

Zinc and Parrots
More than you ever wanted to know!
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Zinc Trivia

The element zinc is a naturally occurring metal widely distributed in nature. The atomic number of zinc is 30. It has an atomic weight of 65.37. Zinc is included in group 2B in the periodic chart. Zinc is a good reducing agent. Zinc dissolves in aqueous acids or bases. Zinc forms compounds in the +2 oxidation state. Zinc usually appears dull gray. It is moderately hard. Zinc is brittle at room temperatures and is a good conductor of electricity. The primary use of zinc is to coat iron or steel in a process called galvanization to prevent rust. Zinc protects steel and iron from rusting as long as contact is maintained because zinc is the stronger reducing agent of the two metals.

Zinc Biology

Zinc is an element that is essential in trace amounts. Most bioactive zinc is present in red blood cells in the enzyme carbonic anhydrase. Zinc is necessary for the action of over 20 enzymes and in humans is required for normal vitamin A activity. Deficiencies of zinc are known to result in retardation of growth and dermatologic problems. The trace amounts of zinc required for sustainable health in humans is 15mg/day (USDA). The normal serum zinc measurements for humans is .75-1.5PPM. Zinc serology is not uncommonly run on humans. Most human problems with zinc involve deficiencies. Zinc is being used today in lozenge form to aid in prevention of cold viruses. These lozenges contain 15mg.

Veterinary medicine has historically viewed zinc as a trace metal or mineral essential for health. Information on zinc toxicosis is largely anecdotal. Most cases are due to ingestion of zinc pennies, hardware and zinc oxide by dogs. Gastrointestinal upset with possible hemolytic anemia are the expected result of intoxication.

Recent advances in our ability to measure serum zinc in avian patients has made it possible to investigate the effects of zinc on pet parrots. Before this development the diagnosis of zinc intoxication was based on histopathology or tissue determinations. These were usually run on birds where the presumptive cause of death was metal intoxication. We would be naive to think that the few examples in the literature reflect the clinical or subclinical occurrence of this problem.

Dr. Peter Jowett at the Louisiana Veterinary Medical Diagnostic Lab at Louisiana State University School of Veterinary Medicine, 1909 S. Stadium Rd., Baton Rouge, Louisiana, 70803(504-346-3193) runs serum zinc determinations on samples as small as 50 micro liters of serum or plasma. Care must be taken in how the sample is drawn and stored to avoid contamination. We use B/D 1/2cc TB or insulin syringes w/28g needles. Samples are stored in heparinized Microtainer R or Terumo Capiject R vials. Samples can be collected into heparinized PCV tubes, clayed and spun. Samples should not be collected with EDTA. We try to use a consistent protocol to avoid zinc contamination from some rubber materials. The test currently used is a flame atomic absorption assay. The same test is used on plasma, serum or cage samples. Current normals are thought to range from .9-2.5 ppm. Affected birds have had serum zincs ranging from 2.5-19ppm.

Determination of toxicosis must be based on clinical presentation. Not all affected birds have metallic foreign bodies.

Dr. Jowett can also run powder coating samples. The sample should be carefully collected with a stainless steel blade and placed in baggies or plastic wrap. The sample needed for cage "paint" analysis is about the size of a dime.

Parrots and Zinc

Certainly parrots must be viewed as very likely to be affected by environmental zinc. Parrots are commonly housed in wire cages. Most birds housed outside or in avicultural situations are in galvanized steel wire cages. Recently powder coating has become a very popular way to finish steel cages. The incredible success of the parrot as a pet has led to many cage manufacturers producing attractive powder coated cages in the moderate price range. But parrots will be parrots and many regard their cages as something else to chew on.

Pet parrots are commonly supplied with a variety of toys. Many of these involve metal chains and hangers. Parrots are often drawn to shiny objects. Parrots also usually have a lot of spare time to play with, chew and destroy anything within reach. The recent popularity of parrots has spawned a huge industry to meet the seemingly insatiable need for entertaining toys for parrots and their owners. In an effort to make toys last, many manufacturers have used sturdy chains and hardware.

Parrots are unfortunately cases of zinc intoxication waiting to happen. Parrots are also tough as nails and the commonly held belief that they are fragile creatures has been shattered. Sometimes it seems that they survive and often thrive against all odds. Avian medicine and aviculture have documented many syndromes of captivity. In my mind the zinc epidemic will be one more. As in most syndromes of disease in parrots or other animals many complex factors come into play to influence how an individual will respond to environmental challenges. In the case of zinc intoxication many variables must be examined. The general health, behavior and management of an individual will influence how tolerant of zinc that individual will be. It is likely that as we investigate further we will find predisposing factors like personality, beak size and species that will affect a bird's tolerance or intolerance of zinc.

Our awareness of the problem has evolved over the course of the last year. Last January a Mollucan cockatoo ate a metal key ring. The bird showed signs of GI upset. The metal piece was in the ventriculus for 9 days. Flushing resulted in passage of the piece. The bird's serum zinc and lead levels soared. With chelating therapy and removal of the foreign body the bird felt better. The lead level returned to normal quickly but the zinc remained elevated. Over a period of months, as the zinc stayed high, the bird's environment and food and water were carefully tested. Systematically any potential sources of zinc were removed (toys and hangers). With all other possible sources removed, the bird's zinc remained elevated. Through a process of elimination we finally tested the powder coating on the cage. Levels were found to be 1200ppm. Results were verified by analysis at a second lab. The bird had chewed quite a bit of the powder coating off. There was an African gray parrot in the same household housed in a similar cage from the same manufacturer. The gray also had a persistent elevation of the serum zinc. The gray was also a cage chewer.

In the last year over 60 birds have been tested. All birds tested were at risk. In our view they are at risk if they chew at galvanized or powder coated cages, suck on quick-links or hardware, eat from galvanized dishes or have metallic foreign bodies. Most birds were feather picking or showed signs of gastrointestinal stasis. Some just felt lousy. Many birds will feather pick with elevated zinc levels. Most medical workups included viral testing, cultures and chemistry panels to identify concurrent problems. Affected birds were treated with a solution of DMSA

(Dimercaptosuccinic acid) 25mg/ml to chelate zinc formulated locally by RinCanada Pharmacy. We have used the published dose of 30mg/kg. The bird's environment was corrected and follow up levels were done. Treatment with DMSA alone, without environmental correction, will only help control the problem. Removal of offending zinc sources is essential. In theory, once a source is removed, excess amounts of zinc should be spontaneously cleared from the body. We have not followed or measured the rate of spontaneous clearance. Resolution of zinc toxicosis has resulted in dramatic improvement in feather picking in many instances. We have recommended using only stainless steel hardware and toy hangers. These are usually available from marine supply stores. Many clients have opted for stainless steel cages. Stripping the cage and powder coating with a food grade product is also a solution.

Powder Coating

Powder coating is a relatively new technology that has caught on for the pet bird cage market. As an alternative to painting, the powder is electrostatically applied to the cage usually made of cold rolled steel. When applied the cage is then heated to a temperature of about 400 F degrees. The process is more environmentally sound than painting. The coating usually results in a safe protective coating for the cage. There are several principle suppliers of powder coatings. Formulas differ by manufacturer. Most contain no zinc. Zinc can be incorporated into the formula in one of three ways. First the zinc oxide can be used as a pigment especially for white colors. Zinc can also be added for corrosion resistance. Neither of these are thought to be a factor in pet bird cages. The third way, however, may be important for pet bird cages. Zinc hardeners can be incorporated into the formula at a rate of .05-.5%. Zinc acetoacetate catalysts used in this way can result in harder finishes that cure faster. High zinc content primers may contribute to the problem. The industry is becoming aware of this problem and is generally taking steps to identify and solve the problem. We have tested about 15 cages. Many have zinc levels between 0-50ppm. Several cages have tested in the 500ppm range. Birds in these cages can become ill. One cage manufacturer has had at least 8 cages over 1100ppm. One cage of unknown origin contained 2700ppm zinc. Most cage companies have responded quickly to remedy the problem.

Galvanized Cages

Galvanized wire is another common source of zinc intoxication in parrots. The industry standard has for a long time been Tinsley Wire. Tinsley wire is galvanized after welding. The wire itself is drawn steel wire. The welds are the result of spot welding, steel wire to steel wire with heat as the catalyst. The zinc is applied by a hot dipping process. This wire is not subject to US grading standards. In the United States there is a recognized AISI grading system for galvanized before welding wire. It is based on the amount of zinc coated on the wire. Most cage wire is class 1 wire. This wire contains a minimum of .30 oz./sq.ft. Most wire produced in the USA is galvanized before welding. A very small part of the welded wire market is for cages. A smaller percentage of that market is aviary wire. Most of the wire sold through hardware stores for cage wire is galvanized before welding. Many distributors and consumers focus more on the wire spacing for square corners rather than on the galvanization process. Whereas any galvanized wire can be a problem for a cage abusing bird, the risk seems to be much higher with lesser quality (wire that is) galvanized before welding wire.

Preparation of any wire is a critical step in cage construction. Most wire is coated with an oil before shipping. A potential toxin in itself, this must be removed before the cage houses a bird. The process of galvanization can leave tags of zinc on the wire. These must be removed with a steel brush. These tags can pose a hazard to birds that might eat them. Most experienced aviculturists carefully brush the wire and also allow it to cure outside before it is used.

Conclusion

Zinc toxicosis is probably only one of many environmental challenges for parrots in captivity that we will identify in the near future. Keeping parrots as pets will continue to be challenging, but no one ever said they were designed to live in our living rooms. Armed with their beaks, their energy and their keen intelligence they will continue to challenge us to find suitable ways to house and entertain them. Although the pet bird industry is huge and so far without any minimal standards, it is an industry run largely by people who care a great deal about parrots. It is my expectation that we will quickly see the cage and toy manufacturers address any potential problems that are identified.

Avian veterinarians are in an ideal situation to educate their clients and test the birds when indicated. With time and more information we will be able to gauge the depth of the problem and design solutions. Meanwhile, it will be up to all of us to furnish our birds with safe housing, dishes and toys.

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