Poultry owners: Batten down the hatches against avian influenza

Dr. Susan Kerr, WSDA education and outreach specialist

Due to the number and locations of highly pathogenic avian influenza (HPAI) outbreaks currently happening around the globe, it is more important than ever for U.S. poultry caretakers to have and implement effective biosecurity farm plans.

The World Organisation for Animal Health (OIE) reports ongoing HPAI outbreaks in 26 countries across Asia, Europe, and the Middle East. The USDA Animal and Plant Health Inspection Service (USDA-APHIS) recently reported the current rates of HPAI in Asia and Europe are similar to the rates in 2014-2015, when HPAI was identified in the U.S., including Washington State. This pattern suggests the risk of HPAI showing up in the U.S. is likely, so poultry owners should implement enhanced biosecurity measures now to reduce birds’ risk of infection.

How avian influenza spreads

Birds ingest or inhale the virus. Ingestion can be through feed or water contaminated by wild waterfowl or the activities of rodents, flies, humans, etc. that move the virus around. Infected birds exhale the virus and contaminate the air and surfaces, putting other birds at risk.

CONTINUED ON PAGE 2
Poultry owners: Batten down the hatches against avian influenza, continued from page 1

**The signs of avian influenza**
- Comb, wattle, and/or leg discoloration
- Swollen eye tissues, comb, or wattles
- Eye discharge
- Difficulty breathing
- Ruffled feathers
- Decreased appetite
- Lethargy
- Decreased egg production
- Depression
- Sudden death

**Why avian influenza is a concern**
The HPAI virus is always circulating somewhere around the globe. It is carried by wild waterfowl, which are usually not affected by it. They discharge the virus in their feces, contaminating water, soil, and other environmental surfaces. Migratory flyways for waterfowl are at greatest risk of such contamination. Washington State is part of one of these flyways, so the risk is elevated in our state. Note the overlap between flyways on the map below.

The virus spreads fast in poultry environments and either kills or requires the euthanasia of all the birds on the premises to contain an outbreak. Infection of commercial operations can cost millions of dollars in lost birds and containment costs.

Investigation of past outbreaks revealed human exposures were due to caretakers not wearing personal protective equipment such as gloves, masks, coveralls, and boots, when collecting eggs, feeding birds, cleaning bird facilities, touching or butchering infected birds, removing dead birds, or otherwise being in close contact with infected birds or environments. Humans exposed to the HPAI virus can then transport it to other farms, expanding the outbreak.

**How to protect your birds’ health**
Investigations of the 2014-15 outbreaks revealed there were only two sources of infection in the Midwest, meaning all the other infections were due to biosecurity breaches. Biosecurity measures reduce the risk of disease agents entering or spreading on property premises.

Make these actions habits on your farm:
- Do not let birds roam. Coop them up to reduce viral exposure.
- Prevent visitors, especially those who have contacts with other birds.
- Establish gates and “No Entry” signs or other statements to control access.
- Keep a closed flock, if possible.
- Quarantine new or returning birds for 30 days and monitor them for signs of illness.
- If buying or selling birds or eggs, meet the buyers or sellers away from your farm.
- Do not share equipment with others.
- Control vermin, wild birds, flies, wildlife, and pets in your bird area.
- Wash your hands with soap and water before and after contacting poultry.
- Protect poultry feed and water from contamination.
- Provide disposable boot covers or footwear disinfectant for anyone having contact with your flock.
- Have farm-specific clothing and footwear; clean and disinfect it after each use.
- Clean and disinfect tools or equipment before and after use, including vehicles.
- Avoid contact with birds if you are sick.
- Do not allow contact between poultry and swine.

**THE NINE MAJOR WATERBIRD FLYWAYS OF THE WORLD**

• Prevent poultry contact with land or water frequented by wild waterfowl.
• Know and watch for the warning signs of infectious bird diseases.
• Isolate and treat or cull sick birds ASAP.
• Keep up to date regarding the presence of poultry diseases in your area.
• Get a human flu vaccination every year.
• Report sick birds to your veterinarian, local extension office, or state veterinarian. The USDA can be reached toll-free at (866) 536-7593. WSDA can be reached via ahealth@agr.wa.gov, (360) 902-1878 or, after hours, at (800) 942-1035.

HPAI: A public health concern

Avian influenza is sometimes a human health concern. The virus is constantly mutating, and some versions affect humans. The same is true for swine influenza. In a worst-case scenario, the human, swine, and avian influenza viruses could all be present in one of those species at the same time. The viruses could exchange genes, and the subsequent mutation could be highly contagious between people as well as deadly. This is why poultry and swine should not have contact, and humans should avoid contact with animals when they are sick, especially with influenza.

To disinfect footwear:

Remove all droppings, mud, or debris from boots and shoes with a scrub brush, wash footwear with soap and water, rinse, then apply an effective disinfectant for the contact time specified on the label.

U.S. avian influenza surveillance and response efforts

To protect poultry health and the country’s $40 billion poultry industry, jobs, local and national economies, and food supply, the USDA routinely monitors chickens in every state for avian influenza. Rapid identification of and response to infection is critical for effective containment of an outbreak, which minimizes the number of birds lost and the resulting economic damage.

Cooperation between local, state, and federal government agencies as well as with the industry, improved detection methods, and enhanced response measures over time are all geared to reduce the impact of an outbreak. For example, the 2020 HPAI outbreak in South Carolina was detected quickly and contained to one farm.

Visit agr.wa.gov/birdflu for more information and resources.

Secure food supply biosecurity plans: The veterinarian's role

Dr. Minden Buswell, WSDA Reserve Veterinary Corp Coordinator

The Secure Food Supply (SFS) Plans provide guidance for livestock producers to voluntarily prepare for a foreign animal disease (FAD) outbreak and limit exposure of their animals through enhanced biosecurity. Animals with no evidence of infection may qualify for a movement permit from the Washington State Department of Agriculture (WSDA). The goal of this planning is to provide business continuity for the livestock industry, transporters, packers, and processors in the face of an FAD outbreak.

There are SFS plans for the following commodities and FADs:

• Secure Beef Supply: Foot and Mouth Disease (FMD)
• Secure Milk Supply: FMD
• Secure Pork Supply: Classical swine fever, African swine fever, and FMD
• Secure Poultry Supply: Highly Pathogenic Avian Influenza
• Secure Sheep and Wool Supply: FMD

As a veterinarian, you can provide a value-added service for your clients by assisting them with their biosecurity planning. For your clients to maintain business continuity during an FAD outbreak and receive a product movement permit from WSDA, they must have an enhanced biosecurity plan completed and ready for use.

Each of the SFS plan websites offers a free enhanced biosecurity plan template to download, review, and complete with your client. After the enhanced biosecurity plan is complete, a copy of that plan must be sent to Dr. Buswell at WSDA.

This advanced FAD planning effort on the part of veterinarian, the producer, and WSDA strengthens agricultural industry resilience and helps protect Washington’s economy. If you are interested helping your clients maintain their business during an FAD outbreak, WSDA is ready to help you get started. For more information, contact Dr. Minden Buswell at mbuswell@agr.wa.gov or 360-280-6499.

NOTE: Enhanced biosecurity plans are more robust and different than a normal daily biosecurity plan, such as the Beef Quality Assurance – Daily Biosecurity Plan for Disease Prevention.
### NOVEMBER 2020

<table>
<thead>
<tr>
<th>DISEASE REPORTED</th>
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<tr>
<td>Cryptococcus (undifferentiated species not identified as C. neoformans)</td>
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<td>Equine influenza</td>
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<td>Johne's disease (paratuberculosis)</td>
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<td>Leptospirosis</td>
<td>Canine</td>
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<tr>
<td>Pigeon Fever (<em>Corynebacterium pseudotuberculosis</em>) (ulcerative lymphangitis)</td>
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<tr>
<td>Potomac Horse Fever (<em>Ehrlichiosis</em>)</td>
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<td>Brucellosis (<em>Brucella canis</em>)</td>
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### JANUARY 2021

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<tr>
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<tr>
<td>Johne's disease (paratuberculosis)</td>
<td>Bovine</td>
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</table>
Summary of 2019 Antimicrobial Sales and Distribution

Dr. Susan Kerr, WSDA Education and Outreach Specialist

A recent report issued by the U.S. Food and Drug Administration’s (FDA) Center for Veterinary Medicine (CVM) shows that efforts to raise awareness of the impacts of antimicrobial products are having an effect, and that both sales and distribution of these products are declining.

Sales and distribution of antimicrobials are down 25 percent since 2010 and down 36 percent since 2015 – the peak year of sales.

The FDA’s 2019 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals shows domestic sales and distribution of medically important antimicrobials approved for use in food producing animals did increase 3 percent between 2018 and 2019. The report did not include the number of head of food animals to be treated, so it is impossible to know if this is a relative or absolute increase in sales.

Although sales data do not necessarily reflect actual use of antimicrobials, sales volume observed over time is a valuable indicator of market changes related to antimicrobial products intended for food-producing animals. However, when evaluating the progress of ongoing efforts to support judicious use of antimicrobials, it is important to take into account additional information sources including actual use data, animal demographics, animal health data, and data on resistance.

The FDA’s objective is to slow development of antimicrobial resistance and preserve antimicrobial effectiveness when fighting disease in animals and humans. The agency’s aim is not simply measured by a reduction in sales volume of antimicrobials; it also includes fostering good antimicrobial stewardship practices by optimizing use of these products and limiting use in animals to only when necessary to treat, control, or prevent disease.

FDA recognizes fluctuations in sales volume may occur over time in response to various factors, including changing animal health needs or changes in animal populations. Given the substantial change at the beginning of 2017 changing many antimicrobials products from over-the-counter use to requiring veterinary oversight, some rebound in reported sales volume in subsequent years was expected as affected stakeholders adjusted to the new requirements.

When analyzing the report, readers should consider:

- Sales and distribution information does not represent actual product use. These data represent sponsor estimates of product sales and are not intended to substitute for actual usage data. For example, veterinarians and producers may purchase but not administer antimicrobials to animals, or they may administer them in later years.
- Before making a direct comparison between the quantities of antimicrobial drugs sold for use in humans vs. animals, consider:
  - There are more animals than humans in the U.S. For instance, there are about 328 million people in the U.S. vs. 9.3 billion chickens that are processed annually.
  - There are differences in physiology and weight between humans and animals. The average adult human weighs 184 lbs., while the average live beef animal weighs 1,347 lbs.
  - Different animal species metabolize drugs differently; some may require more of a medication to be effective, or may need to be treated longer.
- The FDA cautions against making direct comparisons of species-specific sales estimates. A variety of factors confound direct comparison of species-specific sales estimates, including differences in population sizes, weights, lifespans, and drug metabolism in each species.
- Direct comparison of sales volumes for different drug classes is problematic because not all drug classes are approved for use in all species, not all drug potencies are the same, and not all drug classes can be used interchangeably to treat the same conditions.

Although there has been progress made toward antimicrobial stewardship goals, additional work is needed to address antimicrobial resistance. The Center for Veterinary Medicine’s five-year action plan outlines steps the agency is pursuing to further foster antimicrobial stewardship in veterinary settings.

Additional information

- Complete report: 2019 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals
- FDA Q&A: Questions and Answers: Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals
- FDA Animal Drug User Fee Act: ADUFA Reports
- FDA Final Rule to Collect Antimicrobial Sales and Distribution Information by Animal Species
BSE: If you see something, say something

Dr. Susan Kerr, WSDA Education and Outreach Specialist

Which transmissible spongiform encephalopathy (TSE) has been recognized for the longest: bovine, human, or small ruminant? If you guessed scrapie, you are right; it was first described in 1732. There are six types of human prion diseases, the first of which was recognized around 1900. The bovine form is the baby of this fatal family, only recognized since 1986. Bovine spongiform encephalopathy (BSE) is a progressive and always fatal neurological disease caused by abnormal infectious prion proteins. TSEs are a fascinating and complicated topic. This article will focus on BSE.

Unlike chronic wasting disease (wild ruminant TSE), BSE does not seem to be contagious or spread horizontally. However, because there is no vaccine or treatment for TSEs, concerns about human health implications remain.

Variant Creutzfeldt-Jakob disease (vCJD), which is associated with human exposure to the bovine prion, first appeared in 1996. It is theorized the practice of incorporating infected proteinaceous animal processing by-products in cattle rations enabled prions from infected animals to develop cross-species infectivity, thereby putting human consumers of Specified Risk Materials (SRMs; brains and spinal cords from animals 30 months or older) at risk of vCJD.

**Clinical signs of BSE**
- Weight loss
- Decreased milk production
- Tremors
- Ataxia
- Behavior changes (nervous, aggressive, apprehensive)
- Coordination problems
- Difficulty rising
- Gait abnormalities
- Hyper-reactivity to stimuli
- Death

**BSE Strains**
There are two forms of BSE: classical (C-type strain) and atypical (L-type or H-type strain). The atypical forms occur rarely and spontaneously in all populations of cattle, and most cases have been in cattle older than 10. It is unknown what causes these prion proteins to change form from normal to abnormal and initiate disease, but genetic and environmental factors are being investigated.

Classical BSE is caused by a distinctly different prion form and is associated with feed contaminated with the C-type strain.

**Pathogenesis**
After entering the body, the abnormal prion protein (PrPSc) somehow commandeers cellular protein synthesis, causing misfolding of normal prion proteins (PrPC) on the surface of nerve cells. Amyloid plaques of these abnormal proteins accumulate and damage nerve cells. Histopathology of the brain reveals characteristic spongiform vacuolization and amyloid plaques. Plaques arising from classical vs. atypical forms differ in appearance. This neurohistological damage is responsible for BSE’s clinical signs.

The disease agent can be found in the brain, spinal cord, and retinas of naturally-occurring cases. Interestingly, cattle do not mount an immune or inflammatory response to the agent.

<table>
<thead>
<tr>
<th>POINT OF COMPARISON</th>
<th>BSE FORM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prion strain</strong></td>
<td>Classical</td>
</tr>
<tr>
<td></td>
<td>C-type</td>
</tr>
<tr>
<td><strong>Incubation time (infection to clinical signs)</strong></td>
<td>3 to 6 years</td>
</tr>
<tr>
<td><strong>Source of infection</strong></td>
<td>Feed contaminated with infectious prion</td>
</tr>
<tr>
<td><strong>Number and location of U.S. cases</strong></td>
<td>1: Washington, involving an animal about 4.5 years old when it was imported from Canada.</td>
</tr>
<tr>
<td><strong>Public health implication</strong></td>
<td>vCJD linked to human consumption of food containing SRMs derived from classical BSE-infected cattle.</td>
</tr>
</tbody>
</table>
Efforts to prevent BSE

Three measures enacted worldwide have reduced the number of identified BSE cases from a high of 37,316 (the vast majority as classical BSE in the U.K.) in 1992 to fewer than 10 (atypical BSE) annually now:

- Prohibition of inclusion of most mammalian proteins in ruminant feed.
- Prohibition of SRMs in any type of food or feed.
- Destruction of cattle with signs of BSE or risk of BSE development.

Additional control measures further reducing public health risk include:

- Exclusion of cattle carcasses not inspected and passed for human consumption, unless animal was < 30 months old or SRMs removed.
- Antemortem inspection of slaughter cattle.
- Prohibition of animals with signs of neurological disease or other abnormalities.
- Exclusion of non-ambulatory cattle from the human food chain.
- Specific slaughter and processing controls.

Surveillance Efforts

Nationwide surveillance for BSE has been conducted since 1990. Targeted animals include those >12 months old with signs of central nervous system disease and cattle >30 months old that are down, unable to rise, in poor body condition, or dead. Samples are collected at processing facilities, farms, livestock markets, diagnostic laboratories, and veterinary clinics. About 25,000 samples are submitted annually, with 20 to 30 percent from beef cattle and 70 to 80 percent from dairy cattle.

Cattle producers and caretakers are the first line of defense when it comes to BSE detection. Accurate farm records are essential to help track offspring of BSE cases, too. Veterinarians should educate clients about disease signs while encouraging prompt reporting if signs are seen. Such samples are particularly valuable because case histories are often available. Rabies suspects should also be tested for BSE because clinical presentations can be similar.

BSE is a reportable disease. Food animal practitioners are strongly encouraged to report animals with signs consistent with BSE to state or federal regulatory veterinarians. A report can be submitted online at the [WSDA Reportable Diseases webpage](#).

BSE’s effects on international trade

The World Organisation for Animal Health (OIE) evaluates BSE risk levels for specific countries. Factors in this analysis include BSE’s history in the country, surveillance efforts, and presence of an effective feed ban.

After the first BSE case in 2003, the U.S. lost its preferred status and many countries stopped importing beef from the U.S. The value of industry losses attributed to closed export markets was calculated at $11 billion over the subsequent four years.

The OIE reinstated the U.S. status to negligible risk in 2013 and most previous trading partners accept U.S. beef exports again. The OIE excludes atypical cases when assessing BSE risk because they occur so infrequently.

More resources

- FDA BSE FAQs
- USDA APHIS BSE Information
- USDA FSIS BSE resources
- World Health Organization BSE information
- 2003 Washington State BSE case summary
- CDC BSE information
- OIE BSE portal
- Center for Food Safety and Public Health BSE information
- University of Edinburgh National CJD Research & Surveillance Unit

### Number of worldwide fatalities by cause: a comparison

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>vCJD</td>
<td>232* total, 1996-2020</td>
<td>OIE and CDC data</td>
</tr>
<tr>
<td>Rabies</td>
<td>59,000 annually</td>
<td></td>
</tr>
<tr>
<td>Road traffic accidents</td>
<td>1.35 million annually</td>
<td></td>
</tr>
</tbody>
</table>

*4 in U.S., all with time spent overseas. Includes 3 secondary cases contracted via blood transfusion. OIE and CDC data.
Risk factors of recent vaccination and equine herpes myeloencephalopathy

Dr. Amber Itle, Assistant Washington State Veterinarian

Most horses around the world are exposed to the equine herpes virus (EHV) before the age of two and recover uneventfully. EHV rhinopneumonitis usually presents as mild respiratory disease and fever, especially in young horses. It can also cause abortion in pregnant mares.

Of greater concern is the neurologic form of the disease, known as equine herpes myeloencephalopathy (EHM), sometimes involved with extensive morbidity and mortality events. Even though the “wildtype” EHV strain is sometime referred to as the “non-neuropathogenic” strain, both “neuropathogenic” and “non-neuropathogenic” strains of the virus can cause EHM.

The case definition of EHM includes:

- A horse displaying signs of central nervous system dysfunction, including but not limited to hindlimb incoordination, weakness, recumbency, or urinary bladder atony

AND

- Evidence of EHV-1 infection based on virus isolation, PCR testing of blood (buffy coat) or nasopharyngeal/nasal swab specimens.

The American Association of Equine Practitioners recommends vaccinating exhibition, breeding, or boarding barn horses with a five-way vaccine including EHV (rhinopneumonitis) at six-month intervals. High risk classes of horses include those:

- Less than six years old.
- Horses on breeding farms or in contact with pregnant mares.
- Horses housed at facilities with frequent equine movement on and off the premises.
- Performance or show horses.

Vaccines are not thought to be protective against EHM, but they may help reduce shedding of the virus. Additionally, there is some support for cross-protective benefits.

During a recent monthly National Equine Health call that drew both state and federal animal health officials, USDA-APHIS equine epidemiologist Dr. Angela Pelzel-McCluskey shared insights about vaccination recommendations.

She co-authored a 2013 case control study of the 2011 Ogden, Utah EHM outbreak that reviewed risk factors among horses developing the neurologic form of the disease. The study found horses vaccinated with a killed EHV product within 35 days before exposure to EHV-1 were significantly more likely to become neurologic cases during the outbreak.

Another paper done on the Findley, Ohio EHM outbreak focused on an older horse population and found horses receiving more frequent vaccination using a killed EHV-1 product were more likely to become a neurologic case in that outbreak.

Farm Walks have gone podcast

Episodes of the Farm Walks Podcast are now available online. WSU Food Systems Program and Tilth Alliance have been organizing Farm Walks since 2004 - farmer-to-farmer educational opportunities hosted by farm and food businesses throughout Washington.

Farm Walks are normally shared on a farm through a guided walk-and-talk style alongside farmer hosts, but the COVID-19 pandemic has prevented these in-person events. So the Farm Walks programs have moved to podcasts.

Visit farmwalks.org to learn more about the podcasts and the Farm Walks program.
We posed some questions about these results to Dr. Pelzel-McCluskey:

Q. Why do you think horses with recent vaccination are more likely to exhibit the neurologic form of the disease when exposed during an outbreak?

A. We can’t prove the pathogenesis of this, but our working hypothesis relates to the idea that shortly after the vaccine is given, the horse mounts a really high preparatory immune response looking for the target organism (EHV-1), so if the horse happens to encounter EHV-1 in this time period, the body’s immune response is extremely aggressive and can produce the infarcts we see in the spinal cord in the process of the body’s overly aggressive attack on the virus.

Q. Is it known if the horses involved in those outbreaks were vaccinated with a common product or brand?

A. The key point here is that this finding was specifically associated with horses having received any of the killed EHV-1 products on the market. We did collect the actual product names in this study, but there was no difference between all the killed EHV-1 vaccines in this incident. We didn’t have enough data to evaluate other EHV vaccine types on the market, such as a modified live vaccine.

Q. During an outbreak on a quarantined farm, do you recommend vaccination (booster of all horses on the premises) or would that increase the risk of neurologic expression of the disease?

A. My answer is that I do NOT recommend booster vaccinating for EHV-1 in the middle of an outbreak. The main reason is that our key monitoring procedure during an EHM outbreak is to monitor horses twice daily for fever. What we’ve found is that when people booster vaccinate during an outbreak, we end up with a ton of horses spiking a fever in response to the administration of the vaccine and we can’t tell them apart from horses breaking with EHV-1 disease. So, you end up with way too many horses in isolation, only some of which were going down with the virus and all the rest were just responding to vaccination and it makes a huge mess. Also, by the time the boostered horse mounts any sort of immune response at all, your 14-day quarantine period might already be over. Plus, there is the concern if the incident goes on, now you have a bunch more hyped-up immune system horses that could over-react to the virus.

Q. What do you tell people about using EHV-1 vaccine?

A. Well, certainly, we know that the current EHV-1 vaccines are labeled only for prevention of respiratory disease and abortion, which it does seem to accomplish. We think vaccination would also reduce viral shedding in an affected horse, which is also useful. As an equine practitioner, what I would do with this information is I would advise all of my show/competition clients that we need to do any booster vaccination for EHV-1 no more frequently than once per year and we need to time it where the booster occurs several months prior to when the horse is likely to be exposed at a show or event.

If you’re dealing with a boarding facility where horses are coming and going all the time and you don’t really have an “off season” for when exposure might occur, then I think I would try to start to wean that type of facility off of boostering for EHV-1, in all honesty. All horses have been exposed to EHV-1 naturally by the time they are yearlings or two-year-olds, so everybody has some level of circulating antibody anyway. Do we really need to keep vaccinating them and boosting this over their whole life when their most likely clinical experience (respiratory) with the disease would have occurred in their early years? It’s a tough issue that we need to learn more about, for sure.

Q. What are your recommendations for breeding farms?

A. Pregnant mares need to be vaccinated for EHV with a product labeled for use in pregnant mares and following the manufacturer’s recommendations for administration, which will include multiple doses at certain times during pregnancy. This serves two goals: prevention of EHV abortion and development of sufficient protective antibody level in the mare’s colostrum for the foal to receive after birth. ☀️
Was tularemia one of those diseases you studied in veterinary school and forgot about after your last infectious diseases exam? Hopefully not, because tularemia is a serious zoonotic disease detected in all U.S. states except Hawaii. Here is a brief review to help blow the dust off your brain cells and encourage you to include it as a differential in some puzzling cases. This should also be a reminder to ensure your physician knows you are a veterinarian with potential exposure to zoonotic diseases.

**Cause and transmission**

Rodents and rabbits are amplifying agents and possible reservoirs of *Francisella tularensis*, the causative bacterial agent of tularemia. The pathogen can enter hosts through their ocular tissues, skin, mouth, or nose. It has been found in more than 100 animal species, most of which are wildlife including rabbits, squirrels, beavers, muskrats, marmots, and other rodents.

Because it is illegal to own wild animals in Washington state, human cases of tularemia contracted by direct wildlife contact should be rare. However, people have been known to capture prairie dogs and feral domestic rabbits and make them into pets. Rarely, pet hamsters have been identified as disease sources in human cases.

Domestic animals including pets, livestock, fish, and birds can contract tularemia and spread it to humans. Hunters who skin carcasses and those who consume undercooked meat are at elevated risk. Additional means of transmission include bites from infected ticks, mosquitoes, or biting flies, inhalation, contaminated water, and contamination of skin breaks. The disease is not transmitted between humans.

**Pathogenesis**

*F. tularensis* invades and reproduces in infected host macrophages. Affected body organs include lungs, liver, spleen, kidneys, and lymph nodes. Septicemia can cause endocarditis, hepatitis, osteomyelitis, and meningitis. Signs observed are related to affected tissues.

Necropsy findings can include oral ulcers; lymphadenopathy (sometimes suppurative); hepatomegaly; splenomegaly; pulmonary edema, congestion, consolidation, and fibrinous pneumonia; necrotic areas in organs and bone marrow; and granulomas in organs.

**Manifestations in humans**

In humans, the route of entry in an individual affects the form the disease and signs of illness. The disease can range from mild to fatal, depending on the form of the disease and complications.

Cases usually start with flu-like signs and symptoms and include fever, chills, headache, muscle and joint pain, fatigue, anorexia, nausea, and malaise. Any of six forms can develop:

1. **Ulceroglandular:** the most common form, usually caused by insect bite or contacting an infected animal. This form includes ulcerated skin at the site of entrance and enlargement of regional lymph nodes. Nodes may rupture and discharge pus.
2. **Glandular:** similar to ulceroglandular but without skin ulcers.
3. **Oculoglandular:** conjunctivitis and enlarged regional lymph nodes. Occurs when *F. tularensis* contacts ocular tissues.
4. **Oropharyngeal:** inflammation and ulceration of oral tissues and enlarged regional lymph nodes, sometimes with vomiting, diarrhea, and abdominal pain. Occurs via consumption of contaminated food or water.
5. **Pneumonic:** the most serious form, contracted via inhalation of *F. tularensis* or septicemia secondary to other forms. Respiratory signs can be severe.
6. **Typhoidal:** a generalized and non-localized form.

**Tularemia in animals**

As with humans, animals can contract tularemia by ingesting food or water contaminated with *F. tularensis*, bites by infected vectors, inhalation, and skin breaks. Rodent and rabbit host reservoirs...
create a persistent source of the pathogen for dissemination and transmission by vectors, contamination of soil and water, and infection of scavengers (including pets).

Antemortem signs of illness are rarely observed in wildlife but include depression, fever, weakness, vomiting, diarrhea, anorexia, coughing, dyspnea, ulcers, and/or lymphadenopathy. Infected animals are usually just found dead or near death due to septicemia.

Among domestic animals, sheep are particularly susceptible to tularemia, particularly when stressed by inadequate nutrition, adverse weather, poor body condition, or high tick loads. Signs include weight loss, fever, lymphadenopathy, dyspnea, abortions, diarrhea, and death. Horses and young pigs show signs similar to sheep.

Cats (and dogs less frequently) can contract the organism by hunting or consuming wildlife, especially rodents or rabbits. Biting insects can also inoculate them with the bacterium. Signs in cats range from subclinical to the mild signs previously described to fatal. They often appear acutely and severely ill and can present with a fever, oral ulcers, lymphadenopathy (particularly submandibular), icterus, and respiratory distress. Signs are less pronounced in dogs, but abscesses may appear at insect bite sites. Cattle and dogs seem relatively resistant to tularemia.

**Diagnosis and treatment**

Diagnosis in humans and animals starts with physical examination and a thorough history to identify potential exposure. Laboratory diagnostics include smears to identify and isolate the organism from blood, tissues, or discharges; PCR detection of *F. tularensis* nucleic acids in samples; immunohistochemistry (ELISA) to detect antigens; and antibody titers if patients live long enough to mount a response.

Because *F. tularensis* is recognized by the Department of Health and Human Services and USDA as a Tier 1 Biological Select Agent, it can only be cultured in Biosafety Level 3 laboratories. Handling suspects and taking samples are high-risk activities and personal protective equipment must be used to prevent human exposure. Fortunately, tularemia responds well to a variety of antimicrobials.

**F. tularensis** persistence in environment

*F. tularensis* is a hardy gram-negative non-spore-forming bacterium. It can persist for months in soil and mud, organic material, water, and carcasses. It can also persist in frozen meat for years. Infected carcasses contaminate soil and water and pose risk to scavenging species, including pets. The pathogen is inactivated by common disinfectants, including bleach.

**Prevention**

Tularemia prevention measures include:

- Using effective insect repellent and wearing long pants, long sleeves, and long socks to prevent tick and fly bites.
- Washing hands after touching any animal and before eating.
- Washing fruits and vegetables before consumption.
- Wearing gloves and masks when handling healthy, sick, or dead animals.
- Avoiding mowing over dead animals.
- Avoiding contact with wildlife, especially sick animals.
- Promptly removing attached ticks.
- Avoiding bathing in, swimming in, or drinking untreated water.
- Wearing masks when mowing, landscaping, sweeping, and aerosolizing dust.
- Cooking all meat thoroughly before human or pet consumption.
- Keeping pets indoors and preventing contact between domesticated animals and wildlife.
- Controlling and preventing ticks and biting flies on pets and livestock.
- Using effective cleaning and disinfecting protocols.

**Biosecurity challenges for the global feed industry in 2021**

A video and transcript of a discussion with Dr. John Clifford, veterinary trade adviser for the USA Poultry and Egg Export Council and former Chief Veterinary Officer for USDA APHIS Veterinary Services, is available at the Feed Strategy website. View the video to see Dr. Clifford discuss the major biosecurity and pathogen challenges for animal feed producers in the U.S. in the coming year.
An update on leishmaniasis

Dr. Brian Joseph, Washington State Veterinarian

Three cases of leishmaniasis have recently been reported in Washington, the first involving a dog owned by a military family who had been living in Italy for a year and the second was a 7-year-old spayed female dog adopted from a shelter in Iran.

Leishmaniasis is a diphasic, parasitic, and zoonotic protozoal disease. The flagellated extracellular promastigote form is present in the sand fly vector and the intracellular amastigote phase is present in mammals. In dogs, signs generally appear two to four months after infection but may not be apparent for a year. In cats and dogs, hyperglobulinemia is a key finding without other hematological or serum chemical abnormalities. Other signs include skin sores, peeling skin, hairless patches, weight loss, epistaxis, conjunctivitis, blindness, nasal discharge, exercise intolerance, splenomegaly, abnormal nail growth, polyuria or polydipsia, vomiting, colitis, melena, and muscular dystrophy.

Infected humans and animals may be asymptomatic for months to years, a condition termed leishmaniosis, during which the parasite may spread throughout the body via the hemolymphatic system. Asymptomatic and symptomatic people can infect sand flies. Immune suppression may trigger the parasite to multiply and attack, resulting in disease expression. The incidence of HIV-visceral leishmaniasis co-infections appears to be increasing.

The parasite is generally transmitted to humans and animals through the bite of over 23 different sand fly species of the genus Phlebotomus in the Old World and Lutzomyia in the New World (Figure 1). However, transmission can also be vertical and through contaminated needles, blood transfusions, and dog bites.

There are more than 20 leishmania species; cats, cattle, dogs, and rats are known reservoirs. Leishmaniasis is on the World Health Organization’s (WHO) list of neglected tropical diseases. The disease occurs in over 90 countries including temperate and tropical Mexico, Central and South America, the Middle East, East and North Africa, and East Asia. Infected humans and animals have been identified in Europe, Oklahoma, and both U.S. coastal regions. North American cases are largely associated with travel to countries in which the parasite and vector are endemic, but vertical transmission has been documented in American foxhounds. WHO estimates each year the global cost in human health is between 0.9 – 1.6 million cases and hundreds of deaths.

These cases, diagnosed due to practitioners’ diligence, demonstrate the importance of including leishmaniasis in the differential diagnosis of dogs and cats with a travel history to or originating from endemic areas. Additionally, climate change is shifting vector and pathogen ranges and exposing endemic vectors to novel pathogens they may be able to carry and transmit.

Sand fly behavior is like that of mosquitoes. Sand flies are most active from dusk to dawn, but bites can occur during daylight hours if sand flies are disturbed. About 1/4 the size of mosquitoes and two to three mm long, only females bite and transmit the parasite during the blood meal, which is necessary for egg laying. Bites can be painless or painful.

Feline leishmaniasis infections have been documented around the Mediterranean, Brazil, Mexico, and Venezuela and are thought less prevalent than canine infections. According to LeishVet.org, studies
suggest *L. infantum* seroprevalence in Italian and Spanish felines may be greater than 25 percent in the population. Roughly half of the detected cases have been documented in immune suppressed cats secondary to feline immunodeficiency virus, feline leukemia virus, immune-suppressive therapy, or concomitant disease.

Feline signs of illness are like those described in dogs. Ulcerative and nodular dermatitis is common on the head and distal limbs. Uveitis, nodular lingual or gingival lesions, chronic stomatitis, lymphadenopathy, and hypergammaglobulinemia are commonly reported in cats.

Diagnosis is based upon clinical signs, clinicopathological abnormalities consistent with leishmaniasis, and confirmation through serology, molecular analysis, and cytology. Preferred samples for cytological investigation include bone marrow, lymph node, spleen, skin, and conjunctival swabs. Complete blood count findings are inconsistent, but often include a mild to moderate non-regenerative anemia and thrombocytopenia. The most common abnormal serum biochemical findings are hyperproteinemia, hyperglobulinemia, and hypoalbuminemia.

Detailed information concerning incidence, diagnosis, and treatment is available at LeishVet.org. Treatment is variable and includes meglumine antimoniate or miltefosine in combination with allopurinol and/or domperidone. However, limited information is available concerning optimal treatment; an infectious disease specialist should be consulted for current recommendations. Treatment is associated with significant potential side effects. Treated dogs may remain carriers and infectious to sand flies for life. A vaccine is available in Europe, but not in the U.S.

Diligence is necessary to prevent the introduction and establishment of vectors and pathogens not currently present in Washington to protect animal and human health. Practitioners are our front line of defense in preventive efforts. Leishmaniasis is a Reportable Animal Disease (RAD) in Washington; suspect or confirmed diagnoses of reportable diseases must be reported immediately to the Washington State Department of Agriculture’s Animal Health Program through the WSDA Animal Disease Reporting tool. We depend upon and appreciate your surveillance and reporting efforts.

Standing up for animal welfare in the field and in court

Dr. Amber Itle, Assistant Washington State Veterinarian

Driving down country roads in our practice areas, we have all witnessed it: skinny animals standing in mud with no place to lie down, constantly trying to graze the non-nutritive stubble of winter grass, with notable decline in body condition over time. The dark, wet days of winter bring muddy pastures, scarce feed resources, and inadequate shelter for backyard farm animals. This is especially notable in February.

As acknowledged stewards of animal care, veterinarians are considered professional experts in cases of animal neglect and cruelty. By oath, veterinarians are obliged to protect animal health and welfare and prevent animal suffering. However, some veterinarians are hesitant to be involved in cases of farm animal cruelty and neglect for a variety of reasons, such as potential alienation of clients.

Although cases of animal abuse and neglect occur on farms, most veterinarians realize these cases are rare when regular training and best practices are implemented. Veterinary intervention can rectify situations of neglect, especially with novice producers who may not understand that feeding programs and husbandry practices must change with the seasons.

Often, neglect severity can be masked by thick winter coats or blankets that are never removed. Some owners need education about the importance of adequate water supply year round, and animals will not fare well with just snow or iced-over water sources.

Veterinarians and producers alike should drive advancements in animal welfare to gain public trust through service, competence, and adherence to ethical norms. Determining those norms is a challenge because public perceptions are changing. Consumers want to be assured producers share their values and ethics so they can have confidence in the products they purchase, where the products come from, and how they are produced. Consumers desire transparency in food production systems and expect veterinarians to ensure animal welfare on farms.
Five Freedoms of animal welfare

Despite recent and growing interest in animal welfare, the concept is not a new one. The Five Freedom standards have been widely adopted by many humane organizations including the World Organization for Animal Health (OIE) and are frequently used by animal welfare certifying organizations in the U.S.

Steps for practitioners

The process for veterinarians responding to requests from local law enforcement regarding potential animal abuse or neglect cases involves four steps: request, assessment, reporting, and court appearance. Each step is explained in more detail in the unabridged version of this article, located on the WSDA’s veterinary resources site, along with other helpful documents relevant to animal welfare assessment or cruelty/neglect investigations.

It is important to base an investigation on the five freedoms of animal welfare. Objectively document if and when the animal’s needs are met and then make a professional assessment as to whether the animal experienced “pain and suffering.” Note that three of the five freedoms cover “feelings,” including “discomfort,” “pain,” “fear,” and “distress.” Documenting those pieces is critical to being compatible with animal cruelty and neglect language in state statutes (RCW 16.52.205 and RCW 16.52.207).

Responding to neglect and cruelty cases

Cases of animal cruelty or neglect are often investigated because of a citizen’s complaint to local law enforcement agencies. Cases are assigned to animal control officers (ACOs) if available. Most of the time, ACOs can handle these cases on their own. If medical attention or consultation is needed, they may seek assistance from a veterinary expert familiar with the species of concern. If attempts to engage a private veterinarian fail, ACOs can submit a request for assistance from the state veterinarian’s office. These are reviewed and approved on a case-by-case basis. Animal welfare investigations are an unfunded mandate at WSDA and cases are only accepted as a last resort. However, state field veterinarians will support private veterinarians with resources and report writing tips before or after practitioners respond to a request from local law enforcement.

**ANIMAL WELFARE CASE INVESTIGATION ACTION FLOW CHART**

- **Local law enforcement**
  - Private citizen files complaint
  - Stakeholders file complaint (Farm Services Agency, industry association, etc.)
- **Animal control agency**
  - Attempt to recruit private veterinarians for support.
  - Sometimes veterinarians contract with local animal welfare organizations.
- **WA State Veterinarians Ofc**
  - When other options exhausted, WSDA field veterinarians respond.
  - Unfunded mandate.
- **Field veterinarians**
  - Objectively assess animals and write corresponding report.
  - Often called to testify as expert witnesses.

Final thoughts

There is a definite need for veterinarians to act as leaders within their communities to help combat animal cruelty and neglect, while improving public perception of animal welfare on farms. Large animal veterinarians play a key role in this effort by promoting on-farm training for workers and establishing best practices for animals entrusted to their care.

Producers and veterinarians must be committed to advancing animal welfare to ensure a good life for animals and bolster consumer confidence. Supporting local ACOs by responding to their requests is one way to separate great producers from the minority not addressing animal welfare. Writing a strong report will make a solid case with a better chance of settling out of the courtroom and resolving shortcomings quickly.

**THE FIVE FREEDOMS**

1. **Freedom from hunger, thirst or malnutrition** by ready access to fresh water and a diet to maintain full health and vigor.
2. **Freedom from discomfort** by providing an appropriate environment including shelter and a comfortable resting area.
3. **Freedom from pain, injury or disease** by prevention or rapid diagnosis and treatment.
4. **Freedom to display most normal patterns of behavior** by providing sufficient space, proper facilities, and company of the animal’s own kind.
5. **Freedom from fear and distress** by ensuring conditions and treatment that avert mental suffering.