

DIAGNOSTIC INSIGHTS

Nitrate Poisoning

By Dr. Deon van der Merwe

Nitrate is the most important form of useable nitrogen absorbed from soil by plants. The nitrate uptake rate through the roots is variable through the life cycle of a plant, reaching a maximum around the time when the plant growth rate is at its highest, typically during the summer for most plants. The rapid rate of nitrate uptake by plants during periods of peak growth is normally balanced by the utilization of nitrate in the production of proteins, DNA, and other nitrogen-containing molecules. A critical step in the utilization of nitrate by plants is the reduction of nitrate by an enzyme called nitrate reductase (NR). The activity of this enzyme is not constant, but can be increased or decreased depending on the presence or absence of favorable growing conditions. When conditions are unfavorable for the plant, NR activity can be reduced and nitrate concentrations will then increase in plant tissues because nitrate uptake through the roots may



Cows found dead in the morning after being fed high nitrate sorghum-sudan hay the night before.

continue for a time even when the plant is not able to utilize the excess nitrate. The excess nitrate in the plant tissues is then available for rapid use when growing

conditions improve. It usually takes only a few days of normal growing conditions for nitrate levels to return back to normal. However, if plants are consumed by ruminant livestock during a period of nitrate accumulation, the excess nitrate concentrations may be

high enough to cause nitrate poisoning. Also, if plants are cut for hay during such a period the nitrate concentrations will be high in the hay, and will remain at high levels indefinitely.

Several factors play a role in the level of nitrate

poisoning risk. Not all plant species are prone to nitrate accumulation, but it is a risk in several crop and weed species. Commonly affected species in our region include sorghum, corn, rape, wheat, lambsquarters, pigweed, ragweed, fireweed, annual sunflower, sweetclover, and others. As a general rule of thumb, plants with a high growth rate potential tend to be associated with a relatively high risk of nitrate accumulation. Drought during the peak growing season, and plants growing in nitrate-rich soils, are the most common environmental causes of nitrate accumulation, but many other factors that reduce plant growth could play a role. Examples include persistent cloud cover, herbicides, and nutrient deficiencies. Another factor that may play a role is nitrate in drinking water. Some sources of drinking water may contain relatively high concentrations of nitrate, and it is the

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Nitrate Poisoning (continued)

total nitrate ingestion, including feed and water, that determines the potential for nitrate poisoning to occur.

When nitrate is consumed by ruminants, microbes in the rumen rapidly transform the nitrate into nitrite, which oxidizes hemoglobin to methemoglobin. Methemoglobin has a poor capacity for carrying oxygen, and the animal becomes oxygen starved. Animals that are not used to nitrate in the diet are more susceptible. Typical signs of nitrate poisoning include exercise intolerance, rapid breathing, collapse and convulsions. Nitrate can lead to rapid death

in animals that consumed forage with high nitrate concentrations. In some cases it may lead to death of fetuses and abortions, typically 3-7 days after exposure, even if the mother is able to survive. Horses and other non-ruminant species such as pigs are less susceptible, but poisoning may occur when nitrate exposure levels are extremely high. Treatment is only effective if given quickly after exposure to nitrate, and in many cases animals will die before effective treatment can be given.

Dr. van der Merwe is in the Department of Diagnostic Medicine and Pathobiology.

Chronic Wasting Disease (CWD) in Cervids

By Dr. Brad Njaa

Introduction

Chronic wasting disease is a neurological disease found in elk, deer and moose (cervids). Researchers believe that the disease-causing agent is an infectious abnormal protein, called a prion, which is smaller than a virus. Prions (pronounced PREE-ons) attracted public attention during the bovine spongiform encephalopathy or "mad cow" epidemic that affected England in the 1980s.

The disease-causing prions enter brain cells and apparently convert normal prions found within the cells into abnormally-folded prions just like themselves. The abnormally-folded prions accumulate in the brain, causing death of brain cells and the development of microscopic holes. Pathologists describe these holes as "spongy change," which has led to naming this group of diseases "spongiform" brain diseases (Figure 1). Because these diseases can be transmitted, CWD is part of a larger group of diseases referred to as Transmissible Spongiform Encephalopathies or TSE's.

CWD transmission occurs through deer to deer contact. Recent research has determined that plants growing in contaminated areas can accumulate and retain infectious prions from the soil. **There is no scientific evidence that CWD is transmissible to other animals through consuming meat from an infected deer. In addition, there is absolutely no evidence that humans can contract the disease by simply being in an area of Kansas where the disease has been found.**

The prion that causes CWD accumulates in certain parts of infected animals including: the brain, eyes, spinal cord, lymph nodes, tonsils, and spleen.

Although there is no scientific evidence that CWD is transmissible to humans, health officials recommend that these parts not be eaten and also advise that no human or animal eat any part of a deer confirmed positive for CWD.

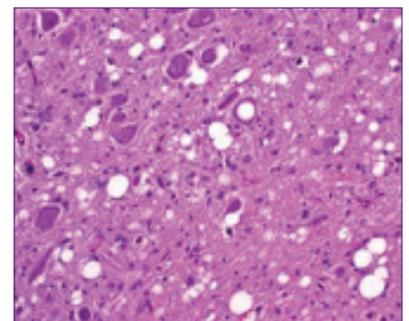


Figure 1. Spongiform changes in the brain stem due to CWD.

Chronic Wasting Disease (continued)

General precautions

- Do not eat the eyes, brain, spinal cord, spleen, tonsils or lymph nodes of any cervid.
- Do not eat any part of a cervid that appears sick.
- Test your cervid for CWD before consuming (Figure 2).

Test selection: Chronic Wasting Disease (CWD) histopathology

Specimens: obex, retropharyngeal lymph node in formalin

Turnaround time: 3-4 days

Cost: \$23.75

- Wait for test results before eating the meat.

Suggested precautions for hunters when field-dressing cervids

- **Wear rubber or latex gloves**
- **Minimize the handling of brain or spinal tissue. If removing antlers, use a saw designated for that purpose only, and dispose of the blade.**
- **Remove lymph nodes in/near joints**
- **Bone out meat from the deer and remove all fat and connective tissue. This will also remove lymph nodes.**
- **Do not cut through spinal column. Avoid using a saw.**
- **Identify and store meat and trimmings from each deer separately.**
- **Each hunter should get meat only from the animal he or she brought to you**
- **Thoroughly clean and sanitize equipment and work areas with bleach** before using it for other processing. Use a solution of equal parts chlorine bleach and water. Wipe down countertops and let them dry. Soak items like knives one hour. When through, dilute the solution further and dump it down a drain.
- **If you store meat until test results are available, work with owners to dispose of meat from animals that test positive for CWD.**



Figure 2. Strong positive staining for CWD in the obex.

Dr. Njaa is an anatomic pathologist in the Kansas State Veterinary Diagnostic Laboratory at Kansas State University.

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Canine Bacterial Pyoderma: Indications and Skin Sampling Techniques

By Dr. Chanran Ganta and Dr. Mary Bagladi-Swanson

Canine bacterial pyoderma is a common skin condition that often has a prolonged course of infection, posing a significant challenge for disease treatment and management.

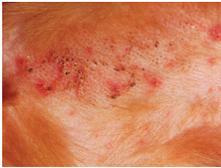
Staphylococcus pseudintermedius is the most common organism associated with canine pyoderma. Normal commensal bacteria like *Pseudomonas*, *Enterobacter*, *E. coli*, etc. can transform into primary pathogens due to abnormal 'host factors' such as hypersensitivities, ectoparasitism, endocrinopathies, autoimmune diseases and cornification abnormalities.

Successful treatment of canine bacterial pyoderma requires identifying the underlying skin condition, isolating the bacterial pathogen through culture, and identifying its antimicrobial susceptibility. The procedures to collect samples for culture and susceptibility depend on the lesion type and are described in **Table 1**.

Indications that suggest bacterial culture may be required in canine pyoderma cases

- A. Presence of intracellular rod-shaped bacteria on cytology
- B. Previous history of drug-resistant infection in the dog or in a pet from the same household
- C. Less than 50% reduction in clinical improvement within 2 weeks after appropriate systemic antimicrobial therapy has begun
- D. Emergence of new lesions (papules, pustules, collarettes) 2 weeks or more after the initiation of appropriate antimicrobial therapy

Table 1. Sampling guidelines for lesions of superficial bacterial pyoderma for culture and susceptibility testing.

Lesion	Sampling Procedure
Pustule 	No surface disinfection. Clip hair with sterile scissors (avoid clippers). Lance pustule with sterile narrow-gauge needle. If purulent exudate is visible on the needle, apply to a sterile swab; if not, gently touch exudate expelled from pustule with sterile swab and place in transport medium or sterile container. Sometimes lancing of very small pustules results in haemopurulent exudate, which is still suitable for sampling.
Crust 	No surface disinfection. Use sterile forceps or a sterile needle to lift the edge of a crust. The presence of exudate under a crust indicates an ideal site for culture. Touch sterile swab to exposed skin surface and place in transport medium or sterile container
Epidermal collarette 	No surface disinfection. Clip hair with sterile scissors (avoid clippers). Roll sterile swab across border of collarette two or three times and place in transport medium or sterile container
Papule 	Sampling by biopsy is probably more reliable. Provide local anesthesia by subcutaneous injection of 2% lidocaine. Clip hair with sterile scissors or clippers. Clean skin surface by a single wipe with 70% alcohol (no additional surgical preparation). Allow alcohol to dry. Using a sterile 3 or 4 mm punch and sterile surgical instruments, collect tissue sample and place in sterile container or transport medium. Suture biopsy site. Alternatively, papules may be prepared and disinfected as above, then sampled by insertion of a sterile needle and culture of emerging or expressed blood or exudate.

Canine Bacterial Pyoderma (continued)

For more information concerning canine pyoderma, please see the articles below.

- A. Guidelines for the diagnosis and antimicrobial therapy of canine superficial bacterial folliculitis (Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Diseases). Hillier A. et. al. Vet Dermatol. 2014 Jun; 25(3):163-75.
- B. Recognizing Pyoderma More Difficult than it May Seem. Gortel K. Vet Clin North Am Small Anim Pract. 2013 Jan; 43(1):1-18.
- C. Canine superficial bacterial folliculitis: Current understanding of its etiology, diagnosis and treatment. Blom P. Vet J. 2014 Feb; 199(2): 217-222.

Dr. Ganta is an anatomic pathologist in the Kansas State Veterinary Diagnostic Laboratory and Dr. Bagladi-Swanson is a dermatologist in the Veterinary Health Center at Kansas State University.

Check out our new resources page!
<http://www.ksvdl.org/resources/videos.html>

Kansas State Veterinary Diagnostic Laboratory

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Resources

Educational Videos

Clinical Pathology:

- Impression Smear for Cytologic Evaluation
- Fecal Egg Count Reduction Test

Bovine:

- Fecal Egg Count Reduction Test

Canine/Feline:

- 6 Tips for Biopsy Submission

Camelid:

- Alpaca Handling

Equine:

- Fecal Egg Count Reduction Test

Wildlife:

- Chronic Wasting Disease Testing in Deer

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785-532-3294 or
866-884-3867
Fax: 785-532-3502
vdlbusiness@vet.k-state.edu

KSVDL Personnel Activities

Presentations:

- Dr. Susan Moore presented at the AAVLD Annual Meeting in Greensboro, NC: "Duration of serum antibody response to rabies vaccination in horses" and "Serologic detection of equine antibodies to vaccine and field strains of rabies virus using a multiplex microsphere-based assay".
- Dr. Michael Dryden presented topics that included control of ticks and Lyme disease to the New Hampshire Veterinary Medical Association in Keene, NH.
- Dr. Susan Moore presented at the One Health Webinar associated with the Rabies in the Americas annual meeting, Belem, Brazil: "Role of serology in animal health: What don't we know?"
- Dr. Brian Lubbers presented "Biology and policy of antimicrobial use in animal agriculture" at the Professional Dairy Producers Conference in Madison, WI.
- Dr. Gregg Hanzlicek presented the "Veterinary feed directive for cattle producers" at the SEK Genetic client appreciation banquet in Parsons, KS.
- Dr. Michael Dryden presented topics that included control of ticks and Lyme disease to the Vermont Veterinary Medical Association in Woodstock, VT.
- Dr. Susan Moore attended the USAHA Rabies and Public Health Committee meeting in Greensboro, NC.
- Dr. Bill Fortney and Beth McQuade represented the KSVDL at Southwest Veterinary Symposium in Fort Worth, TX. Beth McQuade also assisted with the KSVDL Rabies titer booth.
- Dr. Gregg Hanzlicek presented the "Veterinary feed directive for cattle producers" at the Boeringer Ingelheim Cattle Producers Meeting in Tescott and Sylvan Grove, KS.
- Dr. Michael Dryden presented lectures on flea control, tick control and heartworm disease at the Illinois Veterinary Medical Association in Lombard, IL.
- Dr. Jianfa Bai presented a study titled "Application of digital PCR for the detection and association of major Shiga toxigenic Escherichia coli serogroups and key virulence genes" (other investigators: Xuming Liu, Lance Noll, Xiaorong Shi, Andrew O'Guin, Jamal Mitchell, Brent Dalke, T. G. Nagaraja, Gary Anderson) at the 59th AAVLD / 120th USAHA Annual Meeting in Greensboro, NC.
- Dr. Bill Fortney presented "Canine leptospirosis diagnostics" and Dr. Gregg Hanzlicek presented "The value of bovine serology in reproductive cases" at the North West District of the Kansas Veterinary Medical Association meeting in Colby, KS.
- Dr. Gregg Hanzlicek presented "VFD for the beef producer" in Union Town, KS sponsored by K-State Research and Extension.
- Dr. Jianfa Bai was elected co-chair of AAVLD Laboratory Technology Committee at the 59th AAVLD Annual Meeting in Greensboro, NC.
- Dr. Gregg Hanzlicek presented "Trouble shooting unexplained pasture deaths" at the K-State Animal Science Extension Agent Update in Hill City and Dodge City, KS, sponsored by K-State Research and Extension.
- Dr. Michael Dryden presented lectures on flea and tick control to veterinarians in Omaha, NE.
- Dr. Brian Lubbers will present "Antibiotic Stewardship" to attendees at the MAH Stocker Conference in Starkville, MS.
- Dr. Megan Niederwerder will present "The role of the microbiome in PRRS" at the North American PRRS Symposium in Chicago, IL.

Personnel Activities (continued)

- Dr. Gregg Hanzlicek presented “VFD for the beef producer” in Oswego, KS sponsored by K-State Research and Extension.

Publications:

- Rabies vaccine response measurement is assay dependent. Susan A. Moore, Samantha Pralle, Leslie Engelman, Hattie Hartschuh, Mylissa Smith. In press: *Biologicals* (2016) pages 1-6
- Tissue localization, shedding, virus carriage, antibody response and aerosol transmission of Porcine epidemic diarrhea virus (PEDV) following inoculation of 4-week-old feeder pigs. Niederwerder, M.C., J.C. Nietfeld, J. Bai,

L. Peddireddi, B. Breazeale, J. Anderson, M.A. Kerrigan, B. A., R.D. Oberst, K. Crawford, K.M. Lager, D.M. Madson, R.R.R. Rowland, G.A. Anderson, and R.A. Hesse. 2016. *J Vet Diagn Invest.* 28(6): 671-678.

Disease Field Investigations Conducted by KSVDL:

- Mycoplasma mastitis outbreak in a dairy herd
- Respiratory disease outbreak in home-raised, weaned beef calves
- Sudden death in fall calving cows

KSVDL on YouTube

We have posted new videos on the KSVDL YouTube® channel covering the following topics:

- Sampling deer for chronic wasting disease (CWD)
https://www.youtube.com/watch?v=jzmFN6tVa_k
- Deep pharyngeal swab sampling for bovine respiratory disease
<https://www.youtube.com/watch?v=WB3luk1nQjY>
- Bovine lung sampling for bacterial culture
https://www.youtube.com/watch?v=llz_QiXX0II
- Bovine lung sampling for PCR testing
<https://www.youtube.com/watch?v=8fiBz8yKI30>
- 6 tips for biopsy submission
<https://www.youtube.com/watch?v=79v69x7qLFs>
- Fine needle aspirate
<https://www.youtube.com/watch?v=JTYJBNxeTH8>



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KansasStateVeterinaryDiagnosticLaboratory1](http://www.youtube.com/c/KansasStateVeterinaryDiagnosticLaboratory1)

Developing and Delivering Accurate, Innovative Diagnostic Services

The mission of the Kansas State Veterinary Diagnostic Laboratory (KSVDL) is to develop and deliver accurate, innovative, and timely diagnostic and consultative services to the veterinary and animal health community while providing support for teaching, training and research programs.

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Continuing Education

www.vet.k-state.edu/education/continuing/

December 8-11, 2016

CVC San Diego

San Diego, California

<http://www.thecvc.com/dates-and-locations/cvc-san-diego-2/>

February 3-5, 2017

**KVMA/KSVDL Continuing Education
Conference**

Manhattan, Kansas

February 24-26, 2017

Music City Veterinary Conference

Murfreesboro, Tennessee

<http://tvmanet.com/music-city-veterinary-conference-save-the-date/>

For more information, call the Continuing Education Office at 785-532-4528.

Test Results and Schedules

**Laboratory results available
online, all the time!**

Holiday Schedule:

Thanksgiving: Closed: Thursday, November 24th and Friday, November 25th; Open Saturday, November 26th

Christmas: Open Saturday, December 24th; Closed Monday, December 26th

New Year's: Open Saturday, December 31st; Closed Monday, January 2nd

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