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Information on *Bacillus thuringiensis kurstaki* (Btk)

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Bacillus thuringiensis (Bt) is a naturally occurring bacterium that can be isolated from the soil, leaf surfaces and fresh water. Bt is distinguished from closely related bacterial species by its production of protein toxins that are active against insects. These toxins are bound as a crystal which can be seen using a microscope. Bt spends most of its life cycle as a dormant spore waiting to be ingested by an insect. Once Bt spores and crystal toxins are ingested by a susceptible insect, the toxins become activated and the bacteria replicates and reproduces, killing the insect. As the insect's body decays, the active Bt bacteria form into resting spores and produce new crystal toxins. When the insect's corpse breaks apart, both spores and crystals are released into the soil or water where they wait to be ingested by another insect. The crystal toxins released from decayed insects to the soil or water are highly insoluble under normal conditions.

Commercial strains of *Bacillus thuringiensis kurstaki* (Btk) are naturally occurring Bt that have been isolated from the environment and fermented in much the same way yeast is selected from nature for wine making or beer brewing. Commercial Btk strains are maintained by industry laboratories in a pure, uncontaminated form that are used to inoculate large quantities of growth media for production purposes.

Production of Btk for pesticide formulation occurs under sterile conditions in secured facilities. Concerns about product integrity have for many years meant that the industry limits access to Btk fermenting facilities. Sterile growing conditions and pure inoculation strains insure that only *B. thuringiensis* is produced during the commercial process. To further verify the integrity of Btk pesticide formulations, the Btk harvested from a commercial process is tested for cross contamination by other bacteria including *Escherichia coli*, *B. cereus* and *B. anthracis*. Tests are conducted to determine the potency of the product and to ensure that the quantity of crystal protein present in the final product meet the EPA-registered pesticide label specifications. By starting with sterile production facilities and inoculating growth media with known Btk strains, commercial producers can guarantee the integrity of any Btk pesticide formulation.

When Btk is applied as a pesticide, the primary mode of action is ingestion and activation of the insecticidal crystal proteins. When ingested, the bacteria are in the resting spore phase of their life cycle and the spores do not germinate until they enter the insect's gut. Alkaline conditions in the insect gut are required as a signal for the spore to germinate and the bacteria to become metabolically active.

Bacillus thuringiensis can, under unusual conditions, swap genetic material with other *Bacillus sp.* by the lateral exchange of plasmids, but the bacteria must be metabolically active to do so. There is no exchange of plasmids between bacteria in the spore phase. Given that Btk is active only while in the body of an insect, there is little, if any, meaningful opportunity for the exchange of plasmids with other closely related *Bacillus sp.* (such as *B. anthracis*).

WSDA use of Btk to eradicate gypsy moths

Based on many years of successful Btk use, recent EPA re-registration of Bt as a pesticide, and the knowledge that Btk pesticides are both target-selective (affect only caterpillars) and retain their product integrity after being applied in the environment, WSDA finds the use of Btk pesticides to be effective in eradicating the gypsy moth and maintaining human and environmental health wherever they are used. As an added measure of ensuring product integrity, WSDA arranges for chain-of-custody documentation between point of production and point of application in the field. Furthermore, in addition to obtaining manufacturer's product testing results, product identity is confirmed by third-party laboratory analysis.