Fabien pointed out that the approach and outcomes of this outbreak show how the long-term collaborative **Community-Based Wildlife Health Monitoring (CBWHS) Program is effective at helping communities address disease concerns**. When Russell reached out to Fabien as CBWHS Program Lead, the Kutz Research Group and the UCalgary Diagnostic Services Unit were able to jump in and help right away. Phone calls and Zoom sessions helped guide about locating the carcasses quickly, taking key photos, and collecting and processing specific samples safely. Fabien had recently been in Kugluktuk and had provided ongoing training for Government of Nunavut Wildlife Technician Terry Milton while there. Terry was able to process the samples as needed and ship them to Calgary.

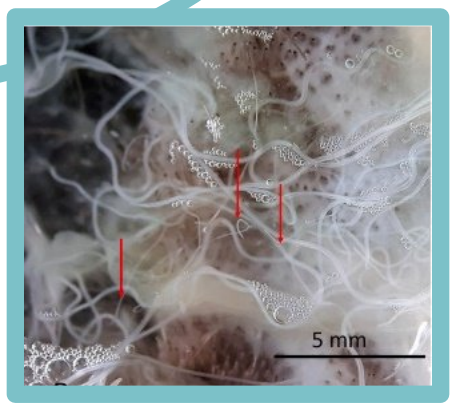
**CBWHS in Outbreaks:**
**Rapid effective north-south communication led to quick sampling, photos, and timely diagnosis!**

**… plus an "all clear" regarding food safety**

## Sample processing in Kugluktuk

- Kutz Research group visited a few weeks before for training
- Zoom session
- Samples in formalin (not frozen!)
- Shipped to Calgary

**Terry Milton**
Wildlife Technician, Gov. of Nunavut




Once the samples arrived, they were swiftly examined and even tested using a new laboratory test the Kutz team had developed. Experts were able to identify **two parasitic worms** (from the family of **"filarioid"** worms) that are **transmitted by biting insects** and that are likely to become an increasingly common health issue in the Arctic as insects are expanding north.

Importantly, the entire information exchange and diagnosis occurred very quickly; **the results were reported back within a few weeks (October 2023)** and Fabien and the UCalgary team were able to assure the community that caribou infected with these parasites are safe to eat.

However, Pat Klengenberg (President of the Olokhaktomiut Hunters and Trappers Committee in Ulukhaktok) explained to the group **how difficult it is for harvesters to take the meat of a sick animal**. He said that even when the risk for people is low, that low risk might not be acceptable when weighed against the wellbeing of relatives and friends sharing the meat. Pat also noted that severe changes in the meat might also affect the pleasure of eating it. He said, **"Country food should be not only safe, but also enjoyable."**

❖ ❖ ❖

A really interesting aspect of climate change is **insects in the North**! Many people across the Arctic are noticing and reporting insects they haven't seen there before. **Dr. John Soghigian** (Assistant Professor, UCalgary) and **Danielle Nowosad** (soon-to-be Postdoctoral Researcher with Kutz/Soghigian Labs) talked about new research that is getting underway this year in connection with the CBWHS Program. The focus is changes in northern biting insects (BIs) and their possible wildlife disease impacts.

Dani leads the community-based **Kitikmeot Biting Insect Monitoring Program**, which is currently running in Kugluktuk and expanding to other communities. Insect trapping and testing have identified BI species that haven't been found at these northern latitudes before. Biting insects can potentially transmit disease to caribou and other animals (i.e., act as "disease vectors"), so if higher numbers of them and their geographic range/survival are shifting northward, this could risk wildlife health. There is much more to learn! John is an expert in mosquitoes and other biting flies. He explained that changes in "phenology" (natural cycles of animals and plants) with climate change are important, too; with warmer temperatures in the North, mosquitoes can now undergo more life cycles in one season, producing much higher numbers per season. John's lab does genetic testing and will be working with Dani and other researchers to identify BI vectors and pathogens that these BIs (and arctic animal hosts) carry that could be spread, potentially affecting caribou and muskox populations and other species. In addition to the research discussion, workshop participants got to view some insects very close-up under the microscope in the lab!

Photos by D Nowosad

# WORKSHOP Day 3 – March 13, 2025

## DAY 3 MORNING:

Back at the CSB, participants divided into two groups. Group 1 got guided **hands-on experience doing all the hunter-kit sample collections** and measurements themselves using deer carcasses. Group 2 went to the lab where Kutz Research Group technician Angie Schneider and team members demonstrated **how all the hunter-kit samples are analyzed**. Everyone got to try techniques and equipment themselves, viewing parasite eggs and larvae under the microscope, pipetting liquid "samples" into testing plates, and more.

Also, two seal carcasses were generously donated by the Marine Animal Response Society (MARS, https://marineanimals.ca/), a stranding network that investigates marine mammal health throughout Atlantic Canada. Participants **performed necropsies on these seals**, with pathology expertise and guidance provided by Laura Bourque throughout.

Lab photos: A Schneider

## DAY 3 AFTERNOON:

Everyone got an interesting tour of the DSU's Histology and Bacteriology Lab (where staff finely cut and stain tissues to make slides for microscope examination; where staff grow swab-samples on culture plates to identify bacteria). It was good for people to get a feel for these essential methods and analyses that help reach diagnoses.

We had planned to have a **Wildlife Diseases Overview** classroom session as well but time was limited so this information is summarized in Appendix III of this report.

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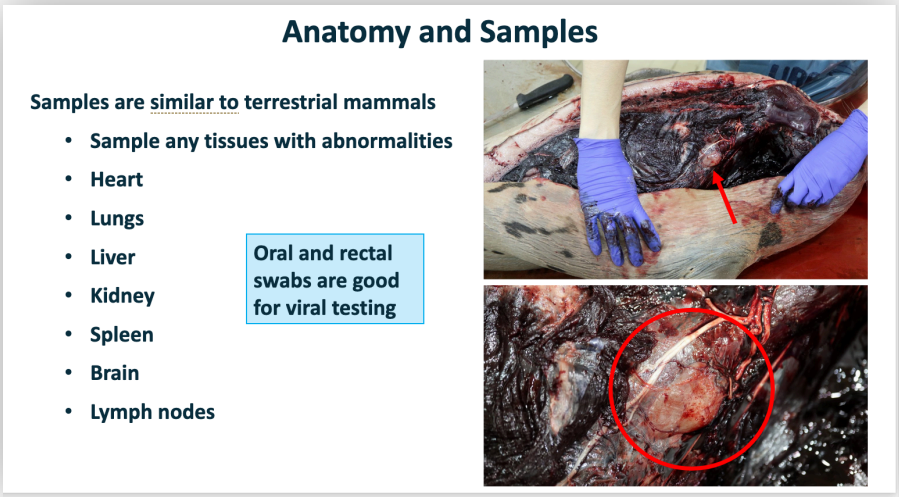
**Laura Bourque** then presented on what is known about **diseases of marine mammals** (there's a lot still to discover!). She gave an overview of sampling, and one focus of her talk was the highly pathogenic avian influenza virus (HPAI), which has caused large mortality events in seals worldwide. The impacts in Canadian seal populations have been less, but seals in the Gulf of St. Lawrence and Resolute Bay, NU have been affected.




Slide: L Bourque

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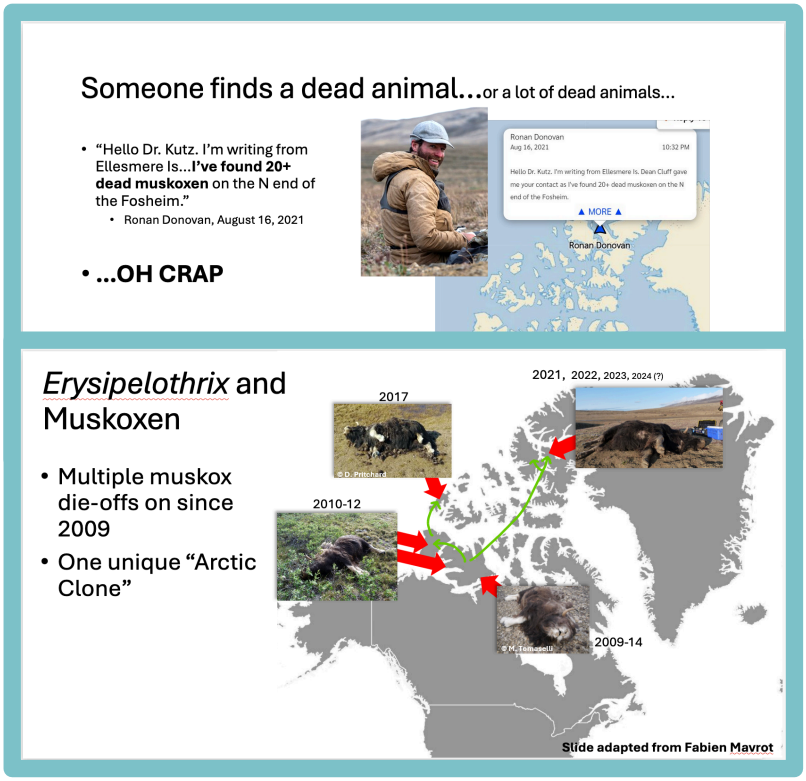
Kutz lab's **Caide Wooten** (PhD candidate) also described a high-mortality disease situation: an ***Erysipelas rhusiopathiae* outbreak investigation in High-Arctic muskoxen** that began in 2021.

Working closely with the Government of Nunavut, Caide and Susan have been repeat-sampling at known carcass sites every summer and visiting any new carcass sites they can as well.

Caide is testing for the *Erysipelas* bacterium in soil beneath and around the carcasses, water, and other species' poop to discover where *Erysipelas* exists, how long it stays in the environment (possibly able to infect animals), and how it might have gotten to Ellesmere/Axel Heiberg Islands from where it's been detected previously: in Western Arctic muskox populations about 1,000 kms away.




Slides: C Wooten

# WORKSHOP Day 4 – March 14, 2025

## DAY 4 MORNING:

On our final morning at the CSB, the groups switched the activities they did the previous day: Group 2 carried out the hunter-kit sample collections on deer carcasses and Group 1 did the various lab tests/analyses demos with the Kutz team.

Photo: A Schneider

Photo: H Justus

## DAY 4 AFTERNOON:

After lunch, everyone returned to the classroom for some final sessions. Kutz team's **Dr. Eleanor Dickinson** (Postdoc) and **Amish Dua** (PhD student working to collect Indigenous Knowledge [IK] on the health of Bluenose-East caribou) led a discussion about **making sure that both IK and wildlife health surveillance data drive co-management decisions** in the best ways.

Overview of what we are collecting that can be used to inform indicators of health?
What do you think are the most important things?
What do you think the programs might be missing?

**WHITEBOARD NOTES:**
***What do you look for to tell if the caribou is healthy?***

- "Fat is #1 – fatty tail"
- "Meat – anything abnormal – texture, blood"
- "Liver"
- "Behaviour – endurance– avoid harvesting ones that lag behind" (this test is better for muskox because caribou can outrun you)
- "Abnormalities seen when skinning"

They asked the group "Which signs of health are most useful?" We got to hear what harvesters look for to tell them how caribou/muskox are doing ("health indicators"). Participants also offered their thoughts and feedback on what the CBWHS Program is collecting in terms of health-related IK and data. Everyone discussed what is most useful and things that the program might be missing.

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An interesting wildlife disease "case study" (investigation to find the answer) was also presented:

**Jamie Rothenburger** (UCalgary Veterinary Pathologist) described the **February 2018 case of a very ill yearling male muskox** who was found down and in grave condition near Ekaluktutiak. She took us through all her steps of investigating this animal, which was ultimately shipped to the DSU for necropsy. After the postmortem examination, numerous types of testing (genetic analysis, histology, culture) shed light on the most likely story: orf (virus infection) had caused nasal/lip crusting and tissue damage that ultimately led to bacterial invasion and a full-body bacterial infection (septicemia).

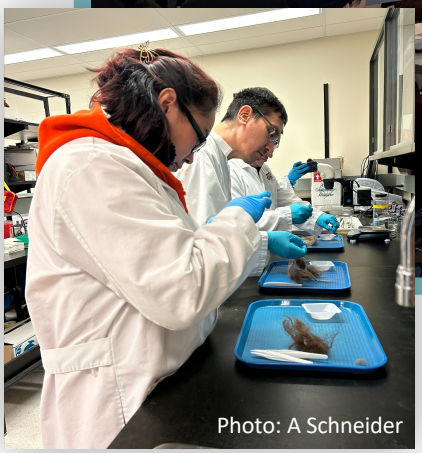


Photo: A Schneider

# WRAP UP & FEEDBACK

It was a very full 4 days with
lots of practical hands-on work and extensive learning and discussion in the classroom. And all was fueled by top-notch tasty snacks and meals (gourmet sandwiches, bison treats, Chinese food, even a final group dinner at Nic's Steakhouse) organized masterfully by UCVM's Kat Emery. *Thank-You, Kat!*

Throughout the workshop and as the final day ended, participants were asked for their input and feedback on various aspects of the Community-Based Wildlife Health Monitoring Program and any ways it could be improved. They were also asked for opinions on how the workshop went and people's ideas and wishes for future.

## Workshop Evaluation, Concerns, and Priorities for Future Monitoring of Arctic Wildlife Health

### What did you think about the workshop?

- Good amount of information.
- Liked the hands-on components.
- The lab work on the samples from the kit - get to see why things can take a long time to receive results.
- Sitting down and getting to meet and discuss with people from other communities.
- Enjoyed every part.

- Meeting people from different communities.
- Hearing from the researchers but also being able to share what we know. Exchange of knowledge.
- It would be nice to organize it regularly and bring more community members, in particular youth and “first responders” in case of diseases in harvested animals.

### What about it being in held in Calgary?

- Liked that is was at a university and could see all the different labs and tools; better understanding of process.
- It was nice to see where the samples are actually processed and all the steps involved. Don’t have access to labs and equipment like that in the Arctic.
- There can be delays due to weather if held in the Arctic.
- Liked connecting with people – see where they work.
- Good to hear perspectives from other communities and sharing.
- Coming to the university was good – the university was well equipped for the workshop.
- Liked seeing how people do things differently.
- Would have liked to have some time outside to see more of the land in the area.

### What else can we do to share information?

- Visit the communities; reach more people this way.
- Whoever is dealing with the sample kits at all stages should come and see how to properly fill them out and the purpose of each sample. Being able to understand why it is important.
- Wildlife monitors should come to workshops – and at the start, before sampling program begins; can better support hunters that way.
- Having someone available to help; HTO/HTC secretaries and managers need training/information/support.
- Some communities have more resources than others so ensuring there is enough support.
- Provide opportunity for each workshop participant to bring a youth who is interested in science.
- Have a couple of people from each HTO/C attend workshops; this way, more than one person holds the information and they can discuss/support activities together when back home.

### What else could be in the sample kit or needs to change?

- Keep the kits as simple as possible.
- More consistent/equal payment. Some communities get more money for a kit than others.
- Appreciate the payment since any income helps. People are going to be harvesting anyways. No one goes out strictly to fill a kit for the payment; it is to feed their family.
- Running out of freezer space for the kits can be an issue. Recommend having more dedicated freezers to store the sample kits in.

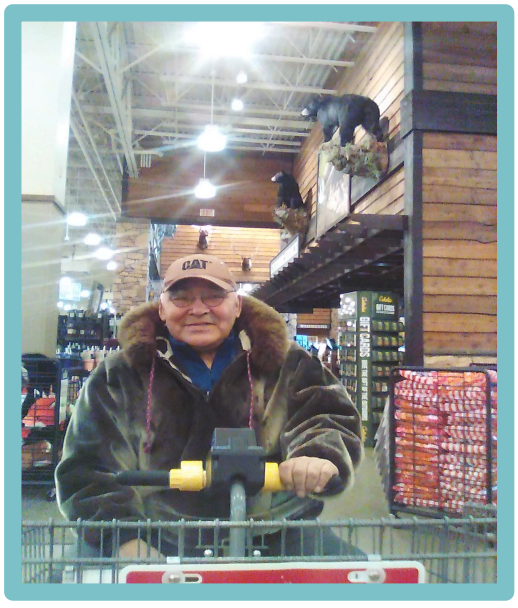
### What does it take to sample?

- Autumn is the best weather for sampling - less bugs and wind.
- Winter has blowing snow, less daylight, trying to sample before things freeze up.
- Difficult when you are new to sampling and have to go back and look what specific samples to collect; gets easier once you’re used to the kit.
- Limited daylight can slow down harvesting multiple animals in a day.
- Have access to all sample information and details to harvesters on the Kutz website for accurate and available information.

What do you look for to tell if a caribou is healthy?

- How fat an animal is - #1 indicator.
- Inspecting the meat: colour, texture, parasites, liver.
- Their behaviour and endurance - skinny and unhealthy, or if they are slow and lag behind.
- Look for fat caribou.
- Don't specifically look for abnormalities and may just see during butchering process.
- Asked where to take the hair from? - specifically, whether under the front leg is possible instead of the rump hair. [Depending on time of year] more experienced hunters will use the hide to make clothing, so taking a patch of skin from the rump can impact the quality of the hide.
- Looking at the tail; if there is lots of fat the caribou will keep the tail up.


**End of workshop smiles**! Some of our great participants holding their attendance certificates (L to R: Frances Anaittuq, Nathan Manillaq, Russell Akeeagok, Paul Ikuallaq, Pat Klengenberg, Shelby Lucas), along with some workshop presenters (L to R: Danielle Nowosad, Erica Suitor, Angie Schneider, Amish Dua, Jamie Rothenburger, Enooyak Sudlovenik, and Fabien Mavrot).



Some even managed to squeeze in a bit of shopping before hopping back on their plane to the North!

# APPENDIX I: **Glossary of workshop terms**

**Abdomen** - the part of the body containing the digestive organs, liver, spleen, gall bladder, urinary organs, and reproductive organs (the thin membrane that lines the abdominal cavity/space is called the "peritoneum")

**Abscess** - a swollen area within body tissue, containing an accumulation of pus

**Benign** - a disease or finding that is not harmful

**Bilateral** - having or relating to two sides; affecting both sides

**Biopsy** - examination of tissue removed from a living body to discover the presence, cause, or extent of a disease

**Case definition** - details (e.g., animal species, place, time) and observed physical findings specific to an outbreak being investigated

**Cervid** - a mammal of the deer family

**CBWHS Project** – Community-Based Wildlife Health Monitoring Project

**CWHC** – Canadian Wildlife Health Cooperative (Damien Joly, CEO)

**Cyst** - a thin-walled, hollow organ or cavity containing a liquid that's been produced/seeps out and collects there

**Diagnosis** - identification of the nature of an illness or other problem by examining the symptoms

**Diaphragm** – the muscular wall separating the thorax and abdomen

**DNA** – "deoxyribonucleic acid," microscopic material in body cells that carries our genetic information

**DSU** – Diagnostic Services Unit, U of Calgary (where CWHC Pathologist Dr. Dayna Goldsmith examines samples from northern wildlife submitted in partnership with Kutz Research Group and the Community-Based Wildlife Health Surveillance Program)

**Eruption** (of teeth) - the development process where teeth move from their initial positions within the bone of the jaw into the mouth cavity where they perform their function

**Exudate** - a mass of cells and fluid that has seeped out of blood vessels or an organ, especially from inflammation (i.e., when part of the body becomes red/swollen/hot/often painful, especially in response to injury or infection)

**Foramen magnum** - the large, oval-shaped opening in the bone of the skull base; this is the hole Dayna showed on the dismembered cougar head – it's the place where you can collect a sample of the (pink) brain tissue without having to open the skull

**Formalin** - a colorless solution of the chemical formaldehyde in water, mainly used to preserve samples (if you ever happen to be using formalin, tissue samples need to be maximum ½ cm size to allow the formalin to penetrate/preserve fully)

**Genetic** – relating to "genes" (sequences of DNA that hold the information cells use to produce chemicals that drive cell and body function) or "heredity" (passage of characteristics from parent to offspring)

**Genomics** - the branch of molecular biology (the structure/function of molecules [like proteins, for example] essential to life) concerned with the structure, function, evolution, and mapping of genomes

**Genome** - the complete set of genes or genetic material present in a cell

**Hemorrhage** - an escape of blood from a broken or burst blood vessel, especially large amounts

**Incisors** - the narrow-edged teeth at the front of the jaw, adapted for cutting

**Incisor bar -** the part of the jaw that holds an animal's entire set of incisors

**Knowledge mobilization** - sharing research findings with various levels (e.g., harvesters, communities, HTOs, wildlife management boards, territorial or federal decision-making bodies) to inform decision-makers and policy and create positive change

**Lesion** – an area of an organ or tissue that has been damaged through injury or disease (e.g., a wound, ulcer, abscess, or tumor)

**Macroscopic** - visible to the naked eye

**Mammal** - a warm-blooded vertebrate animal (i.e., one with a backbone) that has hair or fur, secretes milk (females) to nourish young, and typically gives birth to live young

**Mucosa** - the soft tissue that lines the body's canals and organs in the digestive, respiratory and reproductive systems; it's also called the "mucous membrane"

**Necropsy** (like postmortem and autopsy) – examination of an animal after death to determine the cause of death

**Omentum** - a veil-like fold of peritoneum (the thin membrane lining the abdomen; see definition) that connects the stomach with other abdominal organs; the filmy omentum will contain ribbons of fat if the animal is healthy; the omentum is what Dayna described can sometimes act like a "band aid" and you may find this stuck to injured internal structures (e.g., a broken rib) during and after healing

**Pathogen -** a bacterium, virus, or other microorganism that can cause disease.

**Peritoneum** - the very thin membrane that lines the abdominal cavity and covers the abdominal organs

**PCR (polymerase chain reaction)** - a laboratory test that quickly makes many copies of a specific piece of DNA (genetic material); this process allows scientists to find/detect very tiny quantities of DNA

**Phenology** - the study of natural events that are cyclic and seasonal, especially how these are linked with climate and plant and animal life (examples: 1) John was talking about how mosquito life cycles have changed; now, with warmer climate the insects can undergo more life cycles in one season, resulting in way more mosquitoes per season now; 2) plant growth is different in a warmer North; people are studying whether caribou have access to the right plants/nutrients when they need them most for health, calving/lactation, and survival)

**Postmortem** (like necropsy and autopsy) - examination of an animal after death to determine the cause of death

**Symmetry** - refers to exactly alike parts that face or mirror each other (i.e., bodies are largely symmetric – we have two eyes, legs, arms, lungs, kidneys, etc.)

**Thorax** - the part of the body containing the heart and lungs; also known as the "pleural cavity."

**Toxicology** - the branch of science concerned with the nature, effects, and detecting poisons

**Vascular** - relating to, affecting, or consisting of a vessel or vessels, especially those that carry blood

**Vector** – a "disease vector" is any living organism that can carry or transmit an infectious pathogen (e.g., virus, bacterium, parasite) from one organism to another

**Veterinary pathologist** - a scientist who studies the causes and effects of animal diseases, especially one who examines laboratory samples of body tissue for diagnosis

**Veterinary pathology** - the science of the causes and effects of animal diseases, especially dealing with the laboratory examination of samples of body tissue for diagnosis

# APPENDIX II: **Participants and Team**

| | Name | Organization Represented |
|---|---|---|
| **WORKSHOP PARTICIPANTS** | **Anthony Bearspaw** | Stoney Nakoda Nations, AB |
| | **Clarence Kaiyogana** (joined remotely) | Cambridge Bay \| Ekaluktutiak, NU Hunters & Trappers Organization |
| | **Frances Anaittuq** | Kugaaruk \| Kurairojuark, NU Hunters & Trappers Association |
| | **Nathan Chad Mannilaq** | Taloyoak\| Spence Bay, NU Hunters & Trappers Association |
| | **Patsy Klengenberg** | Ulukhaktok, NT Olokhaktomiut Hunters & Trappers Committee |
| | **Paul Ikuallaq** | Gjoa Haven \| Usqsuqtuuq, NU Hunters & Trappers Association |
| | **Russell Akeeagok** | Kugluktuk, NU Kugluktuk Angoniatit Association |
| | **Shelby Lucas** | Sachs Harbour \| Ikaahuk, NT Hunters & Trappers Committee |
| | **Stephanie Behrens** | Tłı̨chǫ Government, Behchokǫ̀, NT Wildlife/Fisheries Biologist |
| | **Tommy Kuutsiq Mariq** (joined remotely) | Baker Lake \| Qamani'tuaq, NU Hunters & Trappers Organization |

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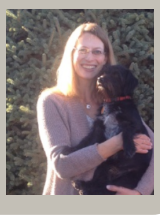

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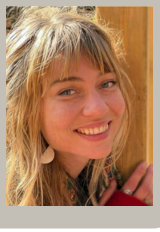

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**Special thanks to DSU staff …**

| | |
|---|---|
| **Lori Goodbrand** | Histology Supervisor |
| **Beverly Morrison** | Clinical Bacteriology |
| **Jim Carlsen** | Necropsy Lab Supervisor |
| **Mel Nicolas** | Necropsy Lab Technician |
| **Patrick Fuller** | Quality Program Coordinator |

# APPENDIX III: **Diseases of Ungulates**

The table lists key diseases of ungulates (e.g., deer, caribou, moose, muskoxen).

| | |
|---|---|
| **Skin**<br>• Orf (contagious ecthyma)*<br>• Winter tick<br>• Nasal bots<br>• *Besnoitia*<br>• *Onchocerca* (leg worm) | **Muscle**<br>• "White spots in meat" – *Taenia*, *Sarcocystis* |
| **Head**<br>• Lumpy jaw | **General / Multi-system**<br>• Abscesses<br>• Brucellosis*<br>• *Erysipelas**<br>• Cervid herpesvirus 2 |
| **Organs, Body Cavities**<br>• Tuberculosis (TB)*<br>• Hydatid disease (lungs)*<br>• Muskox lungworm<br>• Liver tapeworm cyst<br>• *Setaria* (stomach worm) | **Abnormal behaviour, nervous system involved**<br>• Chronic wasting disease (CWD) |

*These are transmissible to people. Each has specific and differing guidance about meat safety/consumption by humans and feeding meat to dogs

Diseases you can get from wildlife

https://www.gov.nt.ca/ecc/en/content/field-guide-wildlife-diseases-and-parasites-nwt

**A handy guide!**