

## Lead Exposure of Scavenging Birds Due to Accidental Ingestion of Lead Ammunition: Geographic and Species Variation in Canada

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Multiple bird species, including raptors and corvids, accidentally ingest spent lead ammunition while scavenging on gut piles of hunted game, which can result in acute and chronic toxicological effects. This phenomenon has been reported worldwide and for some bird species is associated with population-level impacts. To evaluate lead poisoning of scavenging birds across Canada, we initiated a national scale study in 2018, with the objective of using a pan-Canadian database to (i) assess the extent of lead exposure of scavenging birds and (ii) identify bird species and regions at higher risk. Through a collaboration between Environment and Climate Change Canada, the Canadian Wildlife Health Cooperative, territorial governments, and other partners, a sample set of close to 1000 livers has been obtained from dead and moribund birds brought to wildlife organizations. Currently, bald eagle is the most sampled species (n = 423) followed by red-tailed hawk (n = 139), common raven (n = 101), great horned owl (n = 90), golden eagle (n = 50), merlin (n = 38), American crow (n = 35), and turkey vulture (28). Measurement of lead burdens in the livers is on-going, though preliminary concentration data (n = 792) were compared to an established threshold of 20 µg/g dry weight (dw) associated with a high risk of clinical lead poisoning. Bald eagle, golden eagle, and turkey vulture showed the greatest lead exposures, with 12-15 % of birds having liver concentrations in exceedance of 20 µg/g dw. A few individuals of red-tailed hawk and great horned owl also showed exceedances of that threshold, though at a lower frequency of 1-2 %. None of the corvid species had liver concentrations of lead above the threshold (maximum concentrations ≤ 5 µg/g dw). A comparison of bald eagle lead concentrations among regions of Canada showed considerable geographic variation in exposure, with threshold exceedances ranging from 4-23%. Antimony concentrations of bird livers were also examined because antimony is used as a hardener in lead ammunition alloys. A positive correlation was found between bird liver concentrations of antimony and lead, which is consistent with lead ammunition being a dominant source of lead exposure to the birds. This national-scale Canadian dataset will provide a baseline to track long-term trends in lead exposure of a representative suite of raptors and corvids.