Lead Toxicosis & Animal Health: A Guide for Veterinarians in Michigan

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Background

Lead toxicosis in animals has been tied historically to the use of lead in gasoline and paint, lead-batteries and other sources of environmental contaminants such as certain mining, smelting or recycling operation practices. Animals most often are exposed to lead through eating, drinking, or licking lead objects or objects containing lead such as lead fishing weights, lead shot, lead toys, and lead-batteries. In Michigan, the typical lead toxicity case is cattle that have licked lead-batteries. More recently, concerns have arisen related to pets potentially exposed to lead through the drinking water in Flint.

Signs

Signs can vary by species, age, diet, physiological status (pregnancy, lactation), and duration and amount of exposure. Signs are typically associated with the gastrointestinal (GI) and neurologic system and most commonly include:

- Ruminants:
  - Acute: ataxia, blindness, salivation, and muscle tremors
  - Subacute or chronic: rumen stasis, anorexia, transient constipation which may be followed by diarrhea. GI signs generally precede central nervous system (CNS) signs.
- Horses – laryngeal paralysis, colic and/or seizures
- Dogs – Vomiting, anorexia, diarrhea, abdominal pain, anxiety, hysterical barking, blindness, convulsions, and/or aggression. Weight loss may be seen in chronic cases.
- Cats – anorexia, vomiting, and/or seizures
- Water fowl and raptors – chronic wasting and/or signs of peripheral neuropathy
- Psittacines – regurgitation, anorexia, diarrhea, wasting, ataxia, leg paralysis, blindness, circling, head tilt, and/or seizures. Polyuria and/or hematuria may also be seen.

Diagnostics

The sample of choice for lead analysis in a living animal is a whole blood sample. In parallel with lead analysis, evaluation of a CBC including microscopic evaluation of erythrocyte morphology is recommended. The sample of choice in a deceased animal is fresh or frozen liver. Hematologic and histopathologic examination could reveal the following findings alone or in combination depending on the species affected:

- Non-responsive anemia (chronic exposure)
- Inappropriate number of nucleated red blood cells and basophilic stippling of erythrocytes
- Renal tubular necrosis, sometimes with acid-fast intranuclear inclusions in the kidney
- Alterations in the Myeloid: Erythroid ratio, and evidence of ineffective erythropoiesis in bone marrow (autolysis may impact interpretation)
- Multifocal or laminar neuronal necrosis with edema in the brain

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The MSU Diagnostic Center for Population and Animal Health (DCPAH) has the following diagnostic tests to aid in the detection of lead toxicosis:

Live Animal

- Lead, Blood (70019) - minimum 0.5 mL whole blood in Lavender Top Vacutainer (EDTA)
- CBC with Differential (11600) – minimum 0.25 mL whole blood in Lavender Top Vacutainer (EDTA) and two direct smears (unstained and unfixed)

Post-Mortem

- Minerals, Tissue (50254) – minimum 50 mg liver, liver biopsy, tissue
- Necropsy is available for farm animals (30003), horses (30002), and companion animals (30001)

For complete details on specimens required, collection protocol, shipping requirements, and any necessary additional information, please visit animalhealth.msu.edu or call 517-353-1683.

Treatment*

- Providing supportive care
- Preventing further lead exposure
- Using chelating agents such as CaEDTA, Succimer, and/or D-Penicillamine**

*Management options in food-producing animals should be evaluated with the Michigan Department of Agriculture and Rural Development (MDARD)

**Not all animals require chelation therapy. The use of chelators requires close monitoring. D-Penicillamine can increase the absorption of lead from the GI tract into the body, causing worsening clinical signs. CaEDTA is not recommended when kidney disease is present. Chelation therapy should be administered only by a veterinarian with an established client-patient relationship.

Regulatory

Lead toxicity in animals is reportable in Michigan. Veterinarians with suspect cases should contact MDARD at 800-292-3939 for possible assistance with diagnostic testing.

References

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