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Marine Mammal Health and Stranding Response Program

The Marine Mammal Health and Stranding Response program was formalized by the 1992 Amendments to the Marine Mammal Protection Act, with NOAA's National Marine Fisheries Service as the lead agency to coordinate related activities.

The program has the following components: stranding networks, responses to and investigations of mortality events, biomonitoring, tissue and serum banking, and analytical quality assurance.

<http://www.nmfs.noaa.gov/pr/health/>

Hawaiian Monk Seals and *Toxoplasma gondii*

What is *Toxoplasma gondii*?

Toxoplasma gondii is a microscopic protozoan parasite. Feline species are the only recognized definitive host of *T. gondii*, meaning that this parasite must pass through the feline digestive system in order to complete its life cycle and reproduce. The *T. gondii* parasite is common in both feral and free-ranging outdoor pet cat populations in the main Hawaiian Islands.

How does *Toxoplasma gondii* spread?

This parasite spreads when cats shed *T. gondii* eggs (called "oocysts") in their feces (up to 145 billion eggs per year). Cats are required for *T. gondii* to reproduce; they are the ONLY animal in which *T. gondii* eggs are produced. Often, infected cats do not show any ill effects. The eggs shed in cat feces remain viable for years and can infect and cause illness or death in other animals (including humans). In non-feline species such as birds, fish, and other mammals, *T. gondii* can create parasitic cysts in muscle tissue and organs. *T. gondii* can then also spread when predators (or humans) consume infected non-feline species.

Can *Toxoplasma gondii* harm monk seals?

As in other animals, monk seals exposed to *T. gondii* may not always develop disease symptoms (*i.e.*, "toxoplasmosis"). However, a toxoplasmosis infection in monk seals can be deadly. The first *T. gondii* infection in a Hawaiian monk seal was observed in 2004. To date, *T. gondii* has been found in direct association with diseased tissues (*e.g.*, heart and brain) in at least five dead seals, indicating that this parasite caused or was a significant contributing factor in their deaths. Infections in seals can cause death by causing inflammation and dysfunction in multiple organs, including the heart, liver and brain. Seals that acquire infections and survive may suffer from a compromised immune system and/or brain function. These seals are therefore less likely to withstand other threats to their survival.

The Hawaiian monk seal is a critically endangered species. While toxoplasmosis is a source of mortality, it currently does not appear to be a significant threat at a population level. That being said, the potential impact of *T. gondii* on the monk seal population continues to be examined and monitored, and research is being conducted to understand the risk factors for infection and the prevalence of exposure in the population.

How do monk seals become exposed?

Monk seals could become exposed by consuming *T. gondii* eggs directly from the water or by consuming egg-contaminated prey. *T. gondii* eggs shed in cat feces can survive in soil and seawater for months and have been shown to accumulate in filter-feeding invertebrates that live along the sea floor where monk seals also often feed. Thus, Hawaiian monk seals have the potential to ingest eggs through consuming normal prey or directly from the water. In addition, *T. gondii* can enter the ocean environment via freshwater run-off from contaminated soil and untreated sewage, even from sources far inland through watersheds. Monk seals are exposed to these eggs because they spend much of their time in coastal and near-shore marine habitats. It is nearly impossible to determine the cat colony that may have been the source of the eggs so distance or proximity of cat colonies to the coast does not denote greater or lesser risk to monk seals. As long as free-ranging cats exist on the landscape in Hawaii, they provide the opportunity for further proliferation of *T. gondii*, and pose a risk to monk seals.

What can be done to limit the spread of *Toxoplasma gondii*?

Any effort to remove or control feral cat colonies reduces the risk of transmission, and provides an overall benefit to monk seal conservation.

- Do not release unwanted cats to the wild. Instead, take them to a shelter or the Hawaiian Humane Society for effective management.
- Do not let your domestic cat roam outside.
- Support programs to spay and neuter cats.

Which other marine mammal species in U.S. waters have shown exposure to *Toxoplasma gondii*?

T. gondii has been detected in cetaceans (whales and dolphins), pinnipeds (seals and sea lions), mustelids (sea otters) and ursids (bears). Much of what we know about this parasite in marine mammals comes from California sea otters, in which it is a known cause of death. California sea otters are an exclusively coastal-dwelling species, and deaths are associated with areas of high runoff after storms. In California, marine species such as filter-feeding bivalves and mollusks have been shown to concentrate the infective eggs in their tissues. Thus, while cats are the only recognized hosts that shed *T. gondii* eggs, there is a potential role for filter-feeding marine invertebrates in perpetuating this pathogen in Hawaiian coastal habitats.

Can toxoplasma infect humans?

T. gondii can infect humans through eating contaminated food, though many people never know that they are infected. The greatest health implications are for pregnant or immunocompromised persons. Toxoplasmosis can be contracted by eating contaminated shellfish. See the CDC website at <http://www.cdc.gov/parasites/toxoplasmosis> for more information.

Is there any research being conducted on reducing the spread of *T. gondii*?

Mechanisms are being developed to interrupt the reproductive cycle of *T. gondii* in cats. If successful, such mechanisms would reduce environmental contamination and likely reduce the risk of transmission to monk seals, benefiting conservation and recovery of this critically endangered marine mammal, and improving the health of feral and free-ranging pet cats.

For more information please visit:

The National Wildlife Health Center: <http://www.nwhc.usgs.gov/hfs/Toxoplasmosis.jsp>

American Association of Zoo Veterinarians: http://aazv.affiniscape.com/associations/6442/files/idm_toxoplasmosis.pdf

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Life cycle of *Toxoplasma gondii*

Toxoplasma gondii is a microscopic parasite. Cats are the only recognized definitive host of *T. gondii*, meaning that this parasite must pass through a cat's digestive system in order to complete its life cycle.

