# Zinc Toxicosis

By Amanda Lohin, DVM

angell.org/walthamemergency

emergency@angell.org

781-902-8400

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Zinc toxicosis occurs when animals ingest zinc-containing objects or medications. Zinc toxicosis is much more common in dogs than cats because dogs tend to readily eat things they should not, while cats are generally more discriminating in what they will and will not eat.

The most common source of zinc toxicity in dogs is ingesting U.S. pennies minted AFTER 1982. Pennies have always been made with a combination of zinc and copper, but due to the rising cost of copper, in 1982, the ratios were changed so that now pennies are 97.5% zinc, which is then coated in copper. [1,2] Canadian pennies minted from 1997-2001 also contain 96% zinc. Other common sources of zinc include metallic nuts and bolts, galvanized nails, jewelry, metal pieces from board games, zippers, paints, holiday garlands, metallic parts of dog leashes, id tags for dog collars, and zinc-containing supplements. [3] Zinc can also be found in many topical creams, like diaper rash ointments and sunblock. A single exposure from one of these sources may cause some gastrointestinal upset, but chronic exposure would be required to lead to actual zinc toxicosis. [3]

After ingesting a zinc-containing object, the breakdown/dissolution of zinc is strongly dependent on an acidic pH, so the stomach provides a perfect environment for the dissolution and absorption of zinc. Zinc-containing objects (like a penny in Figure 1) can also adhere to the stomach wall rather than move through the intestines, allowing further zinc absorption. [4]

*Figure 1*

The exact mechanism by which zinc causes toxicity is not fully understood. Generally, zinc toxicosis will first cause some gastrointestinal upset (vomiting, diarrhea, lack of appetite) but then progress to cause hemolytic anemia. Hemolytic anemia occurs when oxidative damage to the red blood cells causes the cells to rupture, releasing their contents and decreasing the number of red blood cells available to deliver oxygen to tissues. This can occur within hours to days following ingestion of a toxic dose of zinc. [4] Eventually, if not treated in a timely manner, zinc toxicity can lead to multi-organ failure, disseminated intravascular coagulopathy (DIC – a condition where clotting factors are used up, leading to increased bleeding), and cardiac arrest. [4] For reference, ONE post-1982 penny contains enough zinc to cause death in dogs weighing less than 50 pounds. [5] Although zinc toxicity can occur in any animal, it is more common in medium to small dogs, likely because a single penny ingested can be fatal for them. In contrast, a larger dog would have to ingest more than one penny.

Physical exam findings will vary depending on the timeline from ingestion. Dogs seen early in the toxicity may be presented with vomiting, diarrhea, lethargy, anorexia, etc. Abdominal radiographs (X-rays) would then help identify a metal foreign body, and blood work may be beneficial in catching early signs of anemia. Dogs seen later in the toxicity process may also present with gastrointestinal signs, but they will be sicker. Additional exam findings can include dehydration, pale gums, icterus/jaundice (yellow pigment to the skin, eyes, and gums), an accelerated heart rate, an increased respiratory rate, heart murmur, fever, unsteadiness when walking, abdominal pain, dark urine and seizures. [5] The clinical signs for zinc toxicosis are not at all unique to this condition, so additional testing following an exam, including full lab work (complete blood count, chemistry panel, urinalysis) and abdominal radiographs, would be recommended as a starting point.

The treatment of zinc toxicity involves, first and foremost, removing the source of zinc, usually via endoscopy or surgical intervention. Unstable patients will likely need some stabilization efforts before surgery, including a blood transfusion, intravenous fluids, and administration of gastoprotectants

(including antacids to make the pH of the stomach less acidic). In more stable animals, inducing vomiting can be attempted to avoid surgery or endoscopy, but this tends to be more successful with objects other than pennies, as pennies do have a tendency to adhere to the mucus lining of the stomach and therefore do not come up when vomiting is induced. Unfortunately, because activated charcoal does not bind to zinc, it is not helpful in decontaminating animals with zinc toxicity. [3]

Some medications bind heavy metals, called chelators. However, chelation therapy for zinc toxicosis is unnecessary once the zinc object has been removed. There are some reports of chelation being used anywhere for 5 to 14 days. Still, these medications do come with their own side effects, and using chelation therapy while the source of zinc remains in the G.I. tract can actually increase systemic absorption of the zinc, so it is not ideal. [5]

Once the source of zinc is removed from the patient, serum zinc levels generally decrease within days, but blood work should be monitored during that time. The prognosis for patients with zinc toxicosis is good IF the source of zinc is identified and removed, and clinical signs typically resolve within 72 hours of removal of the source. [6]

## References


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