Intermittent Seizures in a Dog

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A 10-year-old, 42-pound, intact male standard poodle was presented for intermittent seizures, vomiting, and diarrhea.

History. The dog was previously healthy. Within the past 3 months, the owner had remodeled her house. She also began administering a human glucosamine and chondroitin sulfate supplement twice daily to the dog for arthritis. During the past month, the dog developed intermittent seizures, lethargy, weight loss, vomiting, and diarrhea.

Physical Examination. The dog was depressed, anorexic, and 4% to 6% dehydrated. Vital signs were normal, but mucous membranes were slightly pale. Abdominal palpation was inconclusive due to a tense abdomen.

Laboratory Evaluation. Toxicology studies for lead, hematology studies, serum chemistry/electrolyte measurement, fecal analysis, urinalysis, and abdominal radiographs were done. Significant findings are shown below.

Significant Diagnostic Findings

Variable	*Results*	*Reference Range*
Hematology		
Red blood cells (10^6/µl)	5.1	5.5–8.5
Packed cell volume (%)	32	37–55
Hemoglobin (g/dl)	10.6	12–18
Nucleated red blood cells	+15	N/A
Anisocytosis	+1	N/A
Poikilocytosis	+1	N/A
Basophilic stippling	+1	N/A
Serum Chemistry		
Alkaline phosphatase (U/L)	68	3–60
Blood lead level (ppm)	0.4	<0.1

ASK YOURSELF…

- Is the dog's history compatible with the clinical signs and laboratory values?
- What are the differential diagnoses in light of the clinical signs in this dog?
- Are the signs of intermittent seizures incompatible with the suspected diagnosis?

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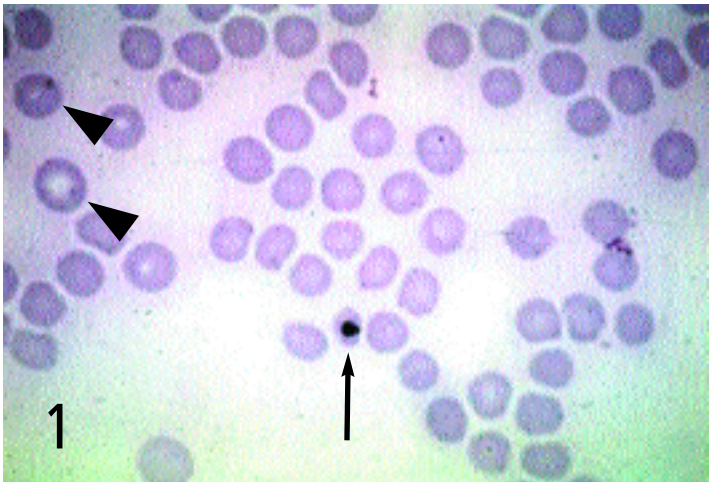
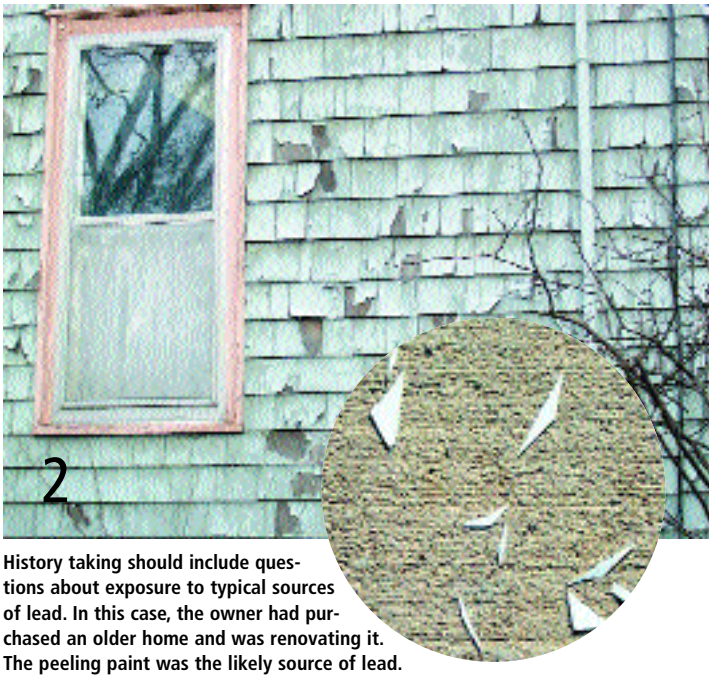


Regenerative anemia with nucleated red blood cells (*arrow*), basophilic stippling (*arrowheads*), and normal packed cell volume.



History taking should include questions about exposure to typical sources of lead. In this case, the owner had purchased an older home and was renovating it. The peeling paint was the likely source of lead.

Diagnosis: Lead poisoning

The gastrointestinal signs, anemia, and neurologic signs were caused by lead toxicosis. Lead is a heavy metal widely distributed in the Earth's crust. Sources of exposure for animals include lead weights, lead-based paints, lead solders, old metal tubes, and car batteries. After further questioning, the owner reported that her house was remodeled 3 months ago and that perhaps the dog had been exposed to paint chips.

Lead acts by binding sulfhydryl-containing enzymes and other cellular components, thereby competing with calcium ions, inhibiting membrane associated enzymes, and altering vitamin D metabolism. Lead may also interfere with zinc in some enzymes, and at high concentrations may interfere with gamma-aminobutyric acid production or activity in the central nervous system.

Signs of acute lead poisoning include anorexia, agitation, behavior changes, ataxia, muscle tremors, and intermittent seizures. Signs of chronic lead poisoning include vomiting, diarrhea, anorexia, behavior changes, lethargy, ataxia, intermittent seizures, weight loss, and anemia. Differential diagnoses for lead toxicosis in small animals include rabies and other viral encephalitides (e.g., canine distemper virus), hepatic disease, epilepsy, and organic brain disease such as tumors.

Laboratory Tests and Diagnosis. Laboratory diagnostic tests include a CBC and measurement of serum chemistry and levels of lead in the blood. A whole blood, heparinized, or EDTA sample can be used to measure levels of lead. Normal levels of lead are usually less than 0.1 ppm (10 µg/dl). In the presence of appropriate clinical signs, levels greater than or equal to 0.35 ppm are diagnostic. Levels between 0.1 and 0.35 ppm suggest significant lead exposure.

Nucleated red blood cell counts of 5 to 40 per 100 white blood cells are consistent with lead toxicosis. Anemia may be seen in chronic cases. Basophilic stippling may be of more diagnostic value in dogs and horses than in other species but is not always present. (**See Figure 1**). Anisocytosis, poikilocytosis, polychromasia, echinocytosis, and target cells may also be seen due to increased fragility of red blood cells.

DID YOU ANSWER ...

- Yes. The history is compatible with the laboratory values and the 0.4-ppm level of lead in the blood.
- Differential diagnoses may include rabies, other viral encephalitides (e.g., canine distemper virus), hepatic disease, brain tumors, and epilepsy.
- No. Intermittent seizures are occasionally reported in cases of acute or chronic lead toxicosis in dogs; however, other potential causes of intermittent seizures should be ruled out.

Abdominal radiographs can also be done. However, the absence of lead densities in the gastrointestinal tract does *not* rule out lead toxicity.

Treatment. Although activated charcoal has limited utility, physical removal of lead objects from the gastrointestinal tract (by means of gastric lavage, enema, surgery, and endoscopy) is very beneficial.

Chelation Therapy. Oral chelators may enhance gastrointestinal absorption of lead. Therefore, the gastrointestinal tract must be free of lead before oral chelation therapy is begun. Commonly used chelators are listed below.

See Aids & Resources, back page, for references, contacts, and appendices.

Commonly Used Chelators in Veterinary Medicine*

Chelator	*Dose*[1]	*Adverse Reactions and Contraindications*
Calcium EDTA	100 mg/kg, divided into 4 equal doses; dilute to 10 mg CaEDTA/ml in 5% dextrose; administer SC at different sites for 2–5 days	Nephrotoxic and gastrointestinal irritation. Sodium EDTA may induce hypocalcemia.
Dimercaprol	3–6 mg/kg IM 3–4 times daily or 2.5–5 mg/kg IM Q 4 H for 2 days, then Q 12 H as needed.	Nephrotoxic; IM administration can be painful at the site of injection. Avoid iron and selenium therapy—extremely toxic complexes may be formed.
2,3–Dimercaptosuccinic acid, succimer	10 mg/kg Q 12 H PO for 10 days	Less potential to cause nephrotoxicity
d-Penicillamine	30–110 mg/kg/day divided into 4 equal doses for 7 days, withhold for 7 days[2], then repeat as needed	Contraindicated if lead is present in gastrointestinal tract; causes gastrointestinal irritation.

*In general, all chelators except succimer can increase the absorption of lead.

at a glance

- **Physically remove lead objects from the gastrointestinal tract by means of gastric lavage, enema, surgery, and endoscopy.**
- **After the gastrointestinal tract is free of lead, begin oral chelation therapy.**