Bacillus thuringinsis kurstaki (Btk) FAQ

Maine Department of Agriculture, Conservation & Forestry
Forest Health & Monitoring

Spruce budworm (SBW) populations are currently building in northern Maine. To reduce SBW populations and prevent an outbreak, landowners in Maine successfully advocated for emergency funding and formed The Maine Budworm Response Coalition (MBRC), where they are collaborating with The Maine Forest Service (MFS) to implement management strategies. The Maine Forest Service is providing technical support and communications to landowners who may be impacted by SBW.

Part of the MBRC response will include aerial applications of insecticides with the active ingredient *Bacillus thuringinsis kurstaki* (Btk, product name Foray 76B), in areas with SBW populations at or above the outbreak level to prevent an outbreak.

What is Btk?

Bacillus thuringinsis kurstaki (Btk) is an active ingredient in the product Foray 76B. Btk contains spores of a bacterium that occurs naturally on dead or decaying matter on plants and in soils.

How does Btk kill insects?

Btk is narrow spectrum; it only affects butterfly or moth larvae and only if they consume foliage that has been treated. Btk spores are activated by the highly alkaline environment (pH>9) inside the larval gut and releases an endotoxin that punctures the gut wall. As a result, the larva's gut bacteria is able to enter the body, causing infection and mortality.

Do humans need to take care not to be exposed to Btk?

Unlike butterfly and moth larvae, humans and other mammals have highly acidic environments (pH<2) in their stomachs, which do not activate Btk spores and instead break them down, rendering it ineffective. There are no adverse effects from humans or mammals consuming crops or foliage treated with Btk. Similarly to pollen, dust, or other particles, some individuals with allergies or weakened immune systems may have irritation if there is direct eye or skin contact – an unlikely situation when there are many precautions present in the treatment plan to prevent exposure.

Though research indicates that products with Btk do not harm humans at applied concentrations, efforts are in place to prevent people from being on site during applications and for 4 hours afterward.

How long does Btk stay active?

After aerial application, Btk settles onto tree foliage in the treatment area where it affects butterfly or moth larvae for a short time, roughly 2-4 days. After this time, Btk rapidly degrades via direct sunlight and microbial activity. Because Btk is only active for a short period of time, a second application is usually completed within a couple weeks to ensure that susceptible larvae are treated.

How does Btk affect other terrestrial organisms?

Btk will only impact butterfly and moth larvae that consume treated foliage. Because of its unique physiology with high alkaline environments, there are practically no off-target impacts to other species. The small portion of Btk that may reach the ground (not intercepted by the spruce-fir foliage) will not harm soil dwelling invertebrates or leach into groundwater as it only remains in the top 3 inches of the ground before naturally breaking down. Although Btk spore propagation is possible, acidic soils –which dominate the spruce-fir forests in northern Maine– decrease this likelihood, further reducing off-target risks.

Will Maine's waters and aquatic organisms be impacted from Btk applications?

No, Btk applications are not known to cause adverse effects to fish or aquatic invertebrates under normal application conditions.

Btk applications will only occur in spruce-fir forests with elevated SBW populations, not over bodies of water. However, additional precautions to prevent accidental drift or runoff are in place and include bodies of water buffered at four times the legal minimum and aerial applications during non-rain events. In northern Maine, runoff risk is further reduced because the seasonal high-water table begins to recede by late May.

Are the natural enemies of SBW impacted by Btk?

No, natural enemies (birds, wasps, spiders, ants, etc.) present on the foliage during aerial Btk applications will not be affected, as they do not have the alkaline gut environment (pH>9) that activates the Btk spore endotoxin. Because aerial applications do not directly impact SBW natural enemies, treatments can contribute to the mortality already caused by these organisms, further reducing populations.

Will birds and mammals that eat larvae treated with Btk be affected?

No, Btk does not impact birds and mammals as they have acidic gut environments (pH<2) that would not activate the endotoxin in Btk. Therefore, larvae treated with Btk is not toxic to other orders of insects, mammals, birds, or aquatic species. There may be indirect impacts for birds or other organisms that readily feed on SBW larvae as a food source, however this is temporary and remedied by the animals adjusting their foraging habits.

Where can I get more information?

For more information about Btk or Foray 76B, contact the National Pesticide Information Center at 1-800-858-7378, or the Maine Board of Pesticide Control at 1-207-287-2731 or email pesticides@maine.gov.

For more information about SBW, visit the Maine Forest Service, Forest Health & Monitoring website http://www.maine.gov/sbw, call 207-287-2431, or email foreshealth@maine.gov.

Adapted from VT DFPR "*Bacillus thuringinsis* var. *kurstaki*" 2018.