MOSQUITO LARVICIDES
REVIEW OF ENVIRONMENTAL CONCERNS

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Introduction:

A naturally occurring bacterium found in soils called, *Bacillus thuringiensis israelensis)* hereafter referred to as **Bti** has been used to kill mosquito larvae. It has been determined that this strain, in particular, is toxic to mosquitoes and possibly black flies and midges. According to recent research Bti is not toxic to fish, but caution is suggested as long-term effects have not been evaluated and some studies indicate that use over a period of 2 to 3 years may result in a decrease of biodiversity. Siegel, Shadduck (1990.)

Methodology:

Some applications indicate that the natural bacteria compete with mosquito larvae for nutrients necessary for survival. Other applications involve genetic engineering to increase the bacterium's endotoxin proteins and once released destroy the larval stomach. These recombinant bacterial strains are used currently for mosquito control. Federici, et.a. (2007).

Concerns:

While it is stated that programmed delays in resistance should enable long-term use, this has not been demonstrated and some strains of Bacillus thuringiensis could produce exotoxins that may exhibit toxic symptoms in mammals. U.S.EPA (1998). The Washington State Department of Health has recommended that people minimize direct exposure to Bti as much as possible. W.S.Department of Health (2002).

Federal Laws prohibit the application of Bti to reservoirs that contain drinking water. U.S. EPA (1998). Fresh water application of the bacteria in many cases would be difficult to contain to any immediate environment. Watershed characteristics often are such that surface and base flow from ground water back to the surface can potentially carry sediment and toxins quickly to reservoirs and wells used for drinking. Harlin, (1978), (1978), (1984), Ward, et.al., (1992), Luo and Harlin, (2003).

Direct exposure to Bti has been shown to cause skin and eye irritation in animals. Siegel, Shadduck (1990). Cases of eye and skin irritation in humans have also been reported flowing direct exposure with some Bt products. NPIC, (2000).

For a strain to compete with larvae for nutrients that are necessary to complete the cycle to adult forms is somewhat of a concern for other forms of life in the fresh water ecosystem, other than just the mosquito.

Poulin, et.al. (2010) noted that early studies on breeding birds showed no significant results, but added the caveat that these studies are scanty. In an exhaustive study of 9051 feeding flights and 14,857 pray items Paulin found a "**red flag**" for a "**green spray**." This study demonstrated that, "Bti applications at recommended rates, and applied to water bodies within 4 days of the appearance of mosquito larvae,

have detectable effects at higher trophic levels, ultimately affecting vertebrate populations." This work suggests that widespread spaying with Bti can have "substantial" effects on the demography of insectivorous birds. Hart, et. al. (2006) recommends more attention to ***cascade effects*** caused by repeated application of Bti and other pesticides.

In Sum:

Given cautionary statements in the publications noted here it would seem that some pause might be in order prior to releasing bacteria and/or genetically engineered strains into fresh water systems. These systems are not isolated systems, they cannot be separated by legally defined boundaries. Collateral damage to other life forms and the environment in general needs careful consideration. Reversing problems could be difficult once more effects surface. Even in the absence of Long-Term studies there seems to be sufficient evidence to reconsider just how safe spraying bacteria into fresh water systems really is. Past experience with DDT and personal, chemical applications like DEET should signal caution.

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