



Fall/Winter 2020, Vol. 4, No. 4

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Staff Spotlight

A newsletter about diagnostic trends at the laboratory, animal health topics, interesting cases and new test offerings.

[www.vdl.ndsu.edu](http://www.vdl.ndsu.edu)

We welcome comments, questions and suggestions. Please email us at [ndsu@ndsu.edu](mailto:ndsu@ndsu.edu) or call the laboratory at (701) 231-8307.

# NDSU Veterinary Diagnostic Laboratory

## Editor's Note

Welcome to the last NDSU Veterinary Diagnostic Laboratory newsletter of 2020. This issue's highlights include information on a major staff change in the microbiology section, distribution of confirmed rabies cases in North Dakota for the year thus far, a guest column from NDSU Extension livestock systems specialist Karl Hoppe on supplementing beef cattle through the winter, and several interesting cases of parasitic disease previously unreported at the VDL.

Dr. Webb will return with updates in the next issue.

We hope everyone has a happy and healthy holiday season and we'll see you all in the new year!

**Heidi Lee Pecoraro, DVM, Ph.D., Diplomate, ACVP**  
Veterinary Pathologist

## Dr. Rice's Mystery Photo

The photo is from a 700-pound beef calf that died after exhibiting neurologic signs. The calf had been treated with thiamine prior to death. Rabies examination was negative. Visit the VDL website ([www.vdl.ndsu.edu](http://www.vdl.ndsu.edu)) to see the answer and read more about the case.

**Brain from a beef calf.**  
(Laura Rice, NDSU)



## Calendar: Winter Closures

- December 24 – Christmas Eve (half day)
- December 25 – Christmas Day
- January 1 – New Year's Day
- January 18 – Martin Luther King Jr. Day
- February 15 – Presidents' Day

**NDSU** VETERINARY DIAGNOSTIC  
LABORATORY  
North Dakota State University

## Bench Notes

### Staff Changes



**Kelli Maddock** (Photo by Kelly Benson, NDSU)

Kelli Maddock is the new section head of VDL Microbiology. Kelli is a licensed medical laboratory science (MLS) technologist who has worked at the VDL since 2015 as a molecular microbiologist. She received additional MLS certification in microbiology and is nearing completion of her master's

degree in the field. Kelli also manages the Biosafety Level 3 (BSL-3) laboratory, which performs tularemia, anthrax and plague testing. Besides her bench duties, Kelli updates the VDL website with the latest testing information and resources, sampling tips and VDL cases of interest, and has been instrumental in organizing the new LIMS system. As Microbiology section head, Kelli's goals are to provide additional interpretation for culture results, expand microbial diagnostic panels, and evaluate and distribute antimicrobial resistance data to regional veterinarians.

### Molecular Diagnostics (PCR)

Due to the current SARS-CoV-2 pandemic, delays in reporting molecular/PCR results may occur. However, we always will do our best to get results back in a timely manner and if a significant delay occurs in reporting results, we will notify you.

Samples must be received by the business day prior to the scheduled test day. Fill out the submission form completely with collection date, case history, and any vaccinations and/or treatments because sample age, prior vaccinations and/or treatment (antibiotics) can affect the interpretation of PCR results. More details on sample submission guidelines and policies are found at [www.vdl.ndsu.edu/updates-from-the-molecular-diagnostics-department/](http://www.vdl.ndsu.edu/updates-from-the-molecular-diagnostics-department/).

For **Johne's testing**, it is essential to have consecutive ID numbers (starting with 1, 2, 3, etc.) on the fecal samples. Correctly labeling will avoid extra processing fees. Please see the 2020-2021 Guide ([www.vdl.ndsu.edu/wp-content/uploads/2020/09/Johnes-2020-2021.pdf](http://www.vdl.ndsu.edu/wp-content/uploads/2020/09/Johnes-2020-2021.pdf)) and examples of proper submissions at [www.vdl.ndsu.edu/johnes-submission-examples/](http://www.vdl.ndsu.edu/johnes-submission-examples/).

We always are looking to improve our test offerings based on client needs. Please let us know if you would like us to add any tests to the molecular diagnostics PCR test list.

## Disease Updates

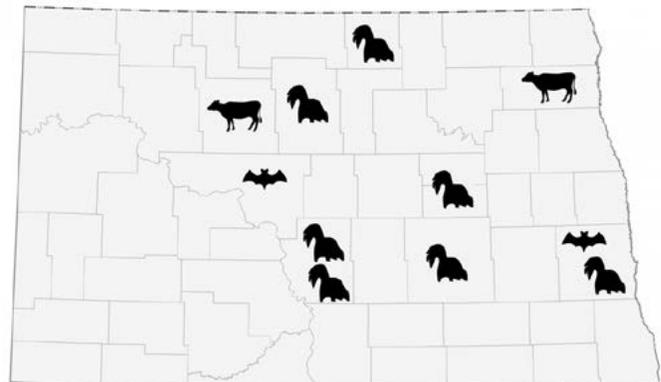
### Rabies

Nearly 400 rabies tests have been conducted this year at the VDL, compared with a total of 233 tests the previous year. Due to the current COVID-19 pandemic, the VDL is the only North Dakota state laboratory that is performing the rabies direct fluorescent antibody (DFA) test. Thus far, North Dakota has had 12 positive cases from animals. Most of the positive cases have been skunks (eight of 12), while bats and cattle make up the remaining cases at two each. Figure 1 depicts the geographical and species distribution for the 12 rabies cases.

We also have had 15 inconclusive tests. A test must be considered inconclusive if the sample is insufficient or markedly autolyzed (rotten). Often, the insufficient sample is due to submission of half of the brain in formalin and half of the brain fresh. Full cross-sections of fresh brain, specifically of the brain stem **and** cerebellum or hippocampus, are required for a valid negative DFA test. However, if any portion of the brain is positive by DFA, the sample is considered positive. Whole fresh brain also is helpful in ruling out other infectious or neoplastic processes. Finally, please remember that **when diagnosis of CNS disease is the goal, keep the brain fresh and whole.**

For submission tips, see our printable rabies guide at [www.vdl.ndsu.edu/wp-content/uploads/2019/10/Rabies-Guide.pdf](http://www.vdl.ndsu.edu/wp-content/uploads/2019/10/Rabies-Guide.pdf).

**Figure 1: Geographical and species distribution of rabies-positive animals in North Dakota January-September 2020.**



# Supplementation for Beef Cattle



Karl Hoppe, Extension Livestock Systems Specialist, NDSU Carrington Research Extension Center

Recently, I was visiting with a young cattle rancher about trace mineral supplementation. He was relaying his conversation with a veterinarian about the need for copper and its interaction with the immune system.

I shared a copper supplementation project that was done in the early 1990s near the Missouri River that showed a drastic reduction in calf scours with adequate copper supplemented to the pregnant cow. I then realized the young rancher wasn't born yet when this project was done.

We sometimes take for granted that people have heard the information that we feel is old news.

From a nutritional standpoint, any deficiency is a concern. However, let's plot a course for addressing nutritional deficiencies.

Energy content of the cow's diet is of most concern. Thin cows have an energy deficiency. While providing more energy seems the logical choice, due to the rumen microbes, a protein deficiency needs to be corrected first. Rumen microbes need nitrogen and amino acid carbon structures to thrive and ferment feed.

Volumes of research have addressed amino acid requirements and metabolizable protein needs in beef cattle. However, for a practical, low-cost, on-farm approach to protein supplementation, a simple crude protein determination of the feedstuffs is very insightful. A pregnant, nonlactating cow requires only 8% to 9% crude protein in her diet.

In November, most grasses are brown and dead. Crude protein levels can range from 4% to 12%. Cows will eat the more palatable 12% crude protein feeds first. Then when pastures are getting grazed off, the lower crude protein feeds are left and a protein deficiency starts.

This deficiency is slight at first, but the longer the cows are grazing the low-protein feed, the worse the deficiency gets. The lack of protein slows digestion by the rumen microbes and decreases rate of passage. This is a lot like the challenge of filling a water bucket that has a hole in it. The water level in the bucket will go down slowly until it's empty.

If a cow is grazing 35 pounds daily of brown grass that is 7% crude protein and the cow's crude protein requirement is 8%, she is getting 2.45 pounds of crude protein daily but needs 2.8 pounds of crude protein.

A 30% protein lick tub with consumption at 8 ounces daily provides 0.15 pound of crude protein. While a tub certainly helps, 2 pounds of a 20% protein "cake" feed would provide the 0.4 pound crude protein needed to provide an 8% crude protein ration.

In this example, 2.25 pounds of a 18% crude protein alfalfa hay also would provide 0.4 pound of protein. A couple of pounds of field peas also would provide the needed protein but you need to feed in a feed bunk or losses to feeding on the ground might double the amount of peas fed (at 50% feed loss).

Providing adequate energy is needed especially during cold weather. Obviously, poor-quality forages need extra energy supplementation. Thin cows are weak, have more dystocia, produce less colostrum and raise calves that are smaller and prone to health issues.

When feeding poor-quality forages, vitamin and mineral supplementation is needed at higher amounts.

With good-quality feeds, a safe assumption is that the feeds will provide at least half of the vitamin and mineral needs and a good-quality mineral mix is formulated to provide the rest. With poor-quality feeds, a mineral mix needs to provide almost all of the vitamins and minerals. This can be accomplished by feeding double the amount of the existing mineral or finding a mineral mix with double the concentration. In other words, feed 4 ounces of mineral instead of 2 ounces or find a mineral that has twice the concentration to be fed at 2 ounces.

Brown forages usually are lacking in vitamin A as well as most major and microminerals. I suggest doing a feed analysis on sample feeds for vitamin A analysis. However, please be aware that the coefficient of variation of vitamin A lab tests can be quite high.

Most feed companies will formulate for higher vitamin A concentrations than listed on the guaranteed feed analysis to offset lab test variation and the loss of vitamin A while feeds are in storage.

North Dakota soils are low in copper and most feed stuffs will provide a report of less than 6 parts per million (ppm) of copper. National Research Council beef cattle nutrient recommendations are 10 ppm of copper in the beef cow diet.

Continued on next page.

Subclinical deficiencies of copper are widespread in herds that do not provide mineral supplementation.

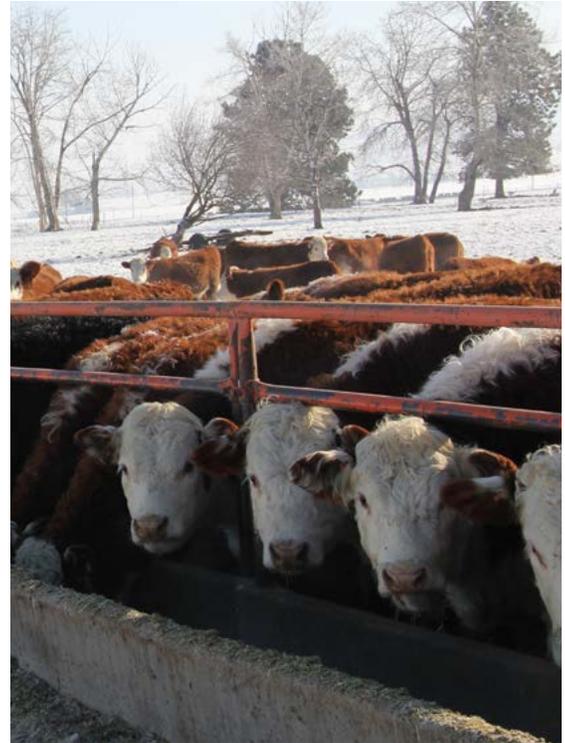
Rations that contain high levels of copper product feeds such as distillers grains, wheat midds and grains will need calcium supplementation to avoid urinary calculi. The high phosphorous concentrations of dried distillers grains with solubles, wheat midds and high grain diets create an incorrect calcium-to-phosphorous ratio. A ratio of 2 calcium to 1 phosphorous is indicated.

Diets high in sulfur may create polio symptoms. Removing the sulfur source or providing a different water source may help. Additional zinc, selenium and vitamin E also usually are needed in the mineral mix.

Be careful of interactions between minerals that can interrupt bioavailability. Chelated or organic forms are more bioavailable and might be needed to offset deficiencies.

Liver biopsies can provide insight to mineral status of the animal. However, due to tremendous individual variation, multiple animals should be sampled to evaluate the herd sufficiency.

Providing a mineral supplement can help reduce mineral deficiencies. Providing directly into a totally mixed ration is the best approach to ensure adequate intake. Free choice supplementation only helps the cattle that actually consume the mineral.



## WOULD YOU LIKE TO KNOW IF YOU ARE A CARRIER OF DRUG RESISTANT ORGANISMS?



**HUMAN HEALTHCARE WORKERS**  
are colonized with antimicrobial resistant bacteria at higher rates than community members



**THE VETERINARY PROFESSION**  
may be associated with similar occupational risks

### NDSU RESEARCHERS

Gerald Stokka DVM, MS  
Paul Carson, MD, FACP  
Teckla Webb, DVM  
Kelli Maddock, MLS, ASCP

WANT TO FIND OUT, AND WE NEED YOUR HELP



#### WHO MAY PARTICIPATE?

- Any veterinarian or veterinary technician, age 18 years or older, who is employed in any aspect of the veterinary profession



#### WHAT ARE THE BENEFITS?

- Help identify if veterinary occupational risks exist
- Your carriage data will be provided to you upon request
- Enter to win an iPad!



#### WHAT IS REQUESTED?

- A self-collected nasal and rectal swab
- Sampling kits will be mailed to you, with free return postage for sample submission



#### I WANT TO PARTICIPATE!

Click [HERE](#) to have sample kits mailed to your clinic  
OR request sample kits from Teckla Webb:  
TecklaWebb@gmail.com  
(970) 217-5693 (call or text)

INSTITUTIONAL REVIEW BOARD APPROVAL HAS BEEN OBTAINED FOR THIS STUDY: PROTOCOL #AG20194

Website for the survey is [https://ndstate.co1.qualtrics.com/jfe/form/SV\\_6zKe5ODNrPRyx9j](https://ndstate.co1.qualtrics.com/jfe/form/SV_6zKe5ODNrPRyx9j)

## Mini Case Reports

As livestock are brought in from pasture and readied for the winter months, parasite infections picked up in the summer may begin to manifest. Nematodes are problematic for many species – both small and large. This issue's mini cases focus on two unusual nematodes detected in regional animals in the last few months.

**Camelid myelitis:** A 3-year-old female alpaca was submitted for autopsy. It had a history of parturition (also called “unpacking” or “criating” in this species) the day prior to death. The animal was noted to have been weak in the backend before becoming down and unable to stand. Another alpaca was exhibiting similar signs.

On gross examination, we found hemorrhages in the lungs and intestines and along the tongue. Microscopically, a mononuclear leukocytic infiltrate was noted around blood vessels in the cerebral cortex. Thus, a rabies test was performed and was negative. Given the history of being down, the spinal cord (SC) was removed for histology.

More than 30 cross- and longitudinal sections of the cervical, thoracic and lumbar SC were examined microscopically. One section each of thoracic and lumbar SC had adult nematodes characterized by a 1- to 2-um-thick eosinophilic cuticle, skeletal musculature, pseudocoelom, and digestive and reproductive tracts (Figure 2). Eosinophils and other leukocytes, as well as axonal degeneration, were observed nearby. Encephalitis caused by *Parelaphostrongylus tenuis*, the meningeal worm of white tail deer, was diagnosed.

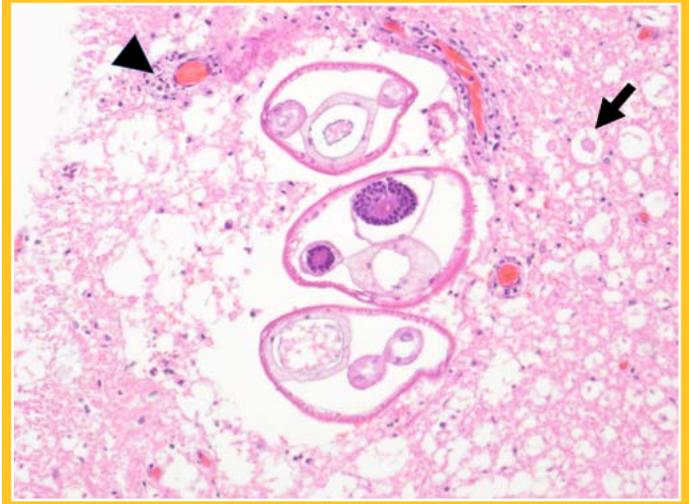
*P. tenuis* infection is one of the main differentials for encephalitis in new world camelids where white tail deer are abundant (for example, northeastern U.S.). This case, however, is the first recorded at the VDL and highlights the importance of parasite prevention. Additionally, *P. tenuis* infection should be considered in regional alpacas with neurologic signs.

**Equine nephritis and encephalitis:** A 22-year-old miniature horse gelding was euthanized with a suspected strangulating lipoma and presented for postmortem examination. Due to neurologic signs, including circling and falling in his stall, rabies virus examination was requested.

Grossly, the right kidney contained multifocal to coalescing foci ranging in size up to 2 millimeters in diameter. On section, the foci bulged and were homogeneously white. No other gross lesions were appreciated.

The white foci in the kidney corresponded microscopically to granulomas centered on nematode larvae (Figure 3). The nematode larvae were characterized by a rhabditiform esophagus composed of a corpus, isthmus and bulb, and a tapered tail. These are hallmark features of

**Figure 2: Cross-sections of adult nematodes in the spinal cord of a 3-year-old alpaca. Axonal degeneration (arrow) and leukocytic infiltrates (arrowhead) are observed nearby. (H. Pecoraro, NDSU)**

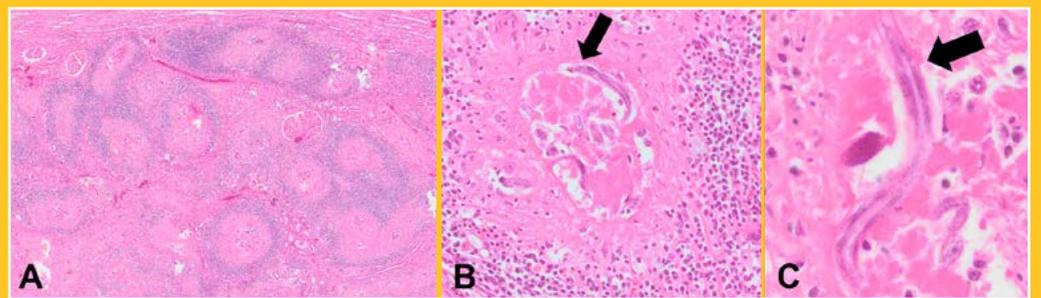


*Halicephalobus gingivalis*. Similar, though fewer, nematodes and inflammation were present in the cerebrum and brainstem.

*H. gingivalis* nematodes are free-living worms in the soil and decaying organic matter. They can infect horses and people and, thus, are considered to have zoonotic potential.

Clinical signs typically reflect the organs that are infected, which are most commonly kidney and brain, as well as lymph nodes, adrenal glands and the oronasal cavity. As this is a disseminated infection, however, any organ can be affected. This is the first record of *H. gingivalis* diagnosed at the VDL. Travel history of the horse was not provided.

**Figure 3: Multifocal to coalescing granulomas in the renal cortex (A) contain central cores of necrosis admixed with nematode larvae (B) that are characterized by a rhabditiform esophagus (arrows) and tapered tail (C). (H. Pecoraro, NDSU)**



## NDSU Veterinary Diagnostic Laboratory

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## Staff Spotlight

This issue we feature Beth Tacke, a longtime VDL chemist. Beth has been in the toxicology laboratory for 36 years. Her answers to our questions reflect the thoughtfulness she brings to the lab.

### **What is your favorite musical instrument and why?**

My favorite musical instrument has always been the cello. I love the warm and melancholy sound it makes. I wish I could play it!

### **If you could magically become fluent in any language, what would it be?**

I would love to be fluent in Italian. It is such a musical language and I like Italian food.

### **Would you rather live where it only snows or the temperature never falls below 100 degrees?**

I would rather live with snow and wear wool sweaters than deal with heat.

### **What's your favorite place of all the places you've travelled?**

The coast of Alaska is probably my favorite place I have ever visited.

### **What is your favorite breakfast food?**

My favorite breakfast food is a vegetable and cheese omelet.

### **Have you ever completed anything on your "bucket list"?**

I don't believe in bucket lists! I would die with regrets of the things I never got to do. I prefer to be grateful for what I have been able to do!



**Beth Tacke**  
(Photo by Kelly Benson, NDSU)



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For more information on this and other topics, see [www.vdl.ndsu.edu](http://www.vdl.ndsu.edu)

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