Pennsylvania Game Commission Wildlife Disease Reference Library

Oil Toxicity

Cause

Wild animals suffer from oil toxicity when they are exposed to oil released into the environment, typically as a result of human activity. Birds will be the main focus of this disease description because they are usually the most severely affected.

Significance

Each year an average of 14 million gallons of oil are released into fresh and salt waters in and around the United States from more than 10,000 accidental spills. These accidental spills may only account for 10% or less of the oil introduced into the environment annually. The majority of the oil is spilled into the environment intentionally from normal transport and refining activities, industrial and municipal discharge, oil waste disposal, urban runoff, and natural seeps. However, spills still have major impacts on affected wildlife.

The Exxon Valdez spill in 1989 resulted in the death of an estimated 350,000-390,000 birds. The more recent Deepwater Horizon spill that began in April 2010 and continued to spew oil for more than 100 days released 170 million gallons of crude oil into the Gulf of Mexico. The extent of the impact this unprecedented spill will have on the ecosystem is still uncertain. Oil spills can be particularly devastating for threatened and endangered species. Some animals are chronically exposed to oil intentionally discharged into the environment from refineries and other sources, but little is known about how this chronic exposure affects individuals and populations.

Species Affected

Aquatic species of birds and mammals are most commonly affected by oil toxicity, but any animal species can become intoxicated. Marine birds including loons, grebes, murres, pelicans, penguins, and birds that nest near the shore are usually the most severely affected. Sea otters are the most susceptible marine mammal because they rely on air trapped within their fur for insulation, and this function is disrupted by oil. Other marine mammals such as whales, dolphins, seals, and manatees can also be affected by oil toxicity. Turtles, fish, and shellfish are also affected by oil spills.

Distribution

Oil spills are more likely to occur in areas of high oil tanker or large ship traffic and near oil wells, pipelines, and refineries. Large spills from ships are more common in January, February, and March because of winter storms. At this time of year many bird species are congregated in large groups at wintering sites, so spills can have a large impact on populations. Oil spills may be small or large and can occur anywhere within the United States or anywhere in the world that people use and transport petroleum products.

Transmission/Exposure

Birds can be affected by oil externally and internally. When birds are coated in oil externally, the feathers lose their ability to provide insulation and water-proofing. During the reproductive season, exposed adults can transfer oil to their eggs, which often causes embryonic death. Birds may also ingest, inhale, or absorb oil directly from the spill or from contaminated feathers while preening. Marine mammals can also be exposed to oil toxicity via ingestion, inhalation, or absorption of oil.

Animals can continue to be exposed to oil long after a spill. Marine birds and mammals experience more chronic intoxication by feeding on contaminated fish and invertebrates.

Clinical Signs

Oiled birds will often leave the water for land in search of warmth because they can no longer thermo-regulate and are chilled. Oil can usually be seen or smelled on the feathers of exposed birds, but it is not always easily detected. Birds that are coated in oil often cannot fly and do not float as well as normal. Birds covered in oil often die of hypothermia, starvation, exhaustion, or drowning.

Ingested oil can lead to anemia, reproductive impairment, and stomach and intestinal irritation and bleeding. These birds may have bright green diarrhea, enlarged livers, smaller than normal spleens, and severe kidney damage. Oil also inhibits water uptake by the intestine, which can lead to dehydration. Birds that inhale oil may suffer from aspiration pneumonia. Young birds often suffer from impaired growth and feather development. Contaminated eggs have decreased hatching success, increased embryonic death, and those embryos that do survive have low hatching weights.

Oiled birds; photo courtesy of the United States Fish and Wildlife Service

Diagnosis

A diagnosis can usually be made by observing oil coating the animal externally. A definitive diagnosis can be reached by

laboratory identification of petroleum hydrocarbons in fat, liver, or kidney tissue at necropsy.

Treatment

Oiled birds should be cleaned and placed in a quiet, well ventilated, area with a heat source. Fluids should be administered to dehydrated birds along with symptomatic supportive care for other ailments.

Management/Prevention

The only way to completely protect wildlife from oil toxicity would be to prevent spills and eliminate other human sources of oil environmental contamination. The United States created the Oil Pollution Act in 1990 that requires oil spill responses that will protect fish and wildlife and clean up the environment. In the event of a spill, quick action should be taken to minimize the spread of the spilled oil, and efforts should be made to discourage animals from using the contaminated area until the clean-up is complete. Only trained individuals should attempt to rehabilitate oiled animals. People assisting in an oil spill clean-up should wear protective clothing because oil is toxic to humans as well.

Suggested Reading

Jessup, D. A., and F. A. Leighton. 1996. Oil Pollution and Petroleum Toxicity to Wildlife. Pages 141-156 *in* A. Fairbrother, L. N. Locke, and G. L. Hoff, editors. Noninfectious Diseases of Wildlife, Second Edition. Iowa State University Press, Ames, Iowa, USA.

Michigan Department of Natural Resources. Wildlife Disease. Oil Intoxication. < http://www.michigan.gov/dnr/1,1607,7-153-10370_12150_12220-27243--,00.html>.

Rocke, T. E. Oil. Pages 309-316 *in* M. Friend, and J. C. Franson, technical editors. Field Manual of Wildlife Diseases: Birds. United States Geological Survey.