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Non-target Effects Summary

Bacillus thuringiensis (*Bt*) and *Bs*-based products are used worldwide as biological insecticides to control specific insect pests. A characteristic of *Bt* and *Bs* that distinguishes them from other *Bacillus* species is the production of one or more parasporal bodies during sporulation that consists primarily of crystalline proteinaceous materials (protoxins) which, when activated in a susceptible insect, cause disruption of the insect gut and eventual death. The activated toxins, called delta-endotoxins, are active on the immature stages of susceptible insects and do not cause mortality in adult insects.

The biology, ecology, and safety of *Bt* has been thoroughly reviewed by the WHO in their Environmental Health Criteria series of monographs #217 *Bacillus thuringiensis* (IPCS WHO 1999), by Glare and O'Callaghan (2000), and in various other publications: e.g., *Bacillus thuringiensis*: A Cornerstone of Modern Agriculture (Metz 2003). These reviews indicate that there are no significant environmental and health issues related to the use of *Bt*-based products.

Numerous laboratory and field tests against several invertebrate/non-target species confirm the specificity of *Bs* for mosquitoes and safety for the vast majority of non-targets, including a variety of mosquito predators and other species of Nematocera (Mulla et al. 1984; Aly and Mulla 1987; Karch et al. 1990; Lacey and Mulla 1990; Rodcharoen et al. 1991; Walton and Mulla 1991; Yousten et al. 1991, 1992; Lacey and Siegel 2000; Lacey and Merritt 2003; Brown et al. 2004). The specificity of *Bs* for mosquito larvae also completely eliminates its direct risk to vertebrates including fish, birds, and mammals (Shaddock et al. 1980; Saik et al. 1990; Siegel and Shaddock 1990b, 1990c; Lacey and Siegel 2000; Lacey and Merritt 2003). Few long-term effects of repeated applications of *Bs* on aquatic-community structure and diversity have been reported (Lacey 2007).

Minimizing the potential impact on humans, the environment, and other non-target organisms is a top priority for any sustainable insect-control program. Valent BioSciences is committed to providing our customers with products that achieve their insect-control objectives in a sustainable way.

Note: All referenced literature can be found in the [References/White Papers](#) section of this site.