

Lead poisoning



Any wetland where
lead is deposited

Wildlife ✓

Livestock ✓

Human ✓

Synonym(s): Pb poisoning

KEY FACTS

What is lead poisoning? Lead poisoning arises through the absorption of hazardous levels of lead in body tissues. Lead is a highly toxic poison which can cause morbidity and mortality in humans, livestock and wildlife. Waterfowl, birds of prey and scavenging birds are at greater risk of exposure to lead than other bird species and mammals due to feeding habits that involve ingesting lead gunshot as grit or consuming prey animals that have been shot with lead ammunition. Lead poisoning in waterbirds is a very serious and large-scale environmental problem. Birds can die from lead poisoning throughout the year but mortality is more likely after waterfowl hunting seasons. Lead exposure may also cause a variety of health effects in humans, particularly for children, foetuses and pregnant women.

Causal agent Lead.

Species affected Many species of birds, particularly waterbirds, birds of prey, scavenging birds, and mammals.

Geographic distribution Occurs worldwide, *i.e.* wherever lead is deposited in the environment.

Environment Any environment where lead is deposited and accessible.

EXPOSURE

How is the environment contaminated by lead? Wetlands are most commonly contaminated by spent lead ammunition and abandoned lead fishing weights which build up in the sediments of lakes and marshes. Any species using an area where shooting with lead ammunition occurs or has occurred previously is at some risk of exposure and, potentially, poisoning. Lead-based paint, mine wastes, lead contaminated industrial effluents and other objects provide additional sources of contamination.

How are animals exposed to lead? Waterfowl usually become poisoned after ingesting spent lead shot, mistaking them for food items or grit, which is usually picked up to facilitate digestion. Predators or scavengers may become poisoned after consuming animals that have been shot with lead ammunition. Lead from ammunition and fishing weights may slowly dissolve and enter groundwater, making it potentially harmful for plants, animals and perhaps humans if it enters water bodies or is taken up in plants. Lead poisoning in livestock often occurs after swallowing point sources of lead such as lead from inside vehicle/machine batteries or lead paint, but also through consuming contaminated water and food supplies. Cattle are at most risk due to their inquisitive natures and they often 'taste-test' objects.

How are humans exposed to lead? Exposure to lead may occur through ingestion of contaminated food, such as lead shot game, and through inhalation and absorption through the skin from sources such as gasoline, industrial activities and water pipes made from lead. Toxic effects may or may not be recognised as such.

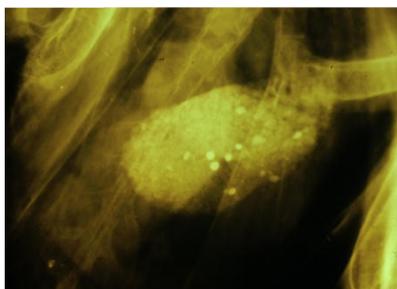
IDENTIFICATION AND RESPONSE

Field signs

Sick and dead birds are usually seen in low numbers, although many are likely to go undetected. Large scale die-offs only occasionally occur. Signs include weakness, lethargy, reluctance to fly or inability to sustain flight, weight loss causing emaciation (the breast-bone becomes prominent), green-stained faeces and vent and fluid discharge from the bill. Birds are often mistaken for cripples during or after hunting seasons. Those suffering from acute poisoning do not attempt to escape but will often seek isolation and protective cover making them difficult to find. In some species, the head and neck position may appear 'crooked' or bent during flight. The wings may be held in an arched position which is followed by wing droop. A lot of green faeces in areas used by waterfowl may suggest lead poisoned birds and warrants further searches. Those suffering from acute poisoning may die with few clinical signs or lesions, but there are usually several weeks between exposure and death.



Lead poisoned mute swan *Cygnus olor* with typical kinked neck and drooped wings (Martin Brown).



Radiograph of dense pieces of lead shot in the gizzard of a lead poisoned swan (Martin Brown).

Dead animals are usually the first sign of lead poisoning in livestock. Live animals show signs of central nervous system damage. They may stop grazing and appear unresponsive and lethargic. These symptoms may be accompanied by muscle twitches (which may be more obvious around the face), blindness, staggering and gazing at the sky ('star-gazing').

Obvious symptoms in humans usually don't appear until sufficient amounts of lead have accumulated. Symptoms in children include: loss of appetite, weight loss, fatigue, abdominal pain, vomiting, constipation and learning difficulties. Symptoms in adults may include pain and numbness, muscular weakness, headache, abdominal pain, memory loss, miscarriage or premature birth in pregnant women and fatigue. A blue line around the gums and a metallic taste in the mouth may indicate lead poisoning. Other less 'identifiable' symptoms include effects on cognitive function, blood pressure and kidney function.

Recommended action if suspected Contact and seek assistance from animal and/or human health professionals if there is any illness in birds, animals and/or people. Depending on local arrangements, suspected cases in livestock should be reported to national authorities.

Diagnosis Confirmation of lead poisoning as a cause of death can only be determined by a combination of pathology, toxicological findings, clinical signs and field observations.

It is useful to record whether dead birds have lead shot or lead particles in the gizzard although this does not provide a confirmative diagnosis. For dead birds, whole carcasses should be submitted to a diagnostic laboratory but if this is not possible, liver and/or kidneys can be submitted, frozen and wrapped separately in aluminium foil. Lead levels in live birds can be determined through blood screening and through indirect measurements using blood enzymes. For this, appropriate veterinary advice should be sought.

Post mortem examination should confirm lead poisoning through the detection of toxic levels of lead in kidney and/or liver tissue of affected animals. Blood samples can be taken from live animals suspected of having lead poisoning to confirm diagnosis.

For humans, a blood test can screen for harmful levels of lead in the body and confirm diagnosis.

PREVENTION AND CONTROL IN WETLANDS

Overall To reduce the risk of lead poisoning in wildlife, livestock and humans, lead should be prevented from entering the environment.

Livestock

- Ensure that livestock do not have access to potential sources of lead such as old batteries, broken battery cases and spilled contents, lead paint, sump oil, contaminated soil from lead mining, and other farm machinery/rubbish.
- Check for these sources before putting stock onto new land and by checking areas ahead when driving stock.
- Animals in the early stages of poisoning are more likely to respond to treatment than those severely affected.

Wildlife

- Ensure that non-toxic shot is used for hunting. This is the only long-term solution for significantly reducing wild bird mortality from lead poisoning.
- Pick up and safely dispose of birds known, or suspected to be, contaminated by lead so that scavenging species do not ingest them.
- Exclude birds from heavily contaminated areas.
- Habitat management to temporarily reduce the availability of lead shot:
 - Lower water levels in feeding grounds after the hunting season to deter waterfowl from an area or increase water levels so that shot is out of reach of certain waterfowl species.
 - Turn the soil so that lead shot lies below the soil surface (>15 cm) so that it is not readily available to birds.
 - Plant food crops other than grains which may worsen the effects of lead ingestion.
 - Provide supplementary grit for waterbirds to ingest for digestion instead of shot.
 - Note that these actions can be expensive, labour intensive and of

limited effectiveness and should therefore not be relied upon as effective long-term solutions. These methods require knowledge of where the birds are picking up lead and knowledge of the wetlands' hunting history and historical lead exposure. Differences in feeding habitat should be considered for the broad spectrum of wildlife using the area.

- Treatment of poisoned birds is generally impractical but endangered species or those of high value may warrant treatment, which involves the use of lead-chelating chemicals under veterinary supervision.

Humans

Humans should reduce their exposure to lead by whatever means including reducing the amount of food consumed containing lead shot or other ammunition. Hunters should be encouraged by whatever means (legislation or education) to only use non-toxic shot when hunting.

IMPORTANCE

Effect on wildlife

Lead poisoning through the ingestion of lead gunshot is one of the most significant causes of death of wildfowl across the world and may also cause sub-lethal effects such as reduced survival and productivity. Lead poisoning is a particular problem in dabbling ducks, diving ducks and grazing species and accounts for an estimated 9% of waterfowl mortality in Europe alone. Morbidity and mortality also occurs in bird species that predate and scavenge animals shot with lead ammunition and has also been reported in upland bird species, reptiles and small mammals. The impacts of lead poisoning on threatened animal species and populations are also a great cause for concern.

Effect on livestock

Lead is a common cause of morbidity and mortality in cattle but is less frequently reported in sheep, goats and other livestock. Domestic animals are most vulnerable when they have access to the sources of lead listed above. Mortality in exposed groups can be high if animals are not removed from the source promptly.

Effect on humans

Lead can cause damage to various body systems including the nervous and reproductive systems and the kidneys and can cause anaemia and high blood pressure. High exposure to lead can cause convulsions, coma and death. Children, foetuses and pregnant women are particularly vulnerable to its toxic effects and there is now considered to be no safe level of lead exposure below which toxic effects do not occur.

Economic importance

There is potential for significant economic losses to the livestock industry due to death and illness of poisoned animals and restrictions on the sale of produce. Even low levels of exposure, which may not cause clinical illness, can cause concentrations of lead residues in milk, offal and meat to exceed residue limits and be deemed unfit for human consumption. The effects of lead on cognitive function of humans, together with other health impacts, have socioeconomic impacts.

FURTHER INFORMATION

Useful publications and websites

- ☐ Friend, M. & Franson, J.C. (2001). **Lead**. In: Field manual of wildlife diseases: general field procedures and diseases of birds. E. A. Ciganovich (ed.). pp. 317-334. U.S. Department of the Interior and U.S. Geological Survey, Washington, DC. www.nwhc.usgs.gov/publications/field_manual/chapter_43.pdf. [Accessed March 2012].
- ☐ The Peregrine Fund, Boise, Idaho, USA. **Ingestion of spent lead ammunition: implications for wildlife and humans**. DOI 10.4080/ilsa.2009.0316 www.peregrinefund.org/Lead_conference/. [Accessed March 2012].
- ☐ Wetlands International (2000). **International update report on lead poisoning in waterbirds**. www.unep-aewa.org/publications/publication_others/wi_lead_poisonwbirds_en_2000.pdf. [Accessed March 2012].
- ☐ African-Eurasian Waterbird Agreement (AEWA). **Lead poisoning in waterbirds** www.unep-aewa.org/publications/leadshot/leadpage2.htm. [Accessed May 2011].
- ☐ USGS National Wildlife Health Center. **Concerns rise over known and potential impacts of lead on wildlife**. www.nwhc.usgs.gov/disease_information/lead_poisoning/index.jsp. [Accessed March 2012].
- ☐ Centers for Disease Control and Prevention (CDC). **Lead**. www.cdc.gov/lead. [Accessed March 2012].
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- ☐ Wildpro. **Lead poisoning in waterfowl**. http://wildpro.twycrosszoo.org/S/00dis/toxic/MetalMineral/Lead_Poisoning.htm [Accessed March 2012].

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