Current chemistry-based decontaminants for chemical or biological warfare agents and related toxic materials are caustic and have the potential for causing material and environmental damage. In addition, most are bulk liquids that require significant logistics and storage capabilities. Since some of these decontaminants are non-aqueous in nature, it would seem very unlikely that they could be used in dealing with contaminated water supplies or water distribution systems.

An appropriate mixture of enzymes with activity against a wide range of contaminants offers considerable advantages over other decontaminants. Being catalytic, the enzymes are highly efficient and can detoxify many times their own weight of agent in seconds or minutes. Unlike most chemical catalysts, enzymes of many different types and specificities can be mixed together in a single formulation. Since enzymes function best a pH values near neutrality, there are few, if any, compatibility or corrosion concerns. Similar to commercial laundry detergents containing enzymes, and enzyme-based decontaminant, being biodegradable will pose little or no health or environmental danger, and leave no hazardous products that would need to be dealth with. Another major advantage is that an enzyme-based decontaminant for liquid use would probably be provided as a dry powder that is added to the water-based system the user has available. This provides a significant reduction in the storage and logistical burden as well as potential cost.

Enzyme-based decontaminants have been under development for many years at the Edgewood Chemical Biological Center (ECBC) for military use. Enzymes with catalytic activity against nerve agents, related organophosphorus pesticides, sulfur mustard and biological agents have been identified and are in various stages of development. In order to evaluate the potential for enzymes to deal with contaminated water supplies or water distribution systems, two approaches are being taken. The first is a liquid formulation that will consist of soluble stabilized enzymes. The second is a filter system with immobilized enzymes through which contaminated water is passed. Two well-characterized enzymes are being used in these studies: Organophosphorus Acid Anhydrolase (OPAA), a bacterial enzyme with the highest known activity against G-type nerve agents (ex. Sarin); and Organophosphorus Hydrolase (OPH), an unrelated bacterial enzyme with excellent activity against organophosphorus pesticides as well as lesser activity against G- and V-type nerve agents. Preliminary results on the stabilization and immobilization of these enzymes will be presented.