

Taking the Lab into the Field

nuclear applications rapidly diagnose animal disease



After a four-hour drive over dusty, potholed roads, the vets finally reach their first destination — Yagoua in northern Cameroon.

The team consults with the staff of the local animal health services and heads further north towards the Chad border to a village where goats have reportedly been dying.

Off the main roads, driving becomes more difficult. With no lighting or signposts, navigation in rural Cameroon is not easy.

Finally, the team reaches Gabarey Waka, the scene of the reported disease outbreak. It is five o'clock — one hour until sunset when the village will be enveloped in darkness.

Inquisitive children greet the visitors. Two little boys, accompanied by their father, are holding baby goats. The animals, like many in the herd, are sick.

The goats have diarrhoea, infected eyes and sores in their mouths. The farmer is worried. Many of his goats have already died. They are his family's main source of food and its only source of income.

The vets, from LANAVET, Cameroon's National Veterinary Service, get to work. In just a few minutes, they set up a small table with chairs and unload a range of sophisticated sampling equipment from the back of their vehicle. They also change into their protective veterinary gear: rubber gloves, brown coats and boots.

By now, the whole village has gathered to observe the unfolding spectacle. After clinical inspections, the vets take blood samples from the animals, process them and place them into a small device, bearing the IAEA logo, which is linked to a laptop and powered from the car battery.

The vets get to work. In just a few minutes, they set up a small table and unload a range of sophisticated sampling equipment.

(Photo: P.Pavlicek/IAEA)



The system is capable of performing rapid and highly accurate diagnostic tests, on-site, in under an hour.

(Photo: P.Pavlicek/IAEA)

After just 45 minutes, they have a diagnosis: PPR, or peste des petits ruminants, a highly contagious virus that kills goats and sheep.

The farmer, Galgava Oumarou, is distraught: "I'm a poor farmer. I've no other source of revenue apart from these animals. Nearly all of them have died from disease," he says.

"I used to sell them to get money to take care of my family. Now that these goats are no more, I do not know what to do. Poverty has stepped into my house and I don't know how I will feed my family."

The technique the vets are using is known as "LAMP PCR"- Loop-Mediated Isothermal Amplification, based on real-time Polymerase Chain Reaction.

It sounds complex and it is. But scientists from the Joint Division of the IAEA and the UN's Food and Agriculture Organization (FAO) have been able to condense four years of research using isotope technology and nuclear-related techniques into one small, portable kit.

The system is capable of performing rapid and highly accurate diagnostic tests, on-site, in under

an hour. In the past, several days were needed to perform the same diagnosis in a well-equipped laboratory.

Senior LANAVET vet Abel Wade says, "This technique has revolutionised traditional diagnostic procedures. In the past, I had to take samples, then return to my lab or wait for samples to arrive from the field. It could take weeks, even a month, before we actually got round to testing the samples and confirming an outbreak of a disease.

"Now, with this portable lab, we can run tests at the farms, in the bush. It's easy-to-use, quick, and works in high temperatures. We can give immediate advice to the farmer to prevent further losses and to limit the spread of the disease."

Animal diseases are a major problem in many African countries, including Cameroon, where the majority of people depend on agriculture and livestock for food and income.

According to estimates from the Interafrican Bureau for Animal Resources Office, around 300 million people in Africa depend on livestock for their livelihoods.

But 25 % of these animals die annually from preventable diseases. For example, whole flocks of poultry infected with Newcastle Disease are sometimes killed.

"I've seen people crying because of outbreaks of diseases like foot and mouth disease, which can kill more than 100 cows — that's 50% of one herd," says Wade. "Cattle are especially important here because you can use cows for their milk, meat and for farming. If you need some money for hospital fees or a scholarship, then you sell cows at the market."

The project, which led to the development of the portable diagnostic platform, was originally launched in 2008 as a direct response to the needs of many countries for the rapid diagnosis of avian influenza, in rural settings and outside of a conventional laboratory.

FAO/IAEA animal disease expert Hermann Unger says, "The rapid diagnosis and confirmation of an infectious disease, best at an early stage, is the prerequisite for its cost-effective control and to curb its spread."

"As most of the diagnostic techniques used so far needed laboratory-based equipment, the development of the LAMP technique in a

portable, robust and simple kit format, which makes it possible to confirm disease in the field in less than an hour, is a major step forward."

With an early diagnosis, quick decisions can be made on how best to contain and control a disease — by quarantine, treatment or vaccination. Fast action can not only limit damage to the affected herds, but can also prevent the disease from spreading into neighbouring villages or even other countries.

The LAMP PCR device can run tests simultaneously for up to eight diseases, including foot and mouth disease, African swine fever and peste des petits ruminants, as well as for diseases such as avian influenza (H5N1), Rift Valley fever and bovine tuberculosis that affect both animals and humans.

"Of course, Africa is not the only place where we're contributing with this new technology," says Unger. The IAEA, through its Technical

Cooperation Department, has already provided devices costing around € 4000 each to more than 30 countries in Africa and Asia.

"In Sri Lanka, for example, we're seeing good progress in applying the technology on leptospirosis, an animal disease that is also infecting rice farmers," Unger says.

Livestock supports the livelihoods and food security of almost a billion people worldwide. As populations increase, countries not only need to increase livestock production, but also need more efficient tools for the prevention, diagnosis and control of animal diseases.

Nuclear and nuclear-related technologies have an essential role to play in maintaining animal health and protecting vulnerable communities.

Louise Potterton, Division of Public Information.
E-mail: L.Potterton@iaea.org

Swift animal disease diagnosis reduce the risk of livestock loss in sub-Saharan Africa

Livestock is the economic backbone for many subsistence farmers in poor countries. Farmers look after their animals for meat and milk, draught power and for social and cultural reasons. However, livestock are vulnerable to a number of highly infectious transboundary animal diseases (TADs) that can spread to other countries. Swift diagnosis is therefore crucial.

In partnership with the FAO, the IAEA develops new technologies and strategies to combat major livestock diseases. Fellows and beneficiaries explain how they have benefitted.

Technician Eugene Arinaitwe (top photo) was trained at the FAO/IAEA's Animal Production and Health Laboratory.

"At the Agency's Seibersdorf laboratories, I've learnt new techniques for the rapid and highly accurate diagnosis of animal diseases. I'll use the experience I've acquired here to train my fellow technicians in my home country, Uganda. This way, I can use this training to improve the diagnostic capacity in the lab where I work."

Cattle farmer Amadou Ama Adama (middle photo) was assisted by the National Veterinary Laboratory through an FAO/IAEA project.

"Some of my cattle die every year from Foot-and-Mouth Disease and this is a great financial loss. But during a recent outbreak the vets came to my farm and collected samples from the sick animals for laboratory analysis. They advised me on how to avoid the further spread of the disease and they gave me drugs to help heal the wounds."

Molecular Biologist Abel Wade (bottom photo) coordinates FAO/IAEA projects at the National Veterinary Laboratory, LANAVET.

"The collaboration between LANAVET and the IAEA is excellent and very important for the farmers we assist. If we can diagnose a disease quickly with the techniques provided by the IAEA, we can stop it from spreading. If it wasn't for the IAEA, we would have never reached the stage where we are now in the analysis and control of animal diseases."



Text: Louise Potterton & Juanita Perez-Vargas, Division of Public Information