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Regulate lead-based hunting ammunition to reduce risk to large raptors, urges study

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Eagles and vultures in southern European mountain ranges are heavily exposed to lead, finds a new study. Analysing tissues from four large species, researchers revealed that nearly half those sampled contained above background levels, with golden eagles and griffon vultures particularly affected. Lead-based hunting ammunition, the main source of contamination, should be banned to protect these birds from its toxic effects, they say.

The toxicity of lead to mammals and birds is well known. Most sources of lead pollution have been removed or regulated in developed countries. Lead-based hunting ammunition is still permitted, however, and 21 000 tons of lead gunshot is estimated to be dispersed each year in the EU[1]. Birds of prey and scavengers that feed on shot animals consume lead particles. Shot pellets are usually regurgitated, but some particles are digested. Lead poisoning therefore affects many raptors, including several rare species.

Vultures and eagles follow hunters, seeking discarded game. This makes them good indicators of the risk of lead poisoning, therefore researchers investigated four species: golden eagle (*Aquila chrysaetos*), bearded vulture (*Gypaetus barbatus*), griffon vulture (*Gyps fulvus*) and cinereous vulture (*Aegypius monachus*), in south-central Europe. Between 2005 and 2019, they collected 252 birds found in France, Austria, Switzerland and Italy (in the Pyrenees, Massif Central, Alps and Apennines).

Five of the birds were alive in rescue centres, the remainder found dead due to natural, artificial or unknown causes. Over 60% of the birds had suffered a premature cause of death, such as collision, including 32 cases of suspected lethal lead poisoning.

The researchers took 595 tissue samples from liver, kidney and bones, and blood samples from living birds. X-rays revealed the presence of ingested ammunition fragments (>1 mm) in eight birds and embedded gunshot in healed wounds in 28 birds, all lead-based.

Acknowledging that intake from lead ammunition is in addition to lead absorbed from other sources, they identified background-contamination levels of up to 2 milligrams per kilogram (mg/kg) in liver and kidney and 8.33 mg/kg in bones. Individuals with lead concentrations exceeding these levels

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were classified as poisoned. Birds with over 6 mg and 4 mg in liver and kidney, respectively, were considered as suffering clinical poisoning and those with over 16.6 mg in bone were classified as chronically poisoned, as the presence of lead in bone indicates a long-term accumulation.

Overall, 44%[2] of the birds were contaminated above background levels in at least one tissue type and 26% were suffering clinical poisoning. In some cases of lethal poisoning, lead may not have yet reached high concentrations in organs, so the findings may underestimate poisoning.

There was no significant difference in contamination levels between regions, however poisoning was most frequent in golden eagles and griffon vultures. Golden eagles prefer mountainous habitats, where hunters discard internal organs of their game or cannot retrieve some injured animals. The eagles also eat living prey which may carry embedded shot. The other species in the study tend to rely on cattle or feed on less contaminated bones and tendons, as well as being prevalent in areas where safe, artificial feeding sites are provided.

The researchers found that bone levels revealed chronic or sub-chronic exposure in 96 out of 223 cases (42.1%). Bones contained the highest average concentrations (6.8 mg/kg wet weight), suggesting scavengers are exposed to repeated poisoning. Analysis by age group showed that golden eagles accumulate considerable amounts before reaching reproductive age. Juveniles across species rely on carcasses more than adults, so some will be poisoned before they start breeding.

Lead's effects include delayed sexual maturity and low reproduction rates, potentially causing raptors to die before producing enough offspring to maintain the population. Thus, in some hunting regions, lead poisoning may thwart conservation efforts.

The researchers suggest that lead found in digestive tracts and — to a lesser extent — embedded fragments was associated with higher average concentrations in liver and bones, indicating that hunting ammunition may be the chief source. The number of birds carrying embedded shot (11%) reveals that illegal killing may be taking place.

The researchers posit that a rapid transition to lead-free bullets and gunshot is required across Europe. Ammunition based on alternative materials is effective, widely available, and priced similarly. A restriction under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), applied to all European countries, would be the most effective and appropriate measure, say the researchers, who posit that such a restriction would also have positive effects on other wildlife, human health and the environment. The researchers highlight that a European Chemicals Agency restriction proposal[3] is currently under examination.

1. European Chemicals Agency (2018). Annex XV Investigation Report. *A Review of the Available Information on Lead in Shot Used in Terrestrial Environments, in Ammunition and in Fishing Tackle* (Version Number: 1.1).

2. Of the portion permitting a complete analysis (i.e. soft tissues and bone, 141 birds), a higher figure (47.5%) showed lead contamination, suggesting this overall figure of 44% is conservative.

3. For further information see: https://echa.europa.eu/it/registry-of-restriction-intentions/-/dislist/details/0b0236e1840159e6