Researcher Looks For Test To Detect Scrapie, Other TSEs

WOOSTER, Ohio — Counting sheep is supposed to help us have a good night sleep. But Ohio sheep farmers whose flocks have been infected with scrapie know that sweet dreams can easily turn into nightmares.

Between Oct. 1, 2001, and July 31, 2002, Ohio — which boasts 142,000 head of sheep with a value of $19.8 million- reported the highest number of confirmed cases of scrapie (38) and infected flocks (13) in the country, according to the U.S. Department of Agriculture (USDA).

That's why Srinand Sreevatsan, a researcher with Ohio State University's Ohio Agricultural Research and Development Center (OARDC), is developing a test that can detect scrapie and other transmissible spongiform encephalopathies (TSEs) — including bovine spongiform encephalopathy (BSE, or mad cow disease) in cattle, chronic wasting disease (CWD) in elk and deer, and Creutzfeldt-Jakob Disease (CJD) in humans- using scrapie as a model.

"There is a desperate need for a fast and reliable test for the diagnosis of TSEs in live animals," said Sreevatsan, whose laboratory is part of OARDC's Food Animal Health Research Program (FAHRP). "Early detection could lead to efficient surveillance systems that may avert or control this group of diseases."

Scrapie is a fatal, degenerative disease that affects the central nervous system of sheep and goats. It was inadvertently introduced into the United States from Europe in 1947. Since then, USDA has reported more than 1,600 confirmed scrapie cases in sheep and 10 cases in goats. There is no cure for scrapie, and death is inevitable once the disease is contracted.

The agent responsible for scrapie and other TSEs is smaller than the smallest known virus. It's generally believed to be a prion the abnormal form (PrPsc) of a normal host protein (PrP) that accumulates in the affected brain. How prions kill nerve cells in the brain and lead to serious degerative diseases is still a puzzle. However, Ohio State University researchers recently discovered that PrPsc is able to spontaneously form within the cell's cytosol. Once there, it can convert normal PrP into PrPsc, aiding in the destruction of host nerve cells and helping the disease to spread from cell to cell.

Sreevatsan is looking for a way to identify prions through clinical samples (blood, serum, tonsil scrapings or cerebrospinal fluid) before the onset of symptoms, which usually occurs two to five years after the animal is infected. Although some tests have been developed in the past, definite diagnosis of scrapie is still only possible after death.

"The idea is to detect the prion protein, which is folded abnormally as compared to its normal counterpart, in an animal that's still living, using non-invasive approaches," Sreevatsan explained. "Identifying infected animals early on will be profitable for the farmers, and it will also be very useful in getting rid of infected animals. Anything that will help both the farmers and public health in general, by preventing a spillover of potentially infected meat or meat products into the food chain, will benefit the animal industry a lot."

Scrapie-infected animals tend to itch and pull out their wool (a scraping action that gives the disease its name), eat but remain thin, bunny hop, step high with their front feet, rub on objects, bite at their legs, smack their lips, wobble or stumble, shake, and stare up at the sky, among other symptoms.

"Not much attention has been paid to the economics of this particular problem," Sreevatsan said. "However, it is anticipated that TSEs (CWD and scrapie) will have a significant impact on meat consumption and the acceptability of the carcass. because animals that are infected usually mutilate themselves and are not acceptable for sale."

Decline in meat sales is not the only damage caused by scrapie to the U.S. sheep industry. The presence of the disease here also prevents the export of breeding stock, semen and embryos to many other countries. In addition, TSEs in general are the subject of increased public attention and concern because of the catastrophic effects of mad cow disease in Great Britain and the link between BSE and variant Creutzfeldt-Jakob Disease (vCJD) in people.

According to Sreevatsan, an accurate prion-detection test could also be used to diagnose other TSEs in domestic and wild animals, as well as in humans. The need for such a test is exemplified by concerns regarding the occurrence of CJD in over 30 professional blood donors and the possibility of a mad cow outbreak in the United States.

"Potentially, we could be able to apply the test to detect the prion protein in other animals and humans," Sreevatsan said. "What is of foremost importance now is to find a tool or a set of tools to identify any infected animals and prevent these diseases from getting to people."

Also involved in the prion test project at Sreevatsan's laboratory are Kaori Takemura, an OARDC postdoctoral researcher, and Katie Ringer, a senior neuroscience student at The College of Wooster.

For more information on scrapie, contact the USDA's Animal and Plant Health Inspection Service Ohio office at (614) 469-5602 or visit http://www.aphis.usda.gov/vs/nahps/scrapie/.