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TECHNOLOGY OF APPLICATION
OF MICROBIALS IN AQUATIC ENVIRONMENTS :
USE OF *Bti* AGAINST BLACKFLIES
IN MOUNTAINOUS AREAS

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The end goal of research on aquatic biopesticides is their successful incorporation into operational control programs. This paper presents a case study to illustrate that the development of sound application methodologies is a critical and essential step toward realization of this goal. Specifically, the development of treatment strategies for operational control programs using *Bti*, *Bacillus thuringiensis israelensis*, against blackfly larvae (*Simuliidae*) in the Adirondack Mountains will be reviewed. New York State communities have now been successfully using this biopesticide against blackflies for ten years.

By 1981, extensive lab and small-scale stream trials had confirmed the environmental safety and efficacy of *Bti* against blackfly larvae. It thus seemed logical that a ground program using *Bti* in the Adirondack Mountains would eventually be adopted as an alternative to the traditional approach of aerial application of chemical adulticides. While interested in using environmentally safer control agents, these mountain communities were unsure of the technical and economic feasibility of using this biopesticide. Their concern was well founded because clearly defined methods for conducting large-scale, ground-based programs in an area with small mountainous streams actually did not exist. As a consequence, our laboratory initiated an "application methods" research project - one that defined the characteristics of effective formulations and spelled out the techniques that applicators should follow. In addition, our research outlined the costs involved in executing such large-scale *Bti* programs. These efforts essentially served as the technology transfer bridge between the scientific community and the communities needing protection.

By reviewing this research project, I wish to show how we learned that constructing an "application methodology" was much more than

defining the hardware involved in applying a biopesticide to streamwater ; it also involved developing procedures that would have to be followed both before and after the actual stream treatment. The point of this presentation is not to teach how to apply *Bti* for blackfly control, but rather to show that unless we take the time to develop clear, practical application methodologies, some promising biopesticides may never see much use in the real world or, if incorporated into operation control programs, may fail to achieve the efficacy and economic feasibility they inherently could. Given our human predisposition to resist change, I am convinced that without the methodology research that was conducted in the early 1980s, Adirondack Mountains communities would still be using broad spectrum chemical insecticides today for their blackfly problems.