

Avian Botulism Type C Identified for the first time in Alaska

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Cooperative efforts involving multiple federal and state agencies, university partners, and NGO researchers has resulted in the identification of the pathogen involved in the recent mass die off of black-legged kittiwakes on Middleton Island in the Gulf of Alaska. Two of four kittiwakes in suitable post-mortem condition tested positive for the toxin of avian botulism type C. While the Middleton Island die-off was an isolated event and not related to the ongoing seabird die-off in the Bering Sea, management agencies and partners will continue to examine carcasses.

Botulism is a natural toxin produced by a bacterium (*Clostridium botulinum*) commonly found in the soil. There are several types of botulism toxin some of which can affect humans who eat improperly canned or fermented foods. Avian botulism type C is specific to birds and does not affect humans. Typically, avian botulism type C is concentrated in aquatic invertebrates that filter feed sediments or water. When birds eat the invertebrates, they get a concentrated package of toxin. A bird-to-bird cycle can also exist where maggots feeding on dead birds can concentrate the toxin and can then be eaten by and poison other birds. Avian botulism type C is often associated with waterfowl die offs and occur in very localized mortality events at a single pond or lake. That is because it takes very specific environmental conditions for the bacteria to proliferate and be toxin-producing in the food the birds are ingesting. This is the first time that avian botulism type C has been linked to any bird die off in Alaska.

The Middleton Island kittiwake mortality event started July 16, 2021, with 43 dead and 149 sick birds showing signs of weakness, lethargy, inability to hold up the head, or to fly. The event ended on July 30 and some of the carcasses were collected by researchers and submitted to the US Geological Survey National Wildlife Health Center (NWHC). After other potential causes of death had been ruled out, the NWHC tested for avian botulism. Management agencies were notified of the positive results on August 27.

We are grateful to the staff and personnel from the Institute for Seabird Research and Conservation, University of Alaska Fairbanks, University of Alaska Anchorage, McGill University, U.S. Fish & Wildlife Service, USGS Alaska Science Center, NWHC, and the Alaska Department of Fish and Game. These agencies and partners were involved in various steps in the investigation, from carcass collection and reporting, to logistics, and diagnostics.

FAQs:

What does it affect? Avian botulism most often affects waterfowl. Because it is associated with fresh water, the source of exposure in the kittiwakes is unknown and under investigation.

What are the field signs? Dead birds or birds manifesting clinical signs such as inability to fly, walk, or hold up their head. Typically, birds will die in good body condition although exceptions exist for birds that are poisoned over a longer period of time and become emaciated. Because botulism is a poison that kills fairly rapidly, most birds do not show any obvious lesions.

Where and when does it occur? Any place where there is water and where waterfowl congregate is a potential area for botulism. It may have occurred in Alaska before but this is the first time we have documented it in a seabird die off. Botulism is not typically tested for except when no other cause can be found at post mortem.

How do you detect it? Although the presence of suggestive clinical signs listed above and absence of gross lesions in dead birds would render a suspicion of botulism, confirming the presence of avian botulism type C as a cause of death in birds requires specialized laboratory tests. The sample of choice is the heart (which contains a lot of blood where the toxin is found) and which must be submitted to the laboratory frozen or fresh.

How can we manage it? Botulism is one of the few wildlife diseases we can manage effectively. Although we don't know all the environmental triggers that cause *Clostridium botulinum* to start producing toxin, we do know that if mortalities are detected early enough, certain management techniques, if implemented quickly, can rapidly stop and mitigate the magnitude of mortality. These measures include:

1. Carcass pick up and removal: *Clostridium botulinum* needs protein to produce botulism toxin. Because animal carcasses are an excellent source of protein, removing them reduces the resources the bacterium needs to produce toxin and can help reduce or eliminate toxin production. Because many birds sick with botulism will hide in vegetation, it is critical that carcass retrieval be thorough. A single carcass left in the wetland can prolong an outbreak.
2. Water management: Draining or flooding the wetland can change the environmental conditions sufficiently so as to stop the production of toxin by *Clostridium botulinum*.
3. Hazing birds away from the source: If the two management techniques above fail, hazing birds away from the wetland until toxin production stops is an option. Because hazing birds constitutes a "take" under the Migratory Bird Treaty Act, this action should be taken in consultation with the U.S. Fish & Wildlife Service.

What is the risk to humans or other animals? There is no known risk to humans but cooking the bird meat to a temperature of 165° F will destroy the toxin. It may be possible for mammalian scavengers, including dogs, to become ill if they consume a number of birds. Other birds become ill if they consume the maggots on the dead birds.

Could this also be the cause of the seabird die offs in the Bering sea and Aleutians? No, it is not related. Avian botulism is a localized event associated with freshwater and specific, temporary environmental conditions. The multi-year, geographically extensive die off of seabirds with primary emaciation and lack of neurologic signs is not consistent with avian botulism. Avian botulism type C is a common and well documented cause of waterfowl die offs in North America but this is the first definitive proof of its occurrence in Alaska.

Who should I contact if I find sick or dead birds? Report dead or dying birds to the U.S. Fish and Wildlife Service, 1-866-527-3358 or email AK_MBM@FWS.GOV, and please include location, number of birds, species (if known) and if any unusual behavior (drooping head, lethargic, lack of predator avoidance) was observed. Photographs of the birds will help with later identification.