Scrapie

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Scrapie is a deadly disease that can be very devastating to livestock producers and a threat to public health. “In animals, Classical Scrapie (C-Scrapie) of sheep and goats and Chronic Wasting Disease (CWD) in farmed and wild cervids are transmitted through direct contact between animals and through grazing prion-contaminated environments, which leads to persistence of these diseases at an enzootic level.” (Scientific Reports). Scrapie can cause financial hardships for farmers when an outbreak erupts. Scrapie is a fatal disease causing a great loss in revenue (U.S Department of Agriculture). Pictured at left is a goat with Scrapie.

Despite being unfamiliar with the disease Scrapie, most people have heard about a similar disease that affects cattle. Such a disease is commonly referred to as Mad Cow Disease. It was a disease that was breaking headlines in the 1990s and was what first brought light to prion diseases in the livestock industry and their impacts. In recent years it has become a worldwide effort to work on eliminating these horrible diseases that have plagued the livestock industry for far too long.

While the first case of Scrapie is unclear with references to the disease dating back to ancient times where it appeared in the early Chinese and Roman epochs (Mathiason), we do know that it was first reported in Great Britain more than 250 years ago. It was originally thought to be a disease only known to infest sheep flocks (Martin). Scrapie came across its name because

the sheep that were infected with it scraped their wool off on the fencing. It was later learned that Scrapie can also infect goats. “The total number of NVSL (National Veterinary Services Laboratories) confirmed positive cases in goats is 44 since FY 2002.” (USDA). This deadly disease is now found in almost all countries around the world with New Zealand and Australia being the only ones excluded (CABI). Australia prides itself on being Scrapie-free as this gives their exported sheep and goat products more merit (Webb). Australia only allows imports from Scrapie-free herds. The main concern to the Australian government is that Scrapie could be introduced into the country “...through the importation of infected sheep or goats or through the use of a veterinary biological product such as a vaccine that contains a contaminated ingredient.” (Webb). This is why Australia has such strict quarantine requirements on all animals imported. Several countries have implemented similar import restrictions in recent years in order to limit the spread of this terrible disease that has been around for more than a century.

“Scrapie is a fatal, degenerative TSE disease affecting the central nervous system of sheep and goats.” (U.S Department of Agriculture). TSE stands for Transmissible Spongiform Encephalopathies (Department of Health). “Transmissible Spongiform Encephalopathies (TSEs) or prion diseases are a family of rare progressive neurodegenerative brain disorders that affect both humans and animals. They have a long incubation period, progress rapidly once symptoms develop and are always fatal.” (Department of Health). “...Prion diseases are a group of rare degenerative brain disorders characterized by tiny holes that give the brain a “spongy” appearance. These holes can be seen when brain tissue is viewed under a microscope.” (NIH). “Research suggests the TSEs are caused by an abnormal version of a protein called a prion (prion is short for proteinaceous infectious particle). “Prion proteins occur in both normal forms, which is a harmless protein found in the body's cells, and in an infectious form, which causes disease.

The harmless and infectious forms of the prion protein are nearly identical, but the infectious form takes on a different folded shape from the normal protein." (NIH). Pictured below is a micrograph image of a neuron in the brain of a goat with scrapie. The red staining shows the presence of a misfolded prion protein that has accumulated in the neuron which is a diagnostic hallmark of scrapie infection. (Avant).

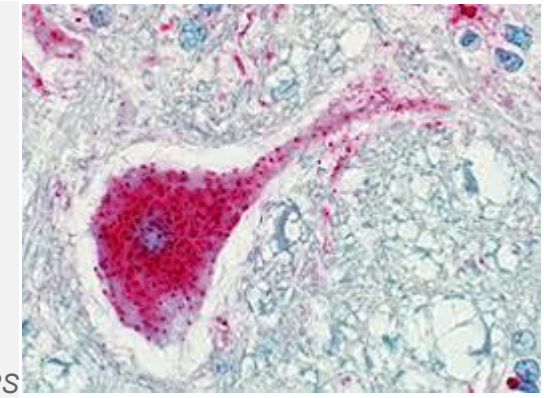


Photo by David Schneider, USDA/ARS

"The agent responsible for causing Scrapie and other TSEs is smaller than the smallest known virus and has not been completely characterized." (U.S Department of Agriculture). With the increased scientific achievements we are expanding our knowledge of this disease day by day and hopefully someday will be able to get ahead of it.

Scrapie has a unique and uncommon method of transmission. "Scrapie is spread through fluid and tissue from the placentas of infected females. It can also be transmitted from an infected female to her offspring at birth, or to other animals exposed to the same birth environment." (Scrapie Canada). "...male animals are at lower risk for transmitting Scrapie but are at equal risk of becoming infected and noted that the World Organization for Animal Health does not differentiate male and female animals in their guidelines." (Animal and Plant Health Inspection Service). scrapie can also be transmitted through milk and colostrum (The Scottish Government). "You should make sure any replacement colostrum or milk you buy comes from flocks or herds which have been monitored for at least three years and are found to be free of

Classical Scrapie." (The Scottish Government). Practicing good herd and flock management can drastically reduce Scrapie transmission.

Scrapie is a virus that is very hard to detect. "It does not evoke any detectable immune response or inflammatory reaction in host animals." (U.S Department of Agriculture). Scrapie has a long incubation period taking more than a year and a half before the onset of symptoms and has been known to take even up to eight years to develop symptoms (Scrapie Canada). This is how Scrapie oftentimes goes undetected for so long and causes many exposures before it is recognized. Animals usually die one to six months after infection (U.S Department of Agriculture). "As the result of nerve cell damage, affected animals usually show behavioral changes, tremor (especially of the head and neck), pruritus, and locomotor incoordination, which progresses to recumbency and death" (U.S Department of Agriculture). Scrapie has a wide variety of symptoms that accompany it. Some of these symptoms include loss of weight despite maintaining appetite, changes in behavior, itching or rubbing excessively, loss of balance and coordination, and abnormal flightiness to movements or noises ("Scrapie | Nebraska Department of Agriculture"). Consulting with a Veterinarian or other licensed professional is a great way to help detect Scrapie based on the signs and symptoms, but the best way is to test for it.

Testing for Scrapie is the best way to detect this disease, as it is often very hard to diagnose from signs and symptoms alone. Scrapie is officially diagnosed using Immunohistochemistry, but Histopathology, Western Blots, and ELISA can also be employed (U.S Department of Agriculture). "Immunohistochemistry is a technique that uses antibodies conjugated to enzymes that catalyze reactions to form detectable compounds to visualize and localize specific antigens in a tissue sample" (ProSci). Histopathology can only be used on animals that are deceased by collecting a brain tissue sample, whereas Immunohistochemistry,

Western Blot, and ELISA can use either the brain tissue or lymphoid tissue (U.S Department of Agriculture). Scrapie testing can even be performed on living animals by the APHIS test, consisting of taking a biopsy of their 3rd eyelid or of the rectal lymphoid tissue (U.S Department of Agriculture). “A single rectal biopsy or two-third eyelid biopsies done at the same time have a sensitivity of approximately 87 percent when compared to the result of IHC testing on lymph nodes and brain.” (U.S Department of Agriculture). Testing for Scrapie can be very beneficial to livestock producers as they can know if Scrapie is in their herd.

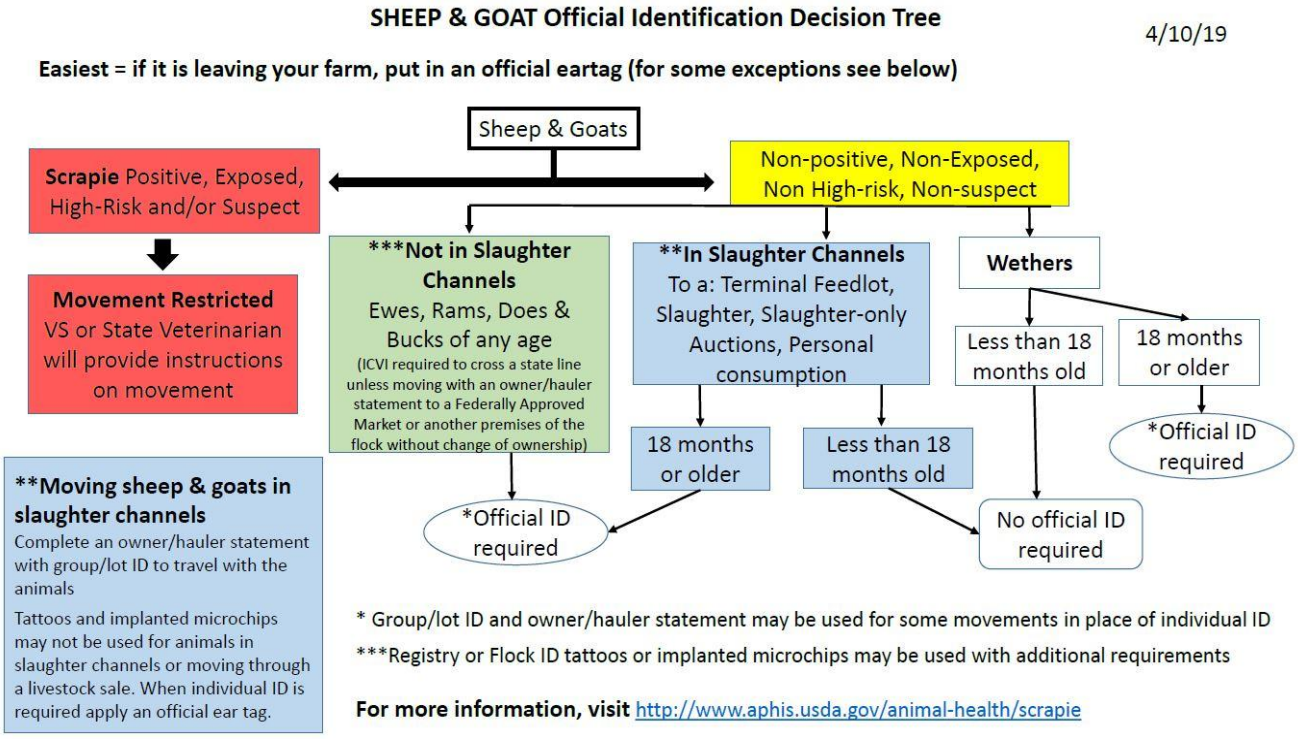
There has yet to be a cure for Scrapie, so the best thing that livestock producers can do is prevent the disease from being transmitted to their herd. “The only absolute way to prevent an introduction of Scrapie into a flock is to prohibit all movement of sheep and goats into a flock.” (U.S Department of Agriculture). This is the only way that biosecurity can be maintained and we can be sure that there has been no Scrapie transmitted to a herd or flock. Scrapie is an extremely durable virus. In a study conducted by Brown and Gajdusek in 1991, it was found that Scrapie can stay in the soil for extended periods of time (Applegate et al. 15). “For example, scientists have demonstrated the persistent infectivity of Scrapie agent in soil, and healthy sheep have contracted Scrapie after grazing on land that had served, three years earlier as pasture for Scrapie-infected sheep (Brown & Gajdusek, 1991).” (Applegate et al. 15). Scrapie has been detected in the ashes of incinerated carcasses of contaminated animals even when the animals were incinerated at 600 degrees Celsius or 1,112 degrees Fahrenheit (Applegate et al. 15). “The UK Spongiform Encephalopathy Advisory Committee (SEAC) has recently affirmed its belief that the risk of infectivity from ash would be extremely small if incineration was conducted at 850 degrees Celsius (1562 degrees Fahrenheit).” (Applegate et al. 15). It is very important to track Scrapie that way a flock or herd does not become unknowingly exposed to the fatal disease.

Scrapie is a disease that has long plagued the vast majority of the world. In response to these diseases causing havoc on our livestock industry, the USDA has implemented the Scrapie Eradication Program. It was in 2001 during a spike in Scrapie in the sheep population of the United States that the USDA revised their Scrapie regulations making official Scrapie identification for all goats and sheep intended for slaughter required (U.S Department of Agriculture). All sheep and goat producers can get free Scrapie tags from APHIS or from accredited veterinarians (U.S Department of Agriculture).

"Effective tracing of infected animals to their flock or herd origin and tracing and testing of exposed animals made possible as a result of the new identification requirements; and providing effective cleanup strategies that will allow producers to stay in business, preserve breeding stock, and remain economically viable." (U.S Department of Agriculture). The USDA also accepts APHIS-approved tattoos instead of Scrapie identification tags for registered animals when

accompanied by a copy of their registration paper (USDA). Through the use of Scrapie identification tags or USDA-certified tattoos, we can better track these animals and help eradicate this disease that has plagued us for far too long.

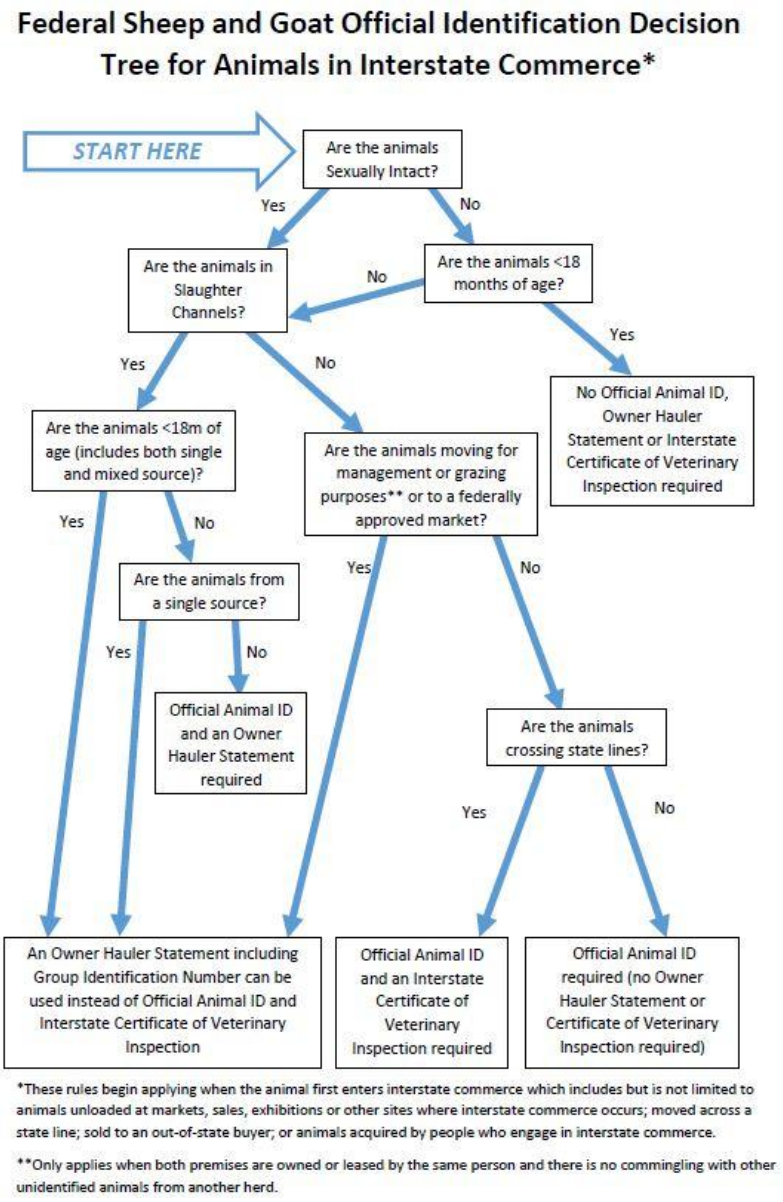
It is of utmost importance to be able to identify herds and their movements, so the USDA has an easy-to-read identification decision tree as pictured below.



To best accomplish this, all livestock if leaving your farm should be identified with an official ear tag or an official tattoo through a registry currently approved by APHIS to be used as official identification.

Tracking of herds is important to help combat Scrapie. For the producer, this means obtaining a Certificate of Veterinary Inspection if crossing state lines. An owner/hauler statement that includes the name, address, and contact information of the owner and hauler, date the animals were moved, the flock ID associated, group/Lot if being used, number of animals, species, breed and class of animals, name and address of the point of origin and the name and

address of the destination along with a statement that the animals are in the slaughter channel if applicable. To the right is a helpful chart in regard to Interstate Commerce and requirements for identification.



Another way that the United States is helping to combat Scrapie is a voluntary program called Scrapie Flock Certification Program or SFCP. Through the use of this program, participants can even be certified to export their animals as Scrapie free through the export certified status (USDA). “The objective of this category is to certify participating flocks and herds as Scrapie free establishments through limiting the acquisition of does and ewes from flocks of same or higher status, annual inspection including reconciliation of animal inventory, official individual animal identification (ID) requirements, recordkeeping requirements, and animal sampling requirements.” (U.S Department of Agriculture). This makes these certified animals much more marketable not only for export but to other herds in the United States, and animals that participate in this program are

extremely unlikely to be Scrapie positive (U.S Department of Agriculture). This helps livestock producers provide certainty to potential buyers that the animals they are buying come from a Scrapie free facility.

In the near future hopefully, this horrific disease is a thing of the past, but I desperately hope that comes sooner versus later. In the meantime, it is very important for livestock producers to stay vigilant in their herd management practices and help stop Scrapie at the source. By livestock producers being diligent about biosecurity and not introducing any new stock to their herd, appropriate inspection by veterinarians, and proper record management we can stop Scrapie at its root. Scrapie has been slowed dramatically over the last decade, and now we just must track down those outlying cases, so that the United States will become a Scrapie-free country one state at a time.

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