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Prepared by the USGS National Wildlife Health Center

Lead Poisoning in Wild Birds

Radiograph showing scattered lead fragments from a lead rifle bullet in the thoracic region of a mule deer (The Peregrine Fund).

Introduction

Lead in its various forms has been used for thousands of years, originally in cooking utensils and glazes and more recently in many industrial and commercial applications. However, lead is a potent, potentially deadly toxin that damages many organs in the body and can affect all animals, including humans. By the mid 1990s, lead had been removed from many products in the United States, such as paint and fuel, but it is still commonly used in ammunition for hunting upland game birds, small mammals, and large game animals, as well as in fishing tackle. Wild birds, such as mourning doves, bald eagles, California condors, and loons, can die from the ingestion of one lead shot, bullet fragment, or sinker. According to a recent study on loon mortality, nearly half of adult loons found sick or dead during the breeding season in New England were diagnosed with confirmed or suspected lead poisoning from ingestion of lead fishing weights. Recent regulations in some states have restricted the use of lead ammunition on certain upland game hunting areas, as well as lead fishing tackle in areas frequented by common loons and trumpeter swans. A variety of alternatives to lead are available for use in hunting, shooting sports, and fishing activities.

Lead Ammunition Poisoning of Avian Predators and Scavengers

Lead ingestion and poisoning from ammunition sources has been documented in many avian predators and scavengers, such as bald and golden eagles, red-tailed hawks, and the California condor. These birds can be exposed to lead when they consume game birds or mammals that have been shot with lead ammunition. Lead pellets may remain intact in tissues and lead core rifle bullets may fragment into hundreds of pieces upon impact and can be found several inches from the site of the wound in large game mammals. When avian predators and scavengers consume the remains of big game in the field or animals that were shot with a lead bullet and not retrieved, the bullet or its fragments may be ingested and can result in lead poisoning.

Bald eagle on a deer carcass and bald eagles sick and dead from lead poisoning (Save Our Avian Resources).

To learn more about how lead bullets fragment, see the Minnesota Department of Natural Resources lead fragmentation study at ***http://www.dnr.state.mn.us/hunting/lead/index.html***

Learn about "Ingestion of Spent Lead Ammunition: Implications for Wildlife and Humans," (The Peregrine Fund, 2008) at ***http://www.peregrinefund.org/lead_conference/***

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Lead Ammunition and California Condors

The primary obstacle for the recovery of the critically endangered California condor is reported to be lead poisoning from the ingestion of lead from spent ammunition. In the 1980s, before all wild California condors were brought into captivity, scientists determined that condors were dying from lead poisoning and the problem continues today, within the recovering wild population of about 150 birds. Lead from mines in different geographic areas contains varying proportions of the four natural lead isotopes; thus, an object made from lead from a certain mine or region can often be identified by an isotope "fingerprint." Research has shown that California condors with low concentrations of lead in their blood had lead isotope fingerprints similar to lead fingerprints in food items in their diet. However, condors with elevated blood lead concentrations had lead fingerprints in their blood similar to lead from a sample of ammunition purchased in southern California, suggesting that the source of lead exposure was from ammunition. On July 1, 2008, California instituted the Ridley-Tree Condor Preservation Act, which includes restrictions on the use of lead ammunition in the California condor range in central and southern areas of the state. Lead-free bullets, the most common of which are made of solid copper, are readily available alternatives. See the California Department of Fish and Game Web site for a complete list of approved alternatives to lead ammunition.

Lead poisoning has been an obstacle to the recovery of the endangered California condor (Christi Van Cleve, The Peregrine Fund).

Learn about the status of the California condor at ***http://www.aou.org/committees/conservation/docs/AOU_CONDOR_REPORT_final.pdf***

See the California Department of Fish and Game webpage for a list of certified nonlead bullets, shotgun slugs, and buckshot at ***http://www.dfg.ca.gov/wildlife/hunting/condor/certifiedammo.html***

Read tips for hunters at ***http://files.dnr.state.mn.us/fish_wildlife/lead/bulletstudy/resources/huntertips.pdf***

Lead Ammunition and Upland Game Birds

Terrestrial bird species reported with ingested spent lead shot include mourning doves, ring-necked pheasants, northern bobwhite quail, wild turkey, and chukars. These species may consume lead shot as they feed on seeds on the ground or when they ingest small stones as grit, especially in heavily hunted areas. In areas managed for mourning dove hunting, biologists have found that about 3–5 percent of birds consume spent shot. The Missouri Conservation Department instituted regulations in 2007 that require the use of nontoxic shot on 21 of the Department's managed hunting areas.

Hunter-killed mourning doves. Mourning doves and other upland game birds may consume lead shot (M. Friend, USGS).

Learn about Missouri's ban of lead shot in certain conservation areas to protect mourning doves and other wildlife at ***http://www.mdn.org/2007/STORIES/SHOT.HTM***

Lead Ammunition and Waterfowl

Lead shotgun pellets settle to the bottom of lakes and ponds and may be mistaken for the grit that waterfowl consume to aid in grinding food. Regulations restricting the use of lead ammunition have been instituted in at least 29 countries. Before the 1991 nationwide ban on the use of lead shot for waterfowl hunting in the United States, an early study estimated that up to 3 percent of all waterfowl in North America died annually from lead poisoning. Birds of prey and other predators were also poisoned as they fed on waterfowl that were sick from ingesting lead shot, dead, or crippled by lead shot embedded in their tissues. The ban was instituted to protect waterfowl as well as their predators, such as eagles. Many types of nontoxic shot are available to waterfowl hunters in the United States.

Lead shotgun pellets, showing various amounts of erosion, from the gizzard of a lead poisoned trumpeter swan (J. C. Franson, USGS).

Lead shot in Canada goose gizzard (M. Friend, USGS). Corn and other cereal grains intensify the negative effects of lead poisoning.

Lead poisoned Canada geese (J. C. Franson, USGS).

Visit the Fish and Wildlife Service webpage for a complete listing of approved nontoxic shot for waterfowl and American coot hunting at ***http://www.fws.gov/migratorybirds/CurrentBirdIssues/nontoxic.htm***

Target loads made with nontoxic shot are now available (J. C. Franson, USGS).

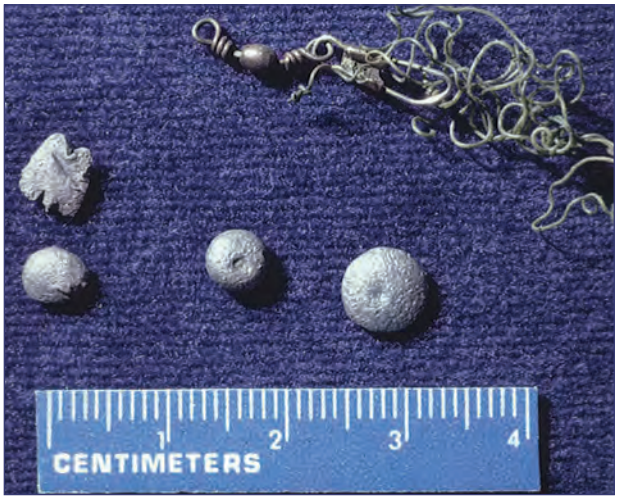
Spent Lead Shot from Shotgun Shooting Sports

High densities of lead shotgun pellets have been found in soil and sediment within the fall zone at clay target shooting ranges. Lead poisoning and elevated lead concentrations in tissues have been reported in waterfowl, perching birds, small mammals, and frogs at trap and skeet ranges. Some ranges require the use of nontoxic shot.

Lead Fishing Tackle and Waterbirds

Species reported to have been poisoned by ingested lead fishing weights include trumpeter swans, brown pelicans, common loons, and other waterbirds. These birds may ingest sinkers attached to broken fishing line in hooked fish or may pick them up as grit. The use or sale of lead fishing tackle is restricted in national parks and wildlife areas in Canada. Restrictions also have been implemented in Maine, New Hampshire, New York, and Vermont, and in several United States National Wildlife Refuges and National Parks.

Radiograph of brown pelican with ingested fishing tackle including hooks and lead sinkers (Wildlife Care Center, Florida).



Various fishing tackle found in the digestive tracts of waterbirds (J. C. Franson and J. Runningen, USGS).

Find a list of nonlead fishing tackle by the Minnesota Pollution Control Agency at ***http://www.pca.state.mn.us/oea/publications/sinkers.pdf***

To learn more about loons and lead, visit the Tufts Cummings School of Veterinary Medicine Web site on Loon Health and Mortality at ***http://www.tufts.edu/vet/loons/***

For more information about lead, visit the Centers for Disease Control and Prevention Web site at ***http://www.cdc.gov/lead/*** or the Environmental Protection Agency Web site at ***http://www.epa.gov/lead/***

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