

Facts about Wildlife Diseases: Capture Myopathy in Farmed White-Tailed Deer¹

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White-tailed deer farming is a rapidly growing industry in rural North America, with nearly 400 deer farms and preserves located in the state of Florida alone. Deer farming involves housing, handling, and transporting deer to new enclosures, preserves, or other farms. However, regardless of the management strategy or technique used, the process of capturing, handling, and transporting the animals can cause significant stress. While this stress may not be immediately evident, it can lead to a complex degenerative disease of the skeletal muscle, known by various names but referred to here as capture myopathy (CM). This condition can occur not only in white-tailed deer (*Odocoileus virginianus*) but also in other ungulates (hoofed animals), as well as some species of birds, reptiles, and fish.

CM is a non-infectious disease of wild and domestic animals that is directly associated with the stress of capture, restraint, and transportation. In ungulates, the disease can lead to significant illness characterized by depression, muscle stiffness or weakness, tremors, rapid breathing, high heart rate, high body temperature, lack of coordination, paralysis, metabolic acidosis (pH change in the body), dark-red urine, and/or death. CM resembles the muscle disorders of domestic cattle, sheep, horses, and swine.

One of the earliest reports of symptoms consistent with CM was described in a white-tailed deer in 1955. Later, CM became widely recognized in Africa in the late 1960s

and early 1970s when many rare animals died during or soon after capture. Subsequently, CM was described in many other North American species, such as black-tailed deer (*Odocoileus hemionus columbianus*), moose (*Alces alces*), pronghorn antelope (*Antilocapra americana*), Rocky Mountain bighorn sheep (*Ovis canadensis*), and elk (*Cervus canadensis*).



Figure 1. Yearling bucks recently worked to cut their antlers. This is crucial to keep bucks together in the same pen during the rut season. Credits: Dr. Juan M. Campos Krauer, UF/IFAS

How does it occur? What causes capture myopathy?

One of the most common causes of this disease is muscle exhaustion. Prolonged muscle exertion changes the body's metabolism from aerobic (uses oxygen) to anaerobic (uses stored energy in the muscles without oxygen). This change in metabolism leads to the production and buildup of lactic

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acid. Lactic acid enters the blood and lowers the pH in the body, affecting heart muscle and decreasing the efficiency of blood flow. When the heart does not pump sufficient oxygen to the muscles, the muscles become damaged and release myoglobin (a breakdown product of muscle) into the blood. Excessive myoglobin damages the kidney, producing kidney failure and ultimately death of the animal. In severe cases, death may occur in only a few hours. In less severe cases, animals may succumb to the disease days or weeks later due to kidney failure.

Animals that are young, old, in poor physical condition, or overweight are more prone to develop capture myopathy than healthy adult animals. Similarly, pre-existing diseases, infections, and severe parasite burdens can predispose animals to capture myopathy. Female animals in their final trimester of gestation may also be at greater risk of developing CM.

Clinical Signs

Be aware of the following signs.

- Depression
- Debilitation
- Lethargy
- Muscle stiffness or weakness
- Tremors
- Ataxia (lack of muscle control or coordination of voluntary movements)
- Firm stepping (muscle tremor is evident in muscles of back and legs that progress to muscle rigor, and the animal is reluctant to move)
- Tachycardia (heart beats faster than normal while at rest)
- Open-mouth and rapid breathing
- Hyperthermia (elevated body temperature); white-tailed deer have a normal body temperature of 38.5°C (101.4°F); temperatures over 40.6°C (105°F) are considered hyperthermia
- Red-brown urine
- Unresponsiveness to human presence

How can the risk of capture myopathy be minimized?

- Plan the work and have all the necessary equipment, tools, and staff to minimize animal handling time.

- Always work during the coldest hours of the day (early morning) or on days when the ambient temperature is lower.
- Trapping or darting animals is always preferable to chasing them. If animals must be pursued, limit the pursuit to 5–10 minutes.
- Once the animal is immobilized, blindfold and keep noise to a minimum.
- During immobilization or recovery, ensure the animal is in a position where it can breathe easily. Never place the mouth or nose close to objects that can block airflow. Consider the use of oxygen if the animal is not breathing well.
- Consider using an oximeter (an instrument for measuring oxygen saturation of the circulating blood). Currently, oximeters are widely available and can alert handlers if low blood oxygenation is detected. For more guidance on this equipment, contact your veterinarian.
- Always check the animal's temperature throughout the procedure. We recommend taking rectal temperature. Use good ventilation and damp cloths over the body if required. Overheating can have deadly consequences.
- If an animal is transported, use trailers designed for deer. Always monitor the temperature inside the trailer.
- Vitamin complex of selenium and Vitamin E is suggested as a prophylaxis (prevention) or treatment for CM; however, the efficacy of these supplements is unclear.
- Preferably, all animal work should be done by or under the supervision of a veterinarian.

How is capture myopathy treated?

Capture myopathy is very difficult to treat, so prevention through the minimizing of stress is critical. Treatment consists of removing animals from the primary source of stress, and administering intravenous (IV) tranquilizers and fluid therapy to correct pH imbalance. Surface cooling and oxygen supplementation are recommended. Treatment should always be done by or under the supervision of a veterinarian.

How can you know if your deer died from capture myopathy?

On occasions, animals that die due to capture myopathy can have areas of pale muscle on the heart or thigh, as well as dark, reddish-brown, and cloudy urine. However, without a detailed animal history, a complete necropsy, and specific histopathologic testing, it can be challenging to clearly identify CM as the cause of death.

Differential Diagnoses

Conditions that could resemble or share similar signs or symptoms to CM in wildlife may include the following:

- White-muscle disease (named because of its characteristic pale coloration of the muscle, caused by selenium deficiency in areas where the mineral is scarce in the soil)
- Some plant toxicities such as those found in *Senna occidentalis* (coffee senna) and *Senna obtusifolia*
- Early tetanus
- Hypocalcemia (low calcium levels in the blood)
- Myositis (a disease that makes the immune system attack the muscles)

Conclusive diagnosis of CM depends on history, symptoms, and gross and microscopic pathology.

Conclusion

CM is a condition that can cause the death of many species, including white-tailed deer. Despite being frequently reported by veterinarians, the condition is still poorly understood. It is characterized by severe direct or indirect muscle injury, kidney failure, and elevated body temperatures. Currently, there is no cure for CM. At present, preventing the condition is the best approach. Deer capture and immobilization events should be carefully planned. All possible preventive measures should be taken to minimize risks and decrease animal handling time.

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