Outdoor Facts

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Game Information Leaflet **Number 100**

DOCUMENTING LEAD POISONING IN WATERFOWL[1]

Waterfowl mortality resulting from the ingestion of lead pellets has been a recognized problem in North America since the late 1800's. Historically, the major geographic area of concern has been the Mississippi Flyway; here wetlands used for duck hunting characteristically have hardpan bottoms which support the spent lead pellets, making them available for ingestion by feeding waterfowl. Waterfowl hunting areas in the Central Flyway, and in Colorado in particular, are normally swift-flowing rivers, large reservoirs, or small ponds. Due to continuous siltation, the reservoirs and ponds have soft bottoms. To date, in Colorado there have been only two confirmed lead poisoning problem areas: Spring Creek, which is located on the Monte Vista National Wildlife Refuge in Rio Grande County in the San Luis Valley, and Turk's Pond in Baca County in extreme southeast Colorado. Both of these areas have ponds with soft bottoms that allow lead shot to settle into the silt, making the shot unavailable to the birds. The need for identifying actual and potential lead poisoning problem areas is imperative, as preventive measures can be taken to reduce waterfowl losses due to ingested lead.

The lead poisoning process begins when the ingested lead pellet reaches the acidic environment (pH ~ 2.0) of the bird's gizzard (ventriculus) (Kimball and Munir 1971). The grinding action of the gizzard rapidly wears down the pellet and the lead is dissolved and absorbed as it passes through the intestine. Although the lead pellet fragment(s) may remain in the gizzard up to 40 days (Kimball and Munir 1971), the effect of lead absorption appears a few days after ingestion. In acute cases, death may occur before any of the characteristic signs of lead poisoning appear. Some of the classic external signs include lethargy, loss of appetite, weakness, weight loss, and a green staining at the vent, from diarrhetic discharge. Occasionally, cephalic edema (swollen head) will be noted in Canada geese (*Branta canadensis*). Internal examination of the affected bird may reveal impaction of the proventriculus and possibly the esophageal area (Fig. 1), cracked and/or peeling pads in the gizzard (Fig. 2), dark green staining of the gizzard lining and intestinal tract, and possibly the presence of a lead pellet fragment in the gizzard. Occasionally, the bird may have excessive pericardial fluid and fibrous necrosis of the blood vessels.

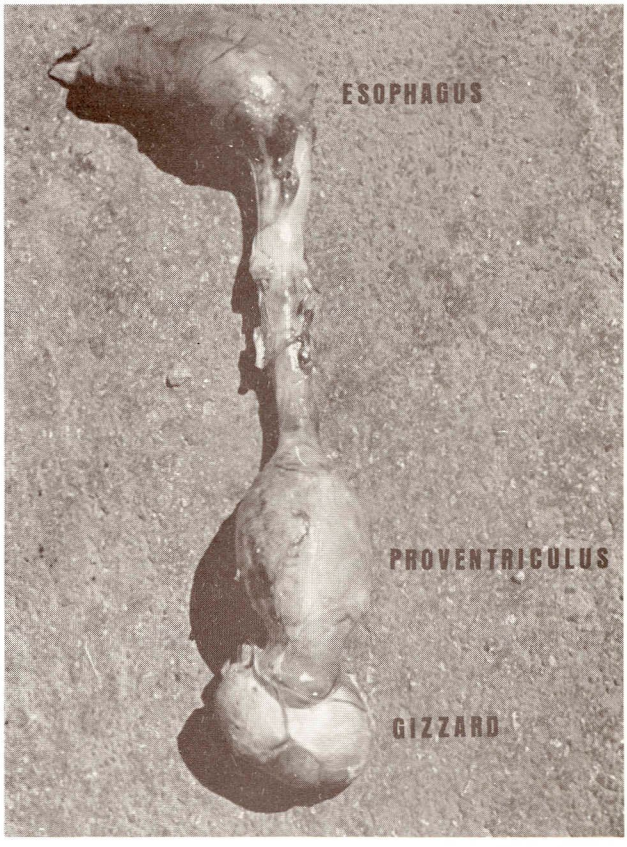

Fig. 1. Upper digestive tract from lead-poisoned Canada goose. Note enlarged area resulting from impaction of food at the upper end of esophagus and in the proventriculus.

[1] *Contribution from Federal Aid Project W-88-R.*

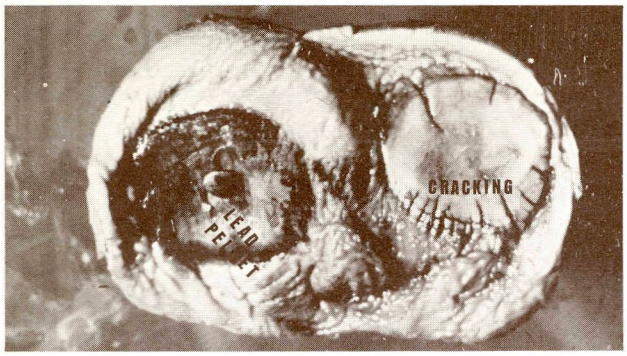

Fig. 2. Gizzard lining with cracking and peeling pads from a confirmed lead-poisoned Canada goose.

A lead poisoning case should not be considered confirmed without chemical analysis of selected tissues. The liver is considered to be the best indicator tissue for chemical analysis in diagnosing lead poisoning. According to analysis of Canada geese collected at Turk's Pond, the presence of any of the more characteristic anatomical signs such as impacted proventriculus or lead fragments in the gizzard was reflected by corresponding high lead levels in the liver. In addition, the range of lead concentration in the liver in non-poisoned Canada geese does not overlap that of definite lead poisoning victims (Fig. 3). The kidney can be used as an alternative indicator tissue if the liver is not available, as there is a significant correlation (r = .73) between liver and kidney lead levels.

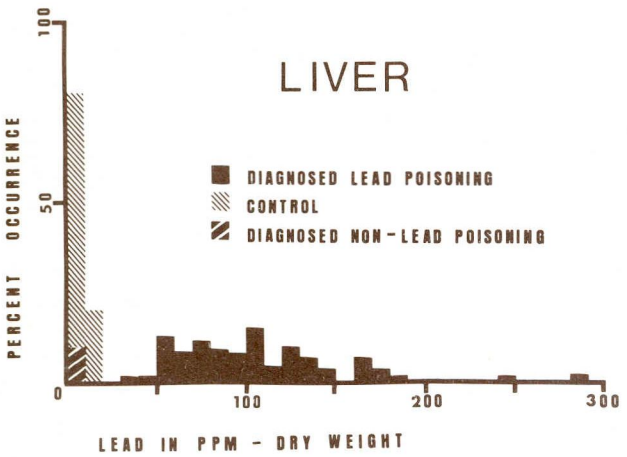

Fig. 3. Percentage distribution of liver lead levels from hand-reared controls vs. suspected Canada goose lead poisoning victims from Turk's Pond.

Because of its availability and ease of handling, bone is a popular tissue for collection for diagnosis of lead poisoning. However, according to analysis of Canada geese collected at Turk's Pond, lead concentration levels in the bones cover a very wide range of values, with a definitive overlap occurring between lead victims and victims of other mortality, mainly crippling (Fig. 4). The metabolic turnover in bone is much slower than that in liver; therefore, lead levels in the bone may not reflect current physiological conditions in the bird. Bone also presents numerous problems in analysis of lead by the usual analytical method, atomic absorption spectrophotometry.

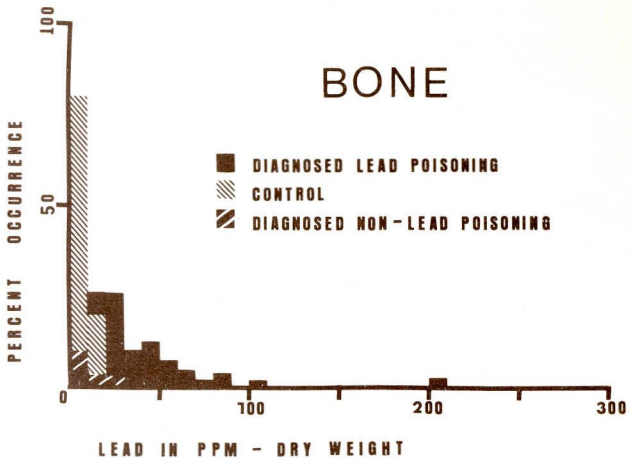

Fig. 4. Percentage distribution of bone lead levels from hand-reared controls vs. suspected Canada goose lead poisoning victims from Turk's Pond.

If unexplained mortality of waterfowl is noted in a particular area in Colorado, notify the Division's Research Center at Fort Collins. Then, if you are told lead poisoning is a possible cause, follow these steps:

(1) Gather all the carcasses. Search the area thoroughly, as birds afflicted with chronic lead poisoning will seek shelter in heavy vegetation.

(2) If you find more than 20 carcasses, select a 40-percent sample. If any of the carcasses have been damaged by scavengers, be sure each bird in your sample has a liver or kidney. Disregard carcasses represented by bone and feathers only.

(3) Note unusual external or internal anatomical features of the sampled birds and remove a lobe of the liver or one entire kidney from each bird. Be sure the liver or kidney can be identified with the bird's corresponding anatomical features. For storage, the livers or kidneys can be either frozen or air-dried. For air-drying, simply allow the tissue plenty of air and do not enclose in any container until sample is completely dry and hard and brittle to the touch.

(4) Transport the livers or kidneys as soon as possible to the laboratory at the Wildlife Research Center in Fort Collins.

LITERATURE CITED

Kimball, W. H., and Z. A. Munir. 1971. The corrosion of lead shot in a simulated waterfowl gizzard. J. Wildl. Manage. 35(2):360-365.

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