuberculosis and anthrax can have significant effects on human and animal health, food security and nutrition, and on economic output and international trade. These diseases threaten livestock in Botswana, as even after eradication, they can be carried into the country by wild animals and spread to livestock.

Early and accurate diagnosis of TADs is essential to protect domestic animals, farmers and the general population. Disease detection, prevention and control require reliable and fast laboratory services. The Botswana National Veterinary Laboratory (BNVL), the only veterinary laboratory in the country, plays a pivotal role in providing animal disease diagnostic services. BNVL also plays an important role in the wider Southern African Development Community (SADC), as it is a World Organisation for Animal Health (OIE) reference laboratory for

contagious bovine pleuropneumonia and a Regional Service Laboratory for avian influenza and other TADs.

Botswana has a livestock population of 2.2 million cattle, 1.6 million goats, 300 000 sheep. On average, BNVL, which is in Gaborone, receives 60 000 samples annually for analysis from around the country. BNVL conducts testing for all diseases, including basic tests that could be performed by less equipped laboratories. The volume of the samples and tests is beyond the current capacity of the lab, resulting in longer turnaround time and slower disease diagnosis. Districts far away from BNVL accumulate samples before dispatching batches to the lab to make transportation more cost effective. This delays the submission of samples for testing and leads to late disease diagnosis. District laboratories are needed that can carry out diagnostic procedures that do not require sophisticated equipment or specialized personnel. This will support early disease diagnosis and timely reaction. BNVL, as a central laboratory would provide specialized services, conduct research and expand its role in training and supporting other labs to enhance their expertise and performance, both in-country and in the wider SADC region.



Joseph Wakala is raising 200 cattle at the edge of the Kalahari desert in southern Botswana. Thanks to the veterinary surveillance and food inspection system now in place, the meat from his cattle will be sold at the lucrative European market.(Photo: M.Gaspar/IAEA)

The project

An IAEA technical cooperation project has helped to transform BNVL from a national veterinary laboratory requiring the support of international reference laboratories to a laboratory self-sufficient in first line diagnoses and diagnostic confirmations. In addition, BNVL is serving as a reference and confirmatory diagnostic laboratory for the SADC region. The IAEA, in partnership with FAO, assisted with the transfer of technology, providing training and supporting the implementation of nuclear and nuclear-derived immunological (enzyme-linked immunosorbent assay and radioimmunoassay), molecular (polymerase chain reaction (PCR) and real-time PCR) and atomic technologies (irradiation and stable isotopes), quality assurance management and the accreditation of diagnostic tests according to ISO/IEC 17025 standard. The project also supported the establishment of two satellite laboratories that can perform first line diagnoses in key agricultural areas of the country. The Jwaneng Satellite laboratory (about 200 km west of Gaborone) became operational in 2016 and is now providing first line parasitic disease diagnoses which will be expanded to include virological and bacteriological diagnoses by the end of 2018. The Maun Satellite Veterinary Laboratory (about 1000 km north of Gaborone) will become fully operational in 2018, focusing mainly on foot and mouth disease. Staff from BNVL are actively involved in the operations of both satellite laboratories.

The impact

The implementation of advanced detection/diagnostic platforms for pathogen detection at BNVL have contributed to more effective diagnosis, prevention and control of animal and zoonotic diseases by veterinary authorities in Botswana, resulting in increased domestic food security and continued beef exports to lucrative European markets. BNVL's increased capacity has enabled it to better support the diagnosis and control of these diseases not only in Botswana, but also in SADC and Africa.

The establishment of the satellite laboratories is leading to an improved turnaround time, which will contribute to early disease diagnosis and reaction. BNVL continues to act as a central laboratory providing specialised services and research and is expanding its role in training and supporting other laboratories to enhance their expertise and services to farmers.

PROJECT INFORMATION

Project No: BOT5015

Project title: Establishing District Laboratories that use Nuclear and Molecular Techniques for Early and Rapid Diagnosis of Endemic and Transboundary Animal Diseases

Duration: 2016-2017 (2 years)

Budget: €233 900

Contributing to:



Partnerships and counterparts

The project was supported by the Food and Agriculture Organization of the United Nations (FAO) through the IAEA/FAO Joint Division, which provided field surveillance and epidemiology supported by FAO (which field samples to collect and send to BNVL) and laboratory detection and characterization supported by the IAEA (which tests to use and how to interpret the data).

Facts and figures

- BNVL performs 15 000 immunological and 6000 molecular tests on a subset of the more than 60 000 samples it receives each year. The remaining samples are analysed using classical macroscopic and microscopic techniques.
- BNVL provides training courses to local veterinarians and veterinary extension service staff with support from the IAEA and FAO.
- BNVL is now ISO/IEC 17025 accredited for more than ten animal disease testing procedures with strong commitment to accredit eight more by 2020.

The science

The IAEA-supported technologies are nuclear and nuclear-derived immunological and molecular diagnostic technologies, which allow detection of whether an animal has been exposed to a pathogen, and whether the suspect animal has developed pathogen specific antibodies in its blood. Antibody presence in the blood of an animal indicates exposure to the pathogen or its vaccine and is an indicator of the animal's protection levels. The tests also show whether the animal is infected with the pathogen (i.e. pathogen nucleic acid presence would indicate infection and possible spread to other animals).