OKLAHOMA STATE UNIVERSITY COLLEGE OF VETERINARY MEDICINE – OKLAHOMA ANIMAL DISEASE DIAGNOSTIC LABORATORY

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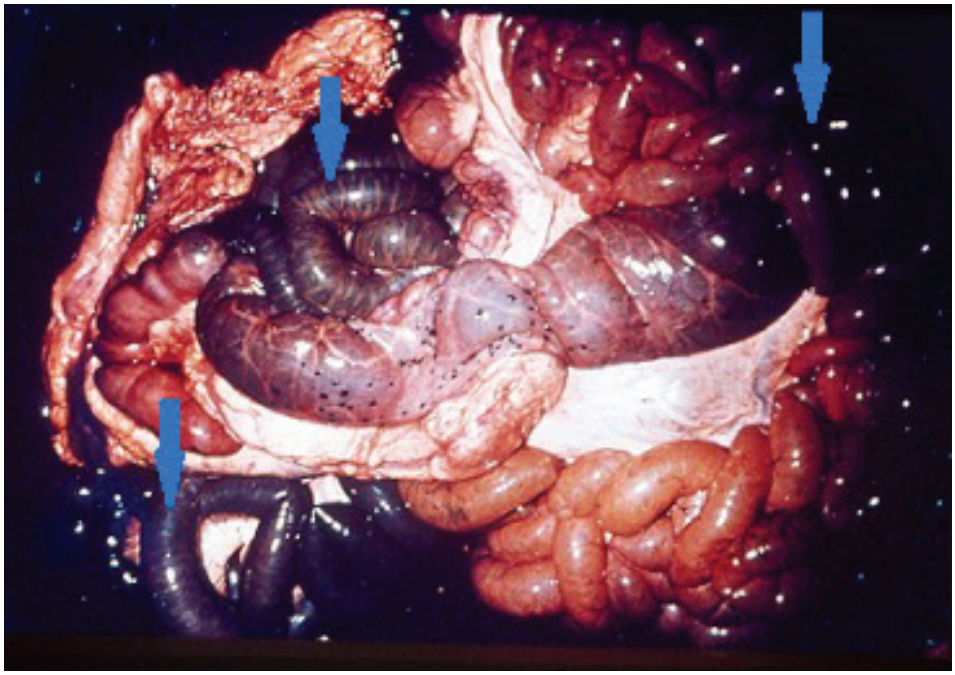
In this Issue

Faculty



Hyperemic intestines with hemorrhagic content (arrows) can be seen in cases of acute arsenic toxicosis. Image courtesy of Dr. Tam Garland (Merck Veterinary Manual)

A Case of Arsenic Toxicosis in Oklahoma Cattle

In May 2023, an adult cow was submitted for necropsy after 12 in the herd were found dead in a low creek area. The producer had concerns for hydrogen sulfide (H2S) given the proximity to creek water. The gross findings were unremarkable, though there was advanced postmortem autolysis. Histologically, there was minimal to mild laminar cortical necrosis and perivascular inflammation. Differentials for laminar cortical necrosis (polioencephalomalacia or PEM) in ruminants include: thiamine deficiency, sulfur, water deprivation/salt toxicity, and heavy metals such as lead and mercury. Rumen contents were submitted to a referral lab for sulfate testing. Published concentration ranges were not available; however, the levels were considered non-toxic in this case. Fresh liver was also sent to a different referral lab for heavy metal and mineral analysis. Arsenic levels in the liver were consistent with toxicity (56 µg/g detected in this case; levels considered above 8 µg/g are considered toxic).

There are inorganic and organic forms of arsenic, with organic arsenicals relatively less toxic than their inorganic counterparts. The heavy metal is found in several herbicides, insecticides, and other chemicals as well as in contaminated water sources, often in the more toxic, inorganic form. Arsenic is absorbed by the gastrointestinal tract and skin. Interestingly, it is the most toxic metal to the skin and can be excreted through the skin, hair, and nails as well as in the urine, bile, and

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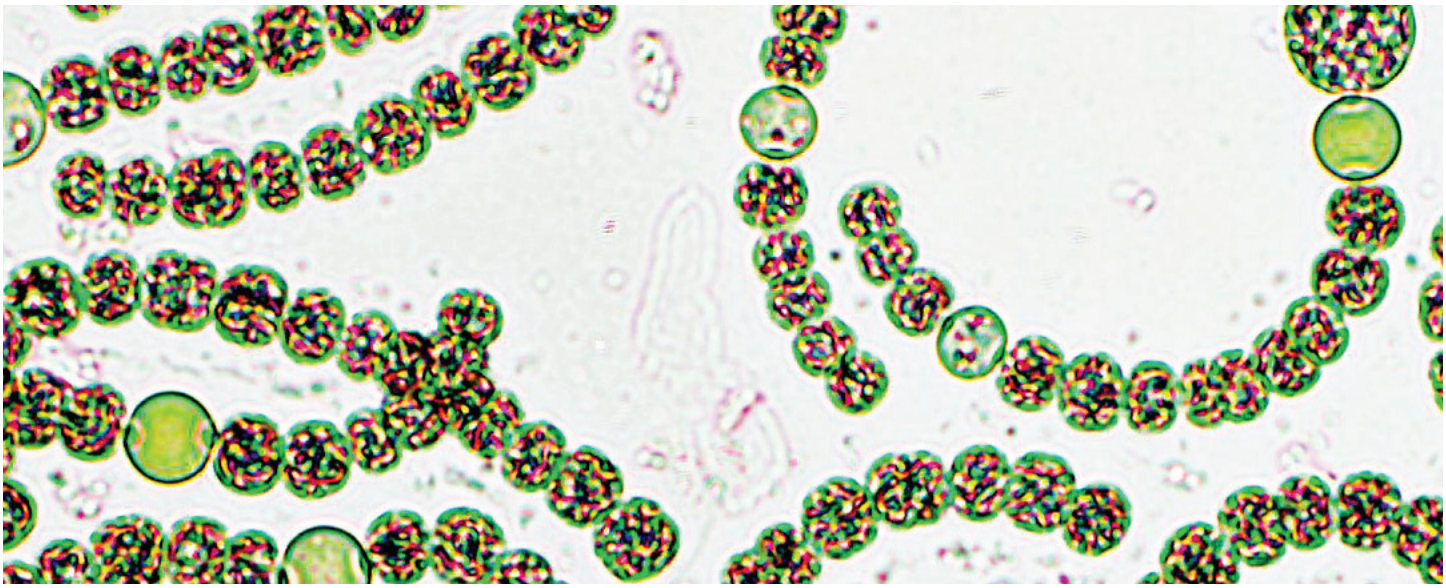
A Case of Arsenic Toxicosis in Oklahoma Cattle *(continued)*

milk. As such, the tissues of choice to determine arsenic exposure are liver, urine, EDTA blood, and hair. Arsenic can also be detected in feed and water sources. The gross lesions in acute arsenic poisoning include irritant contact dermatitis and similar lesions in the oral cavity, mucocutaneous junctions, and gastrointestinal tract. Brain, lung, liver, kidney, and the GIT tract are the organs most susceptible to arsenic toxicosis. In acute cases, hyperemia and inflammation of the gastrointestinal tract may be seen, and GI contents are often watery and fetid. Hyperemic "paintbrush" lesions along the GI and omasal serosa can be characteristic in ruminants. As in this case, heavy metal toxicosis should be considered in cases of sudden death in several animals.

— Dr. Brianne Taylor, DVM, MS, DACVP

Blue-Green Algae Testing at OADDL in 2022

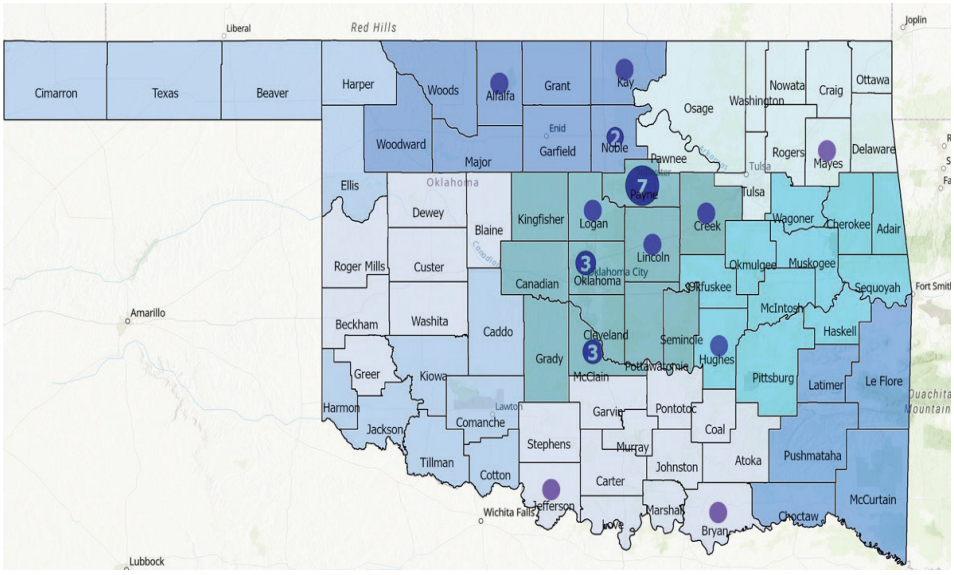


Above: Anabaena sp. of BGA detected in Central Oklahoma.

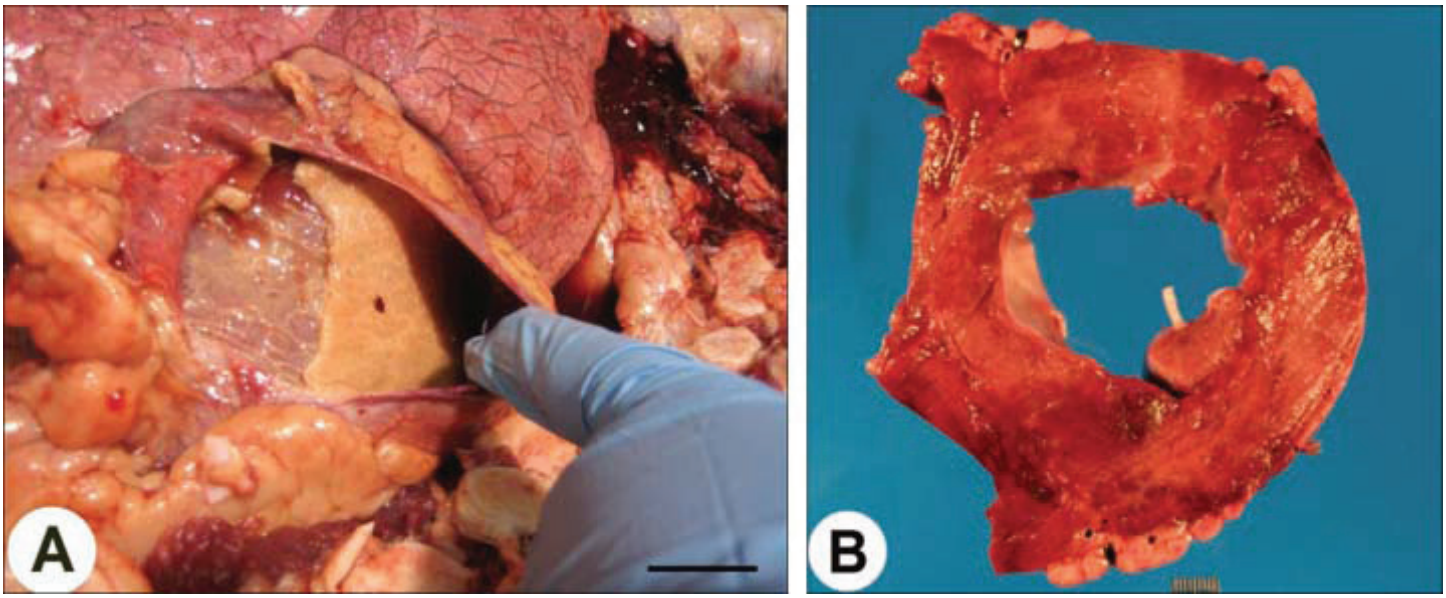
Blue-green algae, also known as cyanobacteria, are responsible for the formation of harmful algal blooms (HABs). HABs can produce different toxins including neuro and hepato toxins that can adversely affect ecosystems, human health, and animal health. Among water samples submitted to OADDL in 2022, the highest number of cases were detected during the months of July and August when the average temperature is highest in the state. Blue-green algae were detected in samples submitted from 13 counties in Oklahoma (Figure 1). Different species of blue-green algae identified include Oscillatoria spp., Microcystis spp., and Anabaena spp. Among them, Microcystis and Anabaena were the most frequently identified.

— Dr. Yash Chikara, Scott Talent, Noah Allen, Clay Deal, Dr. Varsha Sankar Babu, Dr. Akhilesh Ramachandran

Below: Map of Oklahoma showing counties where positive water samples for blue green algae were submitted for testing in 2022. The number of positive samples identified is also shown (no number indicates one positive was tested). The different county colors indicate the 9 different climatic zones in the state.



Blackleg: Prototypical Disease – Atypical Presentations - Part 2



Primary reference for figure and narrative: Snider T, Stern A. Pathology in Practice. Myocarditis and epicarditis. JAVMA 238(9): 1119-21 (2011). doi: 10.2460/javma.238.9.1119.

In the most recent edition of OADDL e-News, part 1 of this series on blackleg described atypical presentations focusing on unusual locations of blackleg, and these included: diaphragm, tongue, masseter muscle, and other unusual locations. In part 2, the atypical presentations of blackleg will focus on a form of blackleg known as visceral blackleg.

As a reminder, blackleg or clostridial myonecrosis is a septicemic, toxemic, usually fatal disease of cattle caused by *Clostridium chauvoei*. The ubiquitous organism is soil-borne, ingested by grazing ruminants as spores that localize throughout the body. Within a local tissue environment of anaerobiasis, spores can germinate and become dividing vegetative cells producing severe systemic toxins. In nearly all typical presentations, locomotor muscles exhibit dry, black, gas filled lesions that can easily lead to an accurate gross diagnosis.

Visceral blackleg is an atypical presentation of blackleg where the target is viscera. Nearly all other disease characteristics – cause, prevention, diagnostics, etc – are unchanged. Only the target is different. The peer reviewed literature on visceral blackleg presents some nonuniform terminology, but most experts term visceral blackleg as a disease caused by *C. chauvoei* affecting viscera, with reported cases affecting intestines, meninges, and heart. In many cases, visceral blackleg can be further named and sub-categorized by the organ affected (eg: cardiac blackleg). While various visceral sites have been reported, most reports in the literature and in unpublished case series indicate that cardiac blackleg is the most important and most common atypical presentation.

Clinically, a case of cardiac blackleg can present as anything from sudden death to a presentation that resembles many other cardiopulmonary conditions. Live cattle presenting with cardiac blackleg can exhibit dyspnea, tachycardia, exercise intolerance, brisket edema, and jugular pulses, as well as general signs of systemic disease such as fever, weakness, and anorexia. These nonspecific symptoms can make it challenging to diagnose cardiac blackleg accurately, particularly in its early stages. Therapeutic interventions, if attempted, should focus on penicillin therapy, anti-inflammatory drugs, and general supportive care. Most cases are fatal.

The approach to necropsy and the diagnostic strategy need emphasis as this is where the diagnosis can be missed. Cardiac blackleg is a necrotizing condition of the myocardium, epicardium, and pericardial sac. Large volumes of fibrin-rich, possibly cloudy pericardial fluid are typical, as well as fibrin mats on the epicardial surface (figure 1A). After removal of the heart, a coronal cross section of the heart will reveal areas of myocardial necrosis recognizable as multifocal areas of myocardial pallor (figure 1B). Fresh and fixed samples of myocardial wall where affected are usually sufficient to provide a pathway to confirmatory diagnosis. Fresh myocardium will be subjected to anaerobic culture and identification of the bacteria if there is growth. Fixed myocardium can yield histopathologic findings of necrosis, suppuration, and fibrin infiltrates.

While the gross appearance of cardiac blackleg is striking, it is not pathognomonic. Depending on the level of examination and dissection, differential diagnoses could include the cardiac form of *Histophilus somni*, anthrax, hardware disease, and possibly thymic lymphosarcoma.

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Blackleg: Prototypical Disease – Atypical Presentations - Part 2 *(continued)*

Due to the atypical nature of visceral or cardiac blackleg, the pathogenesis is incompletely understood. With specific regard to the anaerobic environment needed for spore germination, initiating causes should be considered. The list of potential causes to consider should include: toxins such as ionophores or gossypol; deficiencies of vitamin E or selenium; aberrant reaction to presumptively innocuous *Sarcocystis* cysts; or even intense exercise. There is also some anecdotal data loosely supporting the idea that many cases occur in cattle that received one priming dose of a multivalent Clostridial product, but did not receive the booster dose.

In conclusion, visceral (cardiac) blackleg represents a sinister manifestation of Clostridial myonecrosis that targets the heart and pericardial sac. It is more commonly observed in incompletely vaccinated cattle, underscoring the importance of vaccination in preventing this deadly disease. Veterinary practitioners should remain vigilant and consider atypical locations and presentations when suspecting blackleg. By understanding the nuances of this disease and its atypical presentations, we can better protect cattle and ensure their overall well-being.

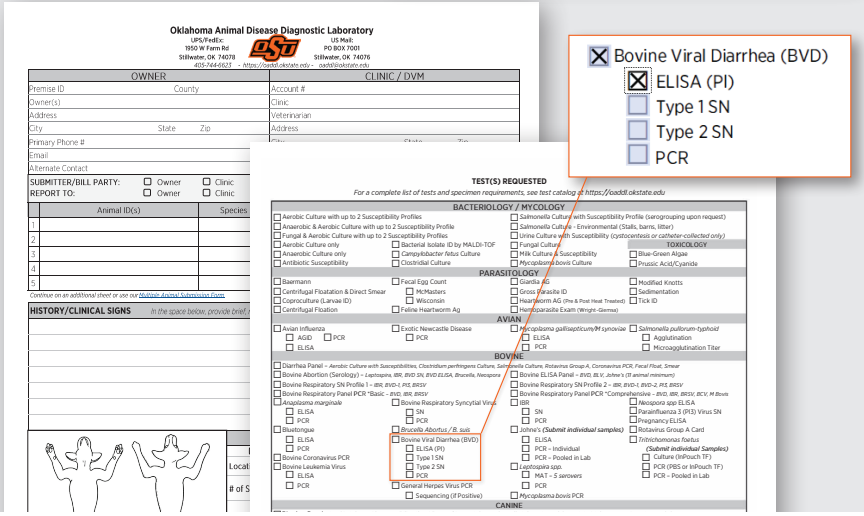
— Dr. Timothy Snider, OADDL Pathologist

Improved OADDL General Submittal Form

Click here to view the submittal form.

We have overhauled our submittal form to clearly identify the bill to and report to parties and make test selections easier.

Non-species-specific tests (Bacteriology and Parasitology) are at the top of the back page followed by species-specific (Molecular and Serology) tests. When there are multiple test types available, please select the specific test needed as seen at right for BVD. We are in the process of coming up with a new and improved Necropsy form as well!



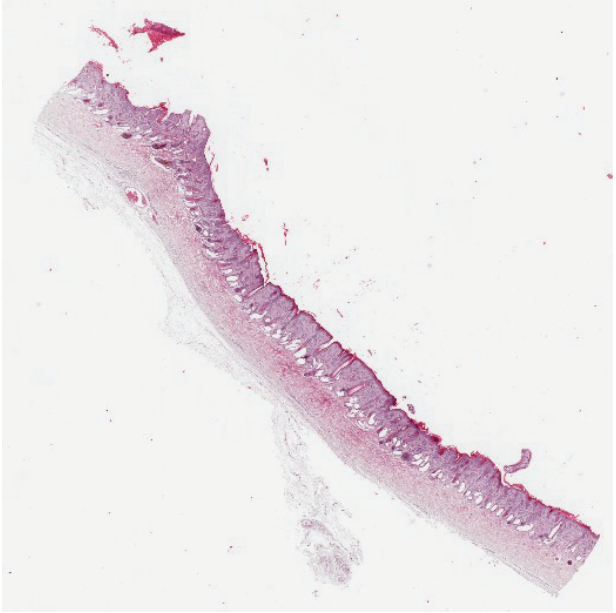
Skin Biopsy Series: Should I include gross pictures with the submission?

One of the most common submissions to our biopsy service is dermatologic in nature. To maximize the diagnostic potential of these biopsies, it is important to obtain adequate samples from affected areas and fill out the submittal form completely. Additionally, submission of photographs of the lesions are very beneficial in interpreting pathologic changes in the skin biopsy.

Clinical imaging is considered to be an essential part of documentation in human dermatology. With the revolution of smartphone cameras, obtaining high quality photographs is easy and immediate. These images are typically included in the patient's medical records. They are also tremendously useful for histopathologic interpretation and can steer the case into the right direction, aiding in quicker results and more adequate treatment of cases. Additionally, these images can be used for consultation among peers, treatment and disease monitoring, academic purposes, and research.

For these reasons, we encourage clinicians to include photographs of their dermatologic cases with their next biopsy submissions. These images can be sent with the biopsy submission, either by printing and attaching them to the submittal form, or by emailing to oaddl@okstate.edu. If you have any questions, please don't hesitate to reach out to us at 405-744-6623 or at oaddl@okstate.edu.

— Giselle Cino, DVM, PhD, Diplomat, ACVP



Alopecia in bovine due to telogen effluvium. A complete clinical history along with the gross images aided in the final diagnosis.

Message from the Director

Welcome to another issue of OADDL eNewsletter. It is always a pleasure to share Lab tidbits with you and introduce our new staff through this publication. The year 2023 is chugging along, with temperatures beating previous records all around Nevertheless, exciting things continue to happen at OADDL. In particular:

- We continue to maintain and strengthen our partnership with the Oklahoma Department of Health – sponsor of our West Nile virus surveillance testing in mosquitoes. And rabies testing program. We are in the second and third years of testing for those two programs respectively and are very pleased to be playing an important role in safeguarding the health of Oklahomans.
- This year we entered into a new partnership with Phoenix-based specialty pathology company, Vidium Inc, for whom we process histology specimens and produce slides for pathologists to do their work.
- In July we assumed responsibility for all the diagnostic and surveillance testing that was for several decades conducted at the Serology Lab of the Oklahoma Department of Agriculture, Food and Forestry.

Diagnostic Excellence SINCE 1975

We thank all our readers for your continuous support as we strive to always provide you with timely and accurate results. Please, do not hesitate to contact us (oaddl@okstate.edu; 405-744-6623) with any questions or suggestions. Happy reading!

– Dr. Jerry Saliki

Getting to Know Us

Taytum Crockett is from Claremore, Oklahoma. She received her BS in Animal Science in 2021 and her BS in Microbiology/Cell & Molecular Biology in 2022, both from Oklahoma State University. She joined the OADDL team in August 2022 as a Serology Senior Lab Technologist. In her free time, she enjoys taking care of her plants, watching horror movies, going to tons of concerts, and spending time with her cat, Goose.

Clay Deal joined the OADDL Bacteriology team in June of 2022 as a Senior Lab Tech. He graduated from Oklahoma State University in May of 2022 with a Bachelor's Degree in Microbiology/Cell & Molecular Biology. He has always lived in Oklahoma and enjoys fishing, hiking, cooking, spending time with friends and family, and is a follower of Jesus Christ.

Ideas/Suggestions for Future Content

We want to hear from you. Send your ideas and suggestions to oaddl@okstate.edu.

Contact Us

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