Information Sheet: Avian Botulism

Avian botulism is caused by a naturally occurring neurotoxin produced by the bacterium *Clostridium botulinum*. In California, avian botulism outbreaks caused by botulinum toxin type C occur nearly every year and primarily impact species of waterfowl and other waterbirds.

WHAT IS AVIAN BOTULISM?

Avian botulism is caused by a naturally occurring neurotoxin produced by *Clostridium botulinum*, a sporulated Gram-positive anaerobic bacterium widespread in the environment. *Clostridium botulinum* spores may persist for long periods in soil and wetland sediments. Under appropriate environmental conditions the spores may germinate, producing the botulinum toxin as a byproduct. Eight different types of toxins have been identified, named A through H. Botulinum toxin type C is most frequently involved in avian botulism cases associated with waterfowl and shorebirds, while type E primarily affects fish-eating birds. Type C avian botulism outbreaks occur globally including in California and across the United States. Type E is mainly reported in fish-eating birds inhabiting the Great Lakes.

WHAT CONDITIONS MAY CONTRIBUTE TO AN AVIAN BOTULISM OUTBREAK?

Environmental conditions that may increase the likelihood of an avian botulism type C outbreak include warm to hot temperatures (25°-40°C [77°-104°F]), shallow water, and algal blooms or other decaying organic matter that may lead to the anaerobic (oxygen-depleted) conditions favorable for bacterial growth. Decaying organic matter, and most importantly, the tissues of dead animals, which can include invertebrates, fish, birds, and/or mammals, provide nutrients for bacterial growth and subsequent toxin production.

WHERE AND WHEN DO AVIAN BOTULISM OUTBREAKS OCCUR?

Avian botulism outbreaks are most often associated with fresh water or brackish water habitats where waterfowl or other waterbirds may congregate. This may include larger bodies of water such as lakes and reservoirs to smaller bodies of water such as park ponds, sewage treatment plants, and sections of slow-moving rivers or creeks with shallow, pooled water. Since the environmental conditions that favor bacterial growth occur during warmer temperatures, avian botulism outbreaks are most often documented during the warmest months of the year in summer and fall. Outbreaks during winter are less common but can occur if temperatures are unusually high.

HOW ARE BIRDS EXPOSED TO THE TOXIN THAT CAUSES AVIAN BOTULISM?

When *Clostridium botulinum* bacteria are producing toxin, aquatic invertebrates that filter feed wetland sediments or water may become contaminated with the toxin. Additionally, insect larvae that actively feed on decomposing animal tissues may accumulate toxin in their bodies. Birds inadvertently ingest the avian botulinum toxin when eating toxin-contaminated fly maggots, beetle larvae, and other invertebrates. This route of exposure is often referred to as the "carcass-maggot" cycle of avian botulism. Once a bird ingests the toxin, it binds to the nerve endings and interferes with muscle movements.

WHAT ARE THE CLINICAL SIGNS OR BEHAVORS OF BIRDS WITH AVIAN BOTULISM?

Avian botulism is characterized by bilateral paralysis that typically progresses from the legs towards the head. Paralysis will usually affect the legs first, and the bird may be unable to stand or walk. The wings are affected next, and the birds' wings may droop, and the bird may be unable to fly. Then the neck and head are affected, the bird may be unable to lift its head and its eyelids remain closed. If the bird is in the water, it may be unable to lift its head and drown. If out of the water, the respiratory system eventually becomes impaired, and the bird may die of asphyxiation. Affected birds can potentially recover if they are not too severely debilitated and removed from the source of toxin and provided with fresh water and shade.

WHAT SPECIES OF WILD BIRDS ARE MOST AT RISK FOR AVIAN BOTULISM?

Bird species at highest risk for developing type C avian botulism include birds that feed on invertebrates at the water's surface such as species of dabbling ducks and near the surface of mudflats such as certain

shorebird species. Geese, diving ducks, and other waterbirds may also be at risk during an avian botulism outbreak when feeding on invertebrates as are gulls which may scavenge on dead birds and ingest maggots or other insect larvae.

DOES AVIAN BOTULISM POSE A HUMAN OR DOMESTIC ANIMAL HEALTH RISK?

Botulinum toxin type C is most frequently detected during avian botulism outbreaks involving wild birds, and especially waterfowl. Avian botulism type C outbreaks also have occurred in domestic chickens and pheasants raised in captivity. Other botulinum toxin types (e.g., A, B, D, and E) have been documented to affect humans and various domestic animals. Humans may be at risk for botulism exposure through the consumption of improperly prepared or stored canned or jarred food items. Domestic animals such as horses and cattle can be exposed to botulism through certain types of animal feed. More information about human botulism is available from the California Department of Public Health.

HOW ARE AVIAN BOTULISM OUTBREAKS MANAGED?

In smaller bodies of water such as park ponds or sewage treatment plants, maintaining waterflow and adequate aeration are important to help avoid anaerobic (oxygen-depleted) conditions that favor bacterial growth. A pond aerator system is preferred over fountains because aerators are more effective at adding oxygen to the water column. At public park ponds, feeding of waterfowl should be discouraged as fecal material can degrade water quality and contribute to increased organic matter available for bacterial growth.

Other management techniques that may reduce favorable conditions for avian botulism may include removal of substrate (vegetation, algal mats) to improve aeration of the water. Altering water levels, if possible, may help improve conditions in some areas although care must be taken to do so in a manner that does not contribute to the avian botulism outbreak. Slowly increasing water levels in an area can change food availability, reducing exposure risk to the toxin. However, if the water level is increased too quickly it can kill vegetation and invertebrates which may contribute to the outbreak. Similarly, if an area is drained quickly, that may alter its use by waterfowl reducing risk of exposure. If drained too slowly, shallow warm water may persist, possibly contributing to the outbreak.

Regular surveys for the detection of dead birds, fish, and other animals should be completed as frequently as possible during the warmest months of the year. Appropriate, safe disposal of dead animals should be done when possible. If there is a need to dispose of dead wildlife, wear impermeable gloves or a plastic bag turned inside out, to collect the remains into a plastic garbage bag, which may then be placed in the regular trash collection. Afterwards, wash hands with soap and water, and change clothing before having contact with domestic birds. If assistance or guidance is needed with the disposal of dead wildlife on private property, contact your county environmental health department or animal services for options available in your area.

WHERE CAN YOU REPORT DEAD WILDLIFE?

Sightings of sick and dead wild birds and mammals may be reported to CDFW through our online form. For orphaned or injured live wild birds or mammals that might be in need of assistance, please contact your nearest wildlife rehabilitation center for advice before collecting the animal. For non-urgent questions concerning wildlife, please contact your regional CDFW office or local animal control service.

For stray or feral domestic birds (e.g., ducks, peafowl, chickens, racing pigeons), please contact your local animal control service for assistance. Sick and dead poultry, domestic ducks, and pet birds may be reported to the California Department of Food and Agriculture's hotline at 1 (866) 922-2473. Visit CDFA's website for more information for keeping poultry healthy.

LINKS FOR MORE INFORMATION:

CDFW's Wildlife Health Laboratory
United States Geological Survey, National Wildlife Health Center, Avian Botulism Summary
United States Geological Survey, Field Manual for Wildlife Diseases 1999; Ch. 38 Avian Botulism (page 271)