A diagnostic tool spots encephalitis in sheep and goats

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The biologist Idoia Glaria-Ezquer has developed a diagnostic tool specifically for detecting encephalitis caused by small-ruminant lentiviruses in sheep and goats; its epidemiological interest lies in the fact that it enables the spread of highly pathogenic lineages affecting flocks to be controlled; the disease leads to economic losses and there is no treatment or vaccine to combat it.

This research was part of her PhD thesis read at the Public University of Navarre (NUP/UPNA); it focussed on lentiviruses, whose incubation period is very long and affects cows, cats, horses, sheep, goats and primates, and even humans with the Human Immunodeficiency Virus (HIV).

Idoia Glaria's research focussed on lentiviruses in small ruminants. These viruses include the Visna Maedi virus and that of caprine arthritis encephalitis. "They infect sheep and goats spread all over the world and cause multisystemic symptoms affecting joints, lungs, mammary glands and the central nervous system," explained the new PhD holder. "The losses arising out of the infection range from an increase in the replacement rate to a fall in animal production or in the commercial value of the flock. Even though in our country the disease caused by small-ruminant lentiviruses does not lead to alarming symptoms in lungs and mammary glands, epidemiological outbreaks causing arthritis and encephalitis in sheep have been described and which affect a large number of animals and cause direct losses".

Absence of treatments and vaccines

In the absence of treatments or fully protective vaccines, "the measures to control the infection are based on the early detection of infected animals so that they can be removed from the flock. The specimens infected develop an antibody response which, even if it is not capable of eliminating the virus, does point to infection," explained Glaria.

So by studying the presence of antibodies in the blood (serological detection), the infection can be diagnosed indirectly. Yet "the methods available on the market have been designed taking a single viral genotype into consideration, when five of them exist, which, added to the great genetic variability of lentiviruses, causes the available measures to fail when it comes to monitoring all the viruses going around flocks".

The genetic and biological characterisation of the lineages involved in the epidemiological outbreaks of arthritis and encephalitis in sheep and goats "may provide ideas relating to the knowledge of the relationship between the viruses and their capacity to infect specific tissue".

That is why Idoia Glaria studied an epidemiological arthritis outbreak in sheep, one of the first cases in Spain detected mainly in Aragon, and obtained the first description of the sequences of this disease.

She also isolated and genetically characterised a lineage involved in an outbreak of encephalitis located in the Castilla y León region and characterised by the presence of neurological symptoms in young animals. "The animals displayed spinal cord damage, a differentiating fact in the outbreak, and it was possible to isolate a representative lineage," affirmed Glaria.

A new laboratory technique

As a result of this study, the new PhD holder designed a synthetic peptide (a type of molecule) that she used to develop a laboratory technique (known as ELISA, Enzyme-Linked ImmunoSorbent Assay) capable of detecting the animals affected by the encephalitis outbreak. "It is a specific diagnostic tool of epidemiological interest to control the spread of these highly pathogenic lineages," she explained.

In the quest for an alternative means of controlling lentivirus infections, Idoia Glaria conducted research into how they behave in the presence of a protein that plays an important role in innate immunity: APOBEC3. "Sheep have four APOBEC3 proteins with, as yet unknown,antiviral characteristics," she said. "When using monocytes, a type of white blood cell, the research made it possible to confirm that a dramatic fall in one of these proteins, A3Z1, coincided with a significant increase in viral replication. The presence of this protein lowers the capacity of the cells to host viral replication, so the study of them could allow new tools designed to control the infection to be developed."

In her view, "all this constitutes an advance in knowledge about the determining factors not only of the virus but also of the host; this could be important in small-ruminant lentiviruses as it is knowledge that could be extrapolated to infection by other lentiviruses, such as HIV," she concluded.

Provided by Elhuyar Fundazioa

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