

Morocco controls foot-and-mouth disease with the help of nuclear-derived methods

By Elodie Broussard



Taking a sample from a cow to test for foot-and-mouth disease.

(Photo: F. El Mellouli/LRARC)

In early 2020, Morocco celebrated a year without foot-and-mouth disease (FMD), a highly contagious animal disease, after launching a series of vaccination campaigns to control a new strain of the FMD virus, which was identified in 2019 using nuclear-derived methods. This achievement was made possible in part through the support of the IAEA, in partnership with the Food and Agriculture Organization of the United Nations (FAO).

FMD is an often fatal disease that affects cattle and ruminants, both domesticated and wild, and can severely impact food security and livelihoods. Morocco has 29 million cattle, sheep, goats and camels, and its livestock sector contributes nearly 13% of agricultural gross domestic product.

When outbreaks hit several Moroccan provinces in 2019, herds were rapidly infected in five locations. For each confirmed case, all livestock within a three-kilometre

radius were slaughtered, and a surveillance zone with a radius of ten kilometres was established, blocking the sale of animals and animal food products.

To rapidly control the spread of the disease, the Regional Laboratory for Analysis and Research of Casablanca (LRARC) used nuclear-derived techniques, which can provide quick and accurate analysis (see the Science Box). Other techniques take longer to identify the disease, resulting in an increased number of infected animals and higher outbreak-related costs.

“The real challenge for national veterinary authorities was to know whether the outbreaks were caused by the same strain of the FMD virus as the one detected in 2015 during the previous outbreak,” said Ivancho Naletoski, Animal Health Officer at the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture.

In 2017, experts from the Joint FAO/IAEA Division, with support from the IAEA technical cooperation programme, trained ten veterinary laboratory staff from Morocco and provided them with equipment and supplies to facilitate disease identification and guide control and response measures. The trainees included staff from LRARC, who subsequently identified the new FMD strain in early 2019 by using their acquired skills, as well as the genetic sequencing service established through the Joint Division.

Shortly after the FMD outbreak, the specific virus genome was sequenced by LRARC and compared with the locally circulating strains. LRARC simultaneously sent samples for genetic sequence analysis to the Laboratory for Animal Health in Maisons-Alfort, France, a reference institution for FMD identification, where LRARC's diagnosis was confirmed.

“Identifying the strain of a virus is the first step for national veterinary authorities in the case of an outbreak. The second step is to select or develop a proper vaccine, as each strain needs a specific one,” said Naletoski.

Once the new strain and vaccine were identified, the Moroccan veterinary authorities implemented vaccination campaigns within a few weeks, which rapidly halted the spread of the disease. Compulsory mass vaccination campaigns for susceptible ruminants (cattle, goats and sheep) were carried out across the whole country at no cost to farmers. These campaigns have helped



to strengthen the animals' immunity and have prevented the spread of the virus.

“The genome sequencing transferred by the IAEA to our lab enabled us to rapidly discriminate the circulating strains in the country and to adjust disease control plans accordingly,” said Fatiha El Mellouli, Head of the Animal and Plant Health Service at LRARC.

The benefits of these efforts are tangible for farmers, producers and exporters of animals and animal products in Morocco. The country has also ultimately maintained its national FMD control programme, endorsed by the World Organisation for Animal Health (OIE) since 2012, and is continuing its efforts to improve animal health and related trade.

Samples from livestock waiting to be tested for viruses.

(Photo: N. Jawerth/IAEA)

THE SCIENCE

Genetic sequencing & polymerase chain reaction

Genetic sequencing is a nuclear-derived technique that analyzes the way in which nucleic acid — ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) — information is arranged inside pathogens. This technique describes the composition of the genetic material, helping scientists to predict the function of the analysed gene, its impact and the behaviour of the pathogen. This not only helps to diagnose a disease but can also disclose its origin and evolution, as well as its potential threat.

Such nuclear-derived tools and techniques are frequently used for the phylogenetic analysis of FMD and other diseases such as rabies, brucellosis and Ebola.

See page 8 for more information about **polymerase chain reaction (PCR)**.