

Vectorborne Diseases and Climate Change

Vectorborne diseases are caused by “disease agents” (bacteria, viruses, protozoa, or other “germs”) transmitted by “arthropod vectors” (ticks, mosquitoes, or other insects or insect-like creatures that carry disease). Many, although not all, vector-borne disease agents cycle back and forth between arthropod vectors and “animal reservoirs” (usually mammal or bird hosts that maintain the disease agents in nature), with humans infected incidentally when we’re bitten instead of animal hosts.

Climate is one of many important interacting variables that affect people’s risk for vectorborne diseases in Minnesota. Climate can have a direct effect on physical conditions (temperature, rainfall, etc.) and an indirect effect on biologic conditions (plants, animals). These physical and biologic conditions can, in turn, influence vector-borne disease risk by impacting the abundance and distribution of tick or mosquito vectors, the percent of vectors infected with disease agents, the abundance and distribution of animal reservoirs, the presence of suitable habitat for these vectors, and people’s behaviors that bring them into contact with infected vectors.

Climate directly impacts short-term and long-term weather conditions at the local and regional levels. Most arthropod vectors of disease are sensitive to physical conditions, such as levels of humidity, daily high and low temperatures, rainfall patterns, severity and snowpack of winter, and so on. For instance, blacklegged ticks (a.k.a. “deer ticks”), which carry Lyme disease, are most active on warm, humid days.

Indirectly, climate also impacts flora and fauna (plants and animals), as well as human behavior. Disease vectors usually thrive in specific types of habitats and may depend on the presence of certain animal hosts. For example, blacklegged ticks are most abundant in wooded or brushy habitats with abundant small mammals and deer. If those habitats are ones where many people live or where people visit for recreational or job-related activities, incidence of tickborne disease can be high.

Geographic distribution, seasonality, and magnitude of risk for vectorborne diseases are therefore multifactorial and highly influenced by climate. The Minnesota Department of Health (MDH) is concerned about changes in climate and how they may alter vector-borne disease risks currently and into the future.

What is MDH doing about vectorborne disease and climate change?

Vectorborne disease monitoring:

- The central element of the MDH vectorborne disease program is long-term monitoring of human disease case numbers.

- All of the known vectorborne diseases found in Minnesota are reportable to MDH; medical providers report diagnosed cases, and laboratories report positive test results.
- For each disease, MDH documents which types of Minnesotans are acquiring the disease, where they are exposed to the disease agents, and when people are at greatest risk of becoming infected.
- MDH tracks patterns and changes in these parameters over time.

Vector monitoring:

- MDH has conducted limited field studies for several years to document infection prevalence in ticks with various disease agents.

Detection of emerging diseases or new disease vectors:

- MDH can detect new diseases or disease vectors through its surveillance system, field studies, and public health laboratory. One example is Powassan virus, which was first identified in Minnesota in 2008 and can cause severe neurologic disease.

Outside research:

- MDH keeps abreast of published vectorborne disease studies that may have local relevance and consults with vectorborne disease colleagues from other states and the Centers for Disease Control and Prevention (CDC).

Vectorborne disease prevention:

- MDH staff provide updates on changing patterns of vectorborne disease risk to the public and medical providers through news releases, website updates, and presentations [here](#)