Landfills, chemical weapon debris possibly a good match, computer model suggests

June 28 2006

Putting building debris contaminated by chemical weapons into municipal landfills likely would pose only a minimal risk to nearby communities and the surrounding environment, according to a study scheduled for publication in the July 1 issue of the American Chemical Society journal *Environmental Science & Technology*. The study's computer model, developed by environmental engineers at the Technical University of Denmark and North Carolina State University, could help policymakers and waste management officials determine what to do with these harmful materials if another terrorist attack occurs.

"The results indicate that burial in a landfill will not result in a massive release of toxic chemicals," says Morton A. Barlaz, Ph.D., the study's corresponding author. "Our work can now be used by scientists who specialize in health effects to confirm that landfill disposal is acceptable. All indications are this is the case."

The new study, supported by the Environmental Protection Agency, will need to be verified by laboratory research, Barlaz cautions. But, he adds, the finding is an important first step toward clarifying whether these potentially lethal compounds, including sarin, mustard gas and VX, could be safely contained in a municipal landfill.

Concerns about contaminated building debris arose following the Sept. 11, 2001, terrorist attacks on the World Trade Center and the Pentagon as well as the later discovery of anthrax in a U.S. Senate office building, postal facilities in Washington, D.C., and Trenton, N.J., and several

buildings owned by media corporations.

For this study, a team of landfill experts used a computer model that combined what is known about organic material in the nation's 2,000 lined solid waste landfills with information available about the behavior of chemical warfare agents to predict how these highly toxic compounds would behave under typical landfill conditions. The researchers included several key factors in their model including the chemical properties of the contaminants, the amount of water entering the landfill, landfill gas production and a description of the protective liner and cover.

The computer model predicted that virtually all of the compounds would bind themselves to organic waste in the landfill. In addition, most chemical warfare agents are rapidly transformed into less toxic forms when they come into contact with water in the landfill. The computer simulation also allowed the researchers to analyze the potential for contaminated gas emissions from a landfill as well as the potential for chemical agent movement through the landfill liner into groundwater.

"There were no chemical warfare agents in the gas. That's significant because of the potential for fugitive gas emissions from landfills." Barlaz says. "Similarly, there was no movement of contaminants through the liner, thus eliminating concerns of groundwater contamination."

To validate the model's findings, Barlaz and his colleagues are conducting laboratory experiments using surrogates, such as malathion, that mimic the behavior of chemical agents but are safer to handle. "This is an important area of research. But like other work on emergency preparedness, I really hope that we never have to apply the results of this work," Barlaz says.

Source: American Chemical Society