

Suspected poisoning of Golden Eagles *Aquila chrysaetos* by Chlorophacinone

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Eight pairs of Golden Eagles, *Aquila chrysaetos*, are resident in a 35 km² area in Southern Alameda County, California, that is part of the watershed of the San Francisco Water Department. They feed primarily on ground squirrels *Spermophilus beecheyi*, perceived by cattle ranchers as agricultural pests. The author has studied the population since 1984.

In early June, 1990, chlorophacinone, an anticoagulant rodenticide, was applied in the form of poison-coated oat groat by ranchers and County personnel in an effort to reduce the squirrel population. During the following week, numerous squirrel carcasses as well as occasional staggering or crawling moribund individuals were found on the grassy slopes of the treated range. Deer Mice, *Peromyscus maniculatus*, a non-target species, were also found dead; several were found partially consumed in squirrel burrows.

On June 19, 1990, an eagle pair was observed leading two recently fledged young, a male and a female, into the treated area. The adult eagles were seen carrying dead squirrels to the fledgling young. Partially consumed squirrels under a roosting tree, some with bait kernels adhering to their flesh, showed evidence of poisoning. Tissues, particularly subdermal fat, had a bright blue coloration derived from a tracer pigment added to the poison bait; the muscles of dead animals had a characteristic pale appearance.

On June 25, the young female eagle was found sitting on the ground, appearing unwell; her feathers were fluffed up despite the warm weather, and her wings drooped. She flew with difficulty from a hilltop to a bluff about 75 yards away and there lay down exposed to a strong wind and intense sunlight. On June 27, the young male was found dead, as was the fledgling female on June 28. The crop of the female showed extensive hemorrhaging; the pectoral muscles, deficient in blood, were extremely pallid. The male was not examined. The adult male eagle was last seen on June 25 and is presumed to have died also. The old female was still alive and apparently well on August 30, but disappeared from the territory in late fall.

With the appearance of dead and dying ground squirrels, 20-30 Turkey Vultures, *Cathartes aura*, moved into the area and fed on poisoned squirrel carcasses over a two-week period without apparent ill effect; no carcasses were found during frequent searches. Likewise, Red-tailed Hawks, *Buteo jamaicensis*, both adults and fledglings, fed on the carcasses and appeared unharmed three weeks later.

In a study of the effects of chlorophacinone on captive American Kestrels, *Falco sparverius*, Radvanyi *et al.* (1988) reported that juvenile kestrels were more severely affected than adults by directly administered chlorophacinone, and that kestrels fed poisoned mice hemorrhaged in one or more organs. Other physical and behavioral changes in treated birds included loss of balance,

decreased flying ability, diarrhea, loss of appetite and conspicuous wing-drooping. In these kestrels, chlorophacinone dosages as small as one-third that required to kill a meadow vole *Microtus sp.* sufficed to bring on behavioral and gross pathological changes and death. The authors suggested that wild kestrels would suffer sublethal secondary poisoning or death if they consumed one poisoned mouse daily for three weeks.

Reporting on secondary poisoning of owls by anticoagulant biocides, Mendenhall and Pank (1980) found that the related rodenticide diphacinone was toxic to Great-horned, *Bubo virginianus*, and Saw-whet Owls, *Aegolius acadicus*, but not to Barn Owls, *Tyto alba*, and that owls fed on chlorophacinone showed "no abnormalities". Consumption of diphacinone-laced mutton caused sublethal hemorrhaging in Golden Eagles, producing weakness and increased prothrombin (Savarie *et al.* 1979). At the University of California at Santa Cruz, during two-week periods following squirrel-poisoning campaigns in 1979 that used both chlorophacinone and diphacinone, non-target species that were found dead included seven Great-horned Owls, one Barn Owl, one Red-tailed Hawk, one Coyote, *Canis latrans*, two Badgers, *Taxidea taxus*, one Striped Skunk, *M. mephitis*, and one Bobcat, *Lynx rufa* (B.J. Walton, pers. comm.).

These observations indicate that laboratory feeding experiments may not necessarily predict effects in the wild; they suggest that chlorophacinone and diphacinone can have profoundly different effects not only on different taxa but even on different age groups within a species. Even closely related genera, such as *Aquila* and *Buteo*, may show totally different effects after ingestion of poisoned animals. The apparent lack of toxicity of chlorophacinone to Turkey vultures thus does not guarantee, for example, that chlorophacinone will be equally harmless to the California Condor, *Gymnogyps californianus*, which is currently being re-introduced into a ground squirrel-rich environment.

Any program using these anticoagulant rodenticides should therefore be considered potentially hazardous to local raptors.

Clearly, application procedures should be strictly controlled and the local raptor populations closely monitored for deleterious effects. The observations of the present study suggest that any carcass found be examined for evidence of hemorrhaging and for abnormally pale musculature that would indicate a blood deficiency.

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