



*Chronic wasting disease, caused by brain-destroying prions, affects elk.*

## Prion Vaccine Delays Brain Disease

**B**rain-destroying prions, which are proteins and are the infectious agents behind mad cow disease, chronic wasting disease in elk and deer, and scrapie in sheep, are so similar to proteins found naturally in these animals that they easily slip past the immune system's radar. So, how can the immune system recognize prions as invaders? School of Medicine scientists have found a way, creating the first vaccine that can significantly delay and possibly even prevent the onset of prion disease in animals.

The work builds on earlier studies by the group showing that a genetically engineered vaccine can delay symptoms of a model of prion disease in mice. The new vaccine is the first to provide active immunization and is given by mouth

rather than through the skin, says Thomas M. Wisniewski, M.D., Associate Professor of Neurology, Pathology, and Psychiatry, who leads the group.

Most infectious diseases are caused by viruses and bacteria, so the idea that prions can cause disease is unusual. Prions cause a group of fatal brain diseases mainly in animals. Once infected, animals develop dementia, lose control of their limbs, and eventually die.

The new vaccine consists of the scrapie prion attached to a genetically modified strain of a salmonella bacterium. Among mice vaccinated before exposure to the prion, about 30 percent remained alive and symptom-free for 500 days, with no evidence of infection in their brains. By compari-

son, among mice that were exposed to prion but not vaccinated, half were dead within 185 days, and all were dead by 300 days, according to a study published in the journal *Neuroscience*.

The oral vaccine stimulates a localized immune response in the digestive tract, which actually prevents the prion from entering other parts of the body, explains Dr. Wisniewski. "Reducing an animal's exposure is a highly effective way of preventing infection."

Current vaccination efforts are aimed at protecting livestock. The human version of prion disease usually occurs spontaneously and only rarely because of eating contaminated meat. "The potential use for a prion vaccine in humans is still theoretical," says Dr. Wisniewski. "But if a more significant outbreak of chronic wasting disease in deer and elk occurs and if this disease turns out to be transmissible to humans, then we would need a vaccine to protect people in hunting areas."

A vaccine that decreases the spread of prion disease in animals also reduces the possibility that the disease could jump the species barrier and infect humans, adds Einar M. Sigurdsson, Ph.D., Assistant Professor of Psychiatry and Pathology, who works on the vaccine. "This is a major issue for the farming community," he says.

An outbreak of chronic wasting disease is occurring in the West, and the geographic range is expanding. For the first time infected wild deer have been reported as far east as New York State. Though it remains unclear whether chronic wasting disease can be transmitted to humans, the infection does share many similarities to mad cow disease. The NYU group is redesigning its vaccine for deer or cattle. ■

— Caitlin E. Cox