

Animal & Zoonotic Diseases in Alaska as an Indicator of Climate Change

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Alaskans don't need to read about global warming to understand the effects; we see them all around us. Alaska Natives have observed profound changes in the ecosystem for the past two decades—things we now recognize are related to climate change. One of the most dramatic changes has been melting permafrost, which is damaging buildings, roads, bridges, and airport runways across the state. Physical changes are the most obvious, but more subtle ecosystem changes are happening.

As global temperatures warm and previous barriers shift, species expand their ranges toward the poles. As they colonize new areas, these species will bring their diseases with them, which can spread into established species. A classic example is the northern and northwestern expansion of beaver in Alaska. Beaver are very good carriers of the parasite *Giardia*. As they colonize new regions, they contaminate new water sources and spread the disease to other animals such as caribou. As caribou migrate, they could spread the parasite across thousands of Alaska miles.

Giardia is a zoonotic disease, or a disease of animals that can also infect humans. Another example of a zoonotic disease that has recently appeared in Alaska is gastroenteritis caused by the bacteria *Vibrio parahaemolyticus*. In 2004, Alaska cruise ship passengers were stricken with the illness after eating raw oysters harvested in Prince William Sound. The disease had not occurred previously in Alaska seafood, primarily because Alaska waters were too cold for the agent to survive. But in 2004 water temperatures exceeded 60°F, the minimum temperature required for the bacteria to infect shellfish. Shellfish poisoning caused by toxic algae is another concern (see the Scherer and Faustman article opposite).

Another category of zoonotic diseases that could become a greater threat are those transmitted by insect vectors. Since its appearance in the western hemisphere in 1999, West Nile Virus has spread across North America and as far northwest as the Prairie Provinces of Canada. Many species of birds that migrate to Alaska can carry the virus and could readily bring it to the state. As with shellfish, Alaska has an active surveillance program to identify diseases as they emerge.

Because of the complexity of ecosystems it is hard to predict changing disease patterns that might be related to climate change. *Echinococcus* is an animal parasite found in rodents in Northwest Alaska. It can be fatal in humans, who are incidental hosts. Rodent population density is a key factor in the disease and rodent numbers depend on climate and weather patterns. An expansion of rodent ranges and populations could pose a greater risk to human health. Last week, I was in Toksook Bay, a delightful Eskimo community on the Bering Sea. In late morning a fox walked into the community and bit a child. Very likely the fox was rabid. If rodent numbers increase, predators such as fox will follow and diseases associated with both are apt to increase.

Zoonotic diseases are a threat to human health, but other animal diseases can affect Alaska Natives who depend on traditional food. This has already happened with the most important economic and traditional food species in Alaska—salmon. Beginning in the late 1980s Alaska Natives along the Yukon River began to notice salmon that had a strange odor and did not dry normally in the traditional smokehouse environment. Eventually, a lab in Oregon identified the cause as “white spot disease,” a parasite that in some years infects 25 to 30 percent of Yukon salmon. Its incidence increases when water temperatures rise above 59°F. Viral hemorrhagic septicemia has also appeared in Alaskan Pacific herring, Pacific hake, and walleye pollock, all of which are important economic species. These could have huge economic impacts on the billion-dollar Alaska fishing industry.

Efforts are now underway in Alaska to establish enhanced surveillance for existing and emerging diseases that could become greater threats because of climate change. As Dr. Musgrave notes (page 18), surveillance of animal populations can help us anticipate emerging diseases in our human populations. ■

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