# Treatment of lead poisoning in Trumpeter Swans *Cygnus buccinator*

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The following treatment protocol is recommended for lead poisoned Trumpeter Swans, *Cygnus cygnus buccinator*, with blood lead levels greater than 0.40 parts per million (ppm), clinical signs of lead poisoning (weakness, weight loss, poor appetite, dehydration, green diarrhea, and variable neurological problems), and/or radiographic evidence of ingested lead shot or fishing weights. The three components of treatment include chelation therapy, supportive therapy and lead removal from the gastrointestinal system.

## Chelation therapy

40 mg/kg Calcium ethylenediamine tetraacetate (CaEDTA; Versonate, Riker Labs Inc., St. Paul, Minnesota, U.S.A.) is diluted in approximately 30-60 ml lactated ringers solution and given intravenously (IV) twice daily for three to four days (off treatments for three to four days between each series of injections). The medial tarsal vein between the hock joint and the foot is the easiest vein to use and allows the swan to be restrained in a sternal position during treatments. Three to four series are adequate for blood lead levels < 1.0 ppm; and six to eight series for levels > 2.0 ppm. Blood lead levels should be monitored weekly or every other week during treatment. Blood lead levels < 0.4 ppm are considered "acceptable". The final blood lead test should be done following a week of no CaEDTA treatments, to allow for equilibration of lead from the storage depots in the bones and soft tissues and the blood.

Another chelation drug that has been used successfully for lead poisoned swans is 2,3-dimercaptosuccinic acid (DMSA, Aldrich Chemical Co., Milwaukee, Wisconsin, U.S.A.) at a dose of 25-35 mg/kg orally, twice daily, five days per week, for four to six weeks. This drug has not been approved for use in veterinary medicine and no controlled tests have been done to study its efficacy in birds. However, no adverse effects were observed in the swans treated with DMSA or DMSA/CaEDTA combination. The combination appears to be extremely effective in chelating lead from Trumpeter Swans.

## Supportive therapy

2 mg iron dextran should be injected intramuscularly (IM) upon admission when the hematocrit is < 40 %. 10 mg thiamine (or 1.0 ml multicomplex B vitamin, small animal concentration) is injected IM once daily for the first week, and as needed thereafter for birds with poor appetite. 500 mg 5-fluorocytosine capsule (or 50 mg/kg body weight) is administered orally twice daily for the first 10 days (Ancoban, Roche Labs, Nutley, New Jersey, U.S.A.). This drug is effective in preventing aspergillosis in swans that are immunosuppressed or stressed during treatment. Rehydration fluids(lactated ringers or 5% dextrose in water) are injected IV via bolus injection at the dose of 10-20 ml/kg body weight, twice daily, as needed. These fluids may also be given subcutaneously. Force feeding may be necessary in anorectic swans. A thick gruel consistency mixture may be made with waterfowl pellets, Nutrical (Evsco Pharmaceuticals, Buena, New Jersey, U.S.A.) and water and administered orally with a 50 cm feeding tube passed into the distal esophagus (approx. 150-250 ml volume). Force feeding is done once or twice daily for swans that are not eating.

## Lead removal from the gastrointestinal system

The following technique has eliminated the need to surgically remove lead shot from the gizzard, and is quick, easy and safe. After radio-


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graphs are taken to verify the presence and number of shot, the swan is anesthetized (Isofluorane gas is safest), intubated, and taped to a tiltable surgical table, or equivalent. A 1.5 meter x 1.2 cm diameter flexible polyvinyl chloride tube (available from most hardware stores) is lubricated and passed into the gizzard (average 110 cm distance). The swan is tilted head down at a 45 degree angle and copious amounts of warm water are pumped in with a stomach pump or large syringes, allowing the water to flow back outside of the tube in the esophagus. The combined water pressure and gravity will force most of the food, grit and lead shot out of the gizzard. Moving the tube back and forth will facilitate flushing. Once the majority of material is flushed out, a radiograph should be taken to verify that all of the shot has been removed. If some shot remains after the first flushing, repeated flushings are usually successful in most cases, or it may be necessary to wait a couple of days and repeat the procedure. If endoscopic equipment and experienced personnel are available, a human colonoscope may be used to remove lead shot from the gizzard. Once all of the shot has been successfully removed, the swan is allowed to recover from anesthesia and free choice grit is offered thereafter to replenish its supply.

## Longterm follow-up studies

Swans that have been treated for lead poisoning should be wing-clipped and maintained in a captive, fenced refuge for at least two to three months following treatment, to allow for stabilization of endocrine and organ systems. The swans should be carefully watched during this period for any abnormalities in feeding or behaviour. Blood work, including a complete blood count and blood lead analysis should be repeated two to three months following the last treatment.

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