



U.S. Fish & Wildlife Service - Pacific Region

Sonny Bono Salton Sea National Wildlife Refuge Complex

A natural oasis for migrating waterfowl and shorebirds

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Wildlife Disease

Avian Botulism

The main culprit in the Salton Sea's bird die offs is avian botulism. The bacterium *Clostridium botulinum*, responsible for botulism outbreaks, is a common bacterium in wetland ecosystems. It is found in wetland sediment and in the tissues of many wetland inhabitants, including aquatic invertebrates, mollusks, crustacea, and many vertebrates, including healthy birds. It can cause explosive outbreaks in waterfowl, shorebirds and raptors, including pelicans and other fish-eating birds at the Salton Sea.



Little is known about the natural factors that allow the bacteria to leave the spore state and produce toxin. Several factors may play a role, including the bacterial host strain and environmental characteristics, such as temperature and salinity. Once birds are infected, a maggot cycle can begin and spread the bacteria to large numbers and species of birds.

There are two types of botulism that have been found at the Salton Sea. Type C botulism is typical for waterfowl and the most common botulism strain found at the Salton Sea. Type C botulism poses virtually no human health risks. The second type of botulism is Type E. This strain has been found largely in fish-eating birds. It is much more common than Type C, but poses greater risks to humans. There have been cases of Type E botulism in humans mostly resulting from the consumption of improperly prepared fish.

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Mode of transmission

Toxin production takes place in decaying animal carcasses. Flies deposit eggs on carcasses, which are fed upon by resulting maggots. These maggots then concentrate the toxin, and the toxic maggots are ingested by birds. These birds die, leading to the proliferation of more maggots. As the cycle accelerates, more deaths occur. Fish-eating birds, such as pelicans, are believed to get sick when they eat fish that have concentrated the toxin in their intestines. These dying fish become prey for the birds that then ingest fatal doses of the toxin.

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Symptoms

Birds initially lose ability to control muscles and appear weak and limp. They have an inability to fly, followed by the inability to walk. The infected bird may be able to move itself using its wings to "paddle" over land or water. Eventually, control of neck muscles is lost and the bird can no longer hold up its head, resulting in drowning.

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Disease Control

Due to the rapid spread of botulism through the maggot cycle, carcass removal is critical to prevent and minimize the spread of the disease. Carcass removal at the Salton Sea is as prompt and as complete as possible, using airboats that have been purchased specifically for the disease program. Birds in the early stages of botulism are sent to rehabilitation centers, where they are cared for and later released. Surveillance continues after the end of an outbreak to insure that the event does not reoccur.



Those working on an outbreak wear rubber gloves and bag all carcasses. They are then incinerated immediately. Disinfection of equipment and clothing is not necessary as this disease spreads mainly through a maggot-driven cycle. In some cases, water is drawn off an impoundment if it proves to be a "hot spot". However, quick removal of all carcasses to prevent maggot growth is the most important method to control the spread of botulism.

At the beginning of an outbreak event, several carcasses of various species are collected for analysis to determine the presence of botulism toxin and the pathogen strain. Specimens are double bagged and packed into a cooler with blue ice and newspaper. Information detailing where specimens were found and any symptoms seen in the field are included. For further information on our wildlife disease program, please call 760-348-5278.

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