White-tailed eagles avoid large bullet fragments during consumption of carcasses

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White-tailed eagles detect and avoid the ingestion of large metal particles (larger than 8 mm) but ignore smaller metal particles whilst feeding on shot mammalian carcasses. Lead-based bullets split into numerous small metal fragments when penetrating an animal's body, whereas lead-free rifle bullets either deform without leaving any particles in the tissue or fragment into larger particles. Thus, the use of lead-free bullets may prevent lead poisoning of scavengers. These findings have recently been discovered by scientists of the German Leibniz Institute for Zoo and Wildlife Research (IZW) and are now published in the scientific journal *European Journal of Wildlife Research*.

In experiments with white-tailed eagles (Haliaeetus albicilla) the IZW researchers discovered that these large birds selectively detect and discard larger metal fragments during feeding on carcasses. With increasing size, particles were more likely to be detected and more frequently avoided by birds. Surprisingly, white-tailed eagles never detected metal fragments in their food by visual cues only, as might be expected from the extraordinary visual acuity of eagles. Rather they appear to sense hard metal particles predominantly by touching them with their tip of the bill or detect particles whilst food is already inside the beak and disgorge them subsequently. These findings indicate that raptors may have sensitive tactile receptors in the tip of the bill as well as inside the beak which help them avoid the ingestion of indigestible hard particles.

To simulate the uptake of lead particles by scavengers when feeding on shot wildlife, the scientists ran feeding experiments in the field where they provided mammalian carcasses prepared with metal particles of different size and shape. The researchers used non-toxic soft iron particles instead of lead-based bullets to prevent any intoxication of or injuries to the scavengers. Feeding experiments were carried out inside the territories of six breeding pairs of white-tailed eagles in the nature reserve Naturpark Nossentiner/Schwinzer Heide in northeastern Germany during the main hunting seasons between 2007 and 2009. The researchers conducted further feeding experiments with six wild white-tailed eagles temporarily kept in the conservation and rehabilitation station Woblitz in northeastern Germany where they recuperated from injuries. Both free-ranging and captive white-tailed eagles showed the same selective feeding pattern: iron particles of up to 3 mm were ingested very frequently, whereas larger metal fragments were typically detected and removed from the food. The largest particles provided, with a diameter of 8.8 mm, were almost completely avoided.

When conventional rifle bullets with their soft lead core penetrate an animal's body, they split into fragments often smaller than 1 mm. Tiny metal fragments are ingested by scavengers during the consumption of carcasses as the study demonstrates. Particularly during the hunting season, carrion containing lead shot or lead bullet fragments becomes an abundant food source for scavengers. As a result, lead poisoning by bullet fragments is the most important cause of death for white-tailed eagles in Germany. "Other avian scavengers are affected by this hazard, too," explains Oliver Krone from the IZW. "Our observations show that, besides white-tailed eagles, common ravens and buzzards are among the main consumers of shot mammalian carcasses."

The study provides the first evidence that scavengers avoid the ingestion of large metal particles during food intake. Consequently, the use of bullets that deform or fragment into particles greater than 9 mm in size,

such as lead-free bullets from numerous manufacturers, may prevent metal ingestion and poisoning in avian scavengers.

More information: "Lead exposure and food processing in white-tailed eagles and other scavengers: an experimental approach to simulate lead uptake at shot mammalian carcasses." *Eur J Wildl Res*; DOI: 10.1007/s10344-015-0953-1

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