

# Lead Poisoning in a Bird of Prey

by

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Lead poisoning has long been recognized as a serious disease of waterfowl (PHILLIPS and LINCOLN, 1930; GRINNEL, 1901; BOWLES, 1908; BELLROSE, 1959). Birds feeding in areas of heavy waterfowl shooting ingest spent lead shot which is mistaken for seeds or grit. The shot is then ground up in the gizzard which makes the lead more absorbable from the intestinal tract. Although most of the lead is excreted in the feces, some is absorbed into the brain, muscles, and feathers, with the highest deposition in bone tissues (BAGLEY, LOCKE and NIGHTINGALE, 1967), etc. Lead absorption from shot which lodges in the body tissue is minimal (MACKLE, 1940).

Food habits of non-aquatic birds in the wild precludes their ingesting spent shot. Consequently, lead poisoning from food is not too likely. This report deals with a probable case of fatal lead poisoning in a bird of prey. Source of the exposure is presumed to be from feeding duck heads having detectable levels of lead within their brain and muscle tissues and from shot lodged within the head itself.

## CASE REPORT

In January 1973, a male Prairie Falcon, Falco mexicanus, was submitted for determination of the cause of sudden death. The bird had been taken from the nest in June of 1969 and raised in captivity. It was trained for the usual activities of falconry and was flown at least every other day.

Approximately one year ago the bird was noticed to have visual difficulties when returning to the lure which could best be described as loss of depth perception. On occasion the bird displayed difficulty in flying and ataxia (AUB, FAIRHALL, MINOT, REZNIKOFF, 1926).

Diet for this and other birds of prey kept in the same compound consisted of duck heads about ninety-five per cent of which were from mallards, Anas platyrhynchos, supplied by a local processor of poultry during wildfowl hunting season and frozen until fed. For ease in eating, the heads are smashed which enables the bird to consume the entire head except the bill. A large amount of feathers are also eaten. After digestion takes place, undigested feathers and bones are regurgitated as a cast.

In order to substantiate the hypothesis of lead poisoning, brain and muscle tissue were removed from the duck head currently being fed. These tissues were then examined for lead content. Before necropsy, x-rays were taken of these same heads to determine the approximate amount of shot lodged in tissue that would have been eaten.

#### METHODOLOGY

Upon necropsy, the falcon appeared to be in good health having a layer of fat immediately under the skin and within the abdominal cavity. Gross examination revealed an accumulation of sero-sanguineous fluid in the pericardial sac. There was also an accumulation of serous fluid within the cranial cavity. A green discoloration of the intestinal tract as described by Trainer, et al. (TRAINER and HUNT, 1965) was present. Organs removed for lead analysis were brain, kidney, heart and liver. In addition, the humerus and femur were collected for bone studies.

For comparison purposes, a great horned owl, Bubo virginianus, collected as a fresh road kill in a desert area was used as a control. The diet of this nocturnal bird of prey would have been primarily rodents and, in all likelihood, it would have had no ducks in its diet. Identical tissues were analyzed in the same manner as those used on the falcon.

Lead analysis was determined by the method recommended in the A.O.A.C., Eleventh Edition, "Mercury Official Final Action" 25.058, 25.059, 25.060, and 25.062 (HORWITZ, 1970). After digestion, the acid digest was decanted into a 100 cc volumetric flask. The digestion flask was rinsed several times and each rinse was added to the flask. Additional water was added to reach the 100 cc volume. A 50 cc aliquot was used for lead analysis using the Perkin Elmer A. A. Model 303.

#### RESULTS AND DISCUSSION

Lead residues found in the tissues of the falcon and the owl are listed in Table 1. The 17.4 ppm found in the falcon liver was equal to or exceeded levels found in other studies which indicated lead poisoning as the cause of death (BAGLEY, LOCKE, and NIGHTINGALE, 1967; ZOOK, SAUER, GARNER, 1972). The relatively

TABLE 1. Tissue Levels of Lead in the Poisoned Falcon as Compared with Those in a Wild Owl.

Tissue	Lead, Parts Per Million	
	Prairie Falcon	Horned Owl
Flesh	3.1	1.9
Heart	3.9	5.0
Kidney	6.0	10.6
Brain	12.9	4.3
Liver	17.4	2.8
Bone	36.0	2.0
TOTAL	79.3	26.6
MEAN	13.2	4.4

high levels of 36 ppm found in the bone indicates a long-term chronic exposure in comparison to the active condition found in the liver (BAGLEY, LOCKE and NIGHTINGALE, 1967). The brain showed an equally high level. The owl tissue showing the most significant difference in comparison with those from the falcon are the liver and the bone. Although both have detectable lead, there is not enough lead in the owl liver to cause an acute condition nor enough in the bone to indicate the chronic level present in the falcon. The highest level found in the owl was 10.63 ppm in the kidney which seems logical when one considers the functions of this organ. It seems reasonable that the owl may represent a level that would be found in most birds of prey in the wild state.

Analysis of brains from ten mallard heads and muscle tissue from the same ten mallards plus breast muscle from six others currently used as a food supply revealed residue levels of lead from 2.0 ppm to 55.8 ppm in the muscle tissue and 4.7 ppm to 32.6 ppm in the brain. Results are listed in Table 2. X-ray examination of nine of the ten heads showed at least one shot present in seven of them. These shot would probably have been eaten and would possibly have added a small amount of lead to body burdens although the absence of a gizzard in these birds

TABLE 2. Lead Analysis of Duck Muscle and Brain Tissues

Duck Species	Total Lead, Parts Per Million		
	Tissue Tested *		
	Neck Muscle	Brain	Breast Muscle
Mallard			
<u>Anas platyrhynchos</u>	5.6	8.0	2.2
(N=16)	5.5	6.7	14.7
	4.9	5.0	55.8
	7.8	32.6	2.0
	6.7	8.5	4.2
	6.7	7.4	3.3
	6.8	7.0	
	21.3	4.7	
	7.9		
	6.8	6.5	
Golden Eye			
<u>Bucephala clangula</u>			8.8
(N=2)			6.3
Redhead			
<u>Aythya americana</u>			3.9
(N=2)			5.7
Widgeon			
<u>Mareca americana</u>			4.3
(N=1)			

\* Data were obtained for neck muscle and brain from ten mallards, and for breast muscle from six other mallards.

limits the amount of time that the shot would remain in the digestive system. The shot could either be regurgitated with the cast or pass on through the alimentary canal and be excreted in the feces. If the latter was the case, the shot would be subject to stomach acid and some absorption of lead salts would likely take place.

All of the above findings furnish evidence that feeding heads from wild ducks is providing captive birds of prey a continuing source of lead poisoning which could result in chronic or acute symptoms or death and that in this particular instance, the falcon probably died from lead poisoning.

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