

Bio-terrorism: Concerns for Mosquito Control

Stephanie M. Tack

## Bio-terrorism: Concerns for Mosquito Control

When people think about bio-terrorism, they usually don't think about mosquitoes or mosquito control agencies, but maybe they should. Bio-terrorism is the use of biological agents which are "organisms or toxins that have illness-producing effects on people, livestock, and crops" (FEMA: Fact Sheet). The rest of this paper will look at the possibilities of mosquitoes and mosquito control trucks to be used by terrorists and how much of a threat these vectors and agencies pose.

Mosquitoes have been known as a vector for some very prominent diseases around the world. Some of these diseases are dengue fever, yellow fever, heartworm, malaria, and encephalitides (West Nile, Le Cross, St. Louis...) (SCMAC). The possibility exists that mosquitoes containing a new microorganism could be released. There are many viruses and bacteria that can cause harm or even kill people and genetic engineering can enable scientists to create new and more virulent diseases or ones that are more resistant to treatment. Fortunately for us it is hard to genetic engineer new viable microorganisms, it costs a lot of money, and to be able to dispense it so that it does harm to the intended targets is a challenge. To create more virulent or treatment resistant diseases, a terrorist would need to have a laboratory with the correct equipment, trained scientists who know how to work with disease causing microorganisms and don't care how they are used, and a lot of money to buy laboratory equipment and to pay the scientists. To genetically alter a virus or bacteria, one would have to insert new

gene(s) that would effect the microorganism without effecting the basic genes used for reproduction, for entering a host cell, and for taking it over. Also, a microorganism has to be chosen that can survive in a mosquito until it can be transmitted to a host and then it must be able to cause disease in the host. This is a difficult thing to do since some microorganisms can't live without a host cell for a long period of time. For example "HIV lives for only a short time inside an insect and, unlike organisms that are transmitted via insect bites, HIV does not reproduce (and does not survive) in insects" (CDC). Different species of mosquitoes have different life spans, not all of them can carry disease, some can fly greater distances than others, and certain species prefer birds or other animals to humans. One species of mosquito, "*Culex tarsalis* , a common California, USA mosquito, might go through its life cycle in 14 days at 70 F and take only 10 days at 80 F" (Koday). Other species can live up to a few months over the winter (Public-Health). The genus *Anopheles* is 1 of 41 genera and of the 430 species in the *Anopheles* genus, about 30-40 can actually transmit malaria (CDC). If the desired vector doesn't have a life span long enough to have a microorganism implanted in it and then bite at least one person, then it is not a very good vector to use. Some adult mosquitoes will migrate up to 50 miles from where they emerged from their larval stage and others might stay within a few hundred feet (Public-Health). This is also another important factor to consider when choosing a vector; they might not fly far enough to reach the intended targets. Some *Culex* prefer to bite domestic and wild birds instead of man, cows, and horses (Koday). Mosquitoes are sensitive to temperature and don't usually

bite in colder environments, which is why they usually aren't seen flying around during the winter. Terrorists would also have to choose a place where a lot of people would be and a warmer environment to be able to infect the greatest number of people. There are a lot of conditions that a terrorist would have to take into account before deciding to release mosquitoes with a genetically engineered microorganism.

Mosquito control agencies could even be a target for terrorists because some use trucks with ultra-low-volume (ULV) sprayers to put out chemicals. Who's to say that someone couldn't steal a truck or have one made that looks just like the ones used and spray a more harmful chemical that could damage people, crops, livestock, or our water supply. These trucks can usually cover a large area in one night and could come in contact with a large number of people. ULV sprayers break down liquid chemicals into micron sized droplets which are then aerosolized. There are many different kinds of chemicals that could be used by terrorists and some of these can affect humans, animals, or crops. Nerve agents, such as Sarin, Soman, Tabun, are similar to pesticides, but are more potent organophosphates which can damage the nervous system. These chemicals are liquids and could theoretically be used in a ULV sprayer. Sarin, Soman, and Tabun are volatile and can evaporate quickly in the environment, so the chance of a lot of people coming into contact with them before they break down is not very high. All three of these agents will mix readily with water and could be used to contaminate the water supply. Blister agents, like Mustard gas (sulfur mustard) and Lewisite are different and cause damage to the skin, lungs,

and eyes. Sulfur mustard and Lewisite do have a liquid form, but they are oily and would not stay aerosolized for a long period of time in the environment even though they don't break down as rapidly as the organophosphates. These agents can also be used to contaminate the water supply. Another group of chemicals that could be used are the pulmonary agents, such as Bromine and Chlorine which affect the lungs. Bromine does dissolve in water and is sometimes used in pools instead of chlorine, but will not effect people a great deal unless they are exposed for a long period of time and by a significant quantity of this chemical. Chlorine is also used in pools for disinfection and as a liquid, it turns into a gas when exposed to the environment and if it were put into a ULV sprayer, it would probably start leaking out through any small holes. This gas could become flammable if it mixes with other chemicals such as turpentine or ammonia. Even though there are a lot of different types of chemicals in the world, including more than described above, most of them are not harmful in small doses such as a ULV sprayer would produce. Also, these chemicals would be toxic to the terrorists who would be distributing them, so they might not even get very far driving a truck with any of these chemicals coming out of the back of the ULV sprayer.

When bio-terrorism is related to mosquito control, there are concerns that should be considered and plans to prevent bio-terrorism involving mosquitoes and mosquito control trucks should be created. Right now terrorists may not have a new disease that can be transmitted through mosquitoes to humans which could harm or even kill a lot of people. They may not be able to steal or make

trucks similar to the ones used by mosquito control agencies to distribute toxic chemicals to their target without first harming or killing themselves. Although the

Centers for Disease Control and Prevention, local health departments, and mosquito control agencies are on the look out for new diseases spread by mosquitoes and are still trying to control the mosquito-borne diseases that we already know about which are still killing and changing the lives of people today.

## Works Cited

Centers for Disease Control and Prevention (CDC). "Emergency Preparedness and Response: Chemical Agents" updated May 26, 2004  
<http://www.bt.cdc.gov/agent/agentlistchem.asp>

Federal Emergency Management Agency (FEMA). "Fact Sheet: Terrorism" updated February 11, 2003  
<http://www.fema.gov/hazards/terrorism/terrorf.shtm>

Koday, Ed. University of Florida "Mosquito Facts"  
<http://www.ivyhall.district96.k12.il.us/4th/kkhp/1insects/mosquito.html>

Public-Health Pest Control. "Mosquitoes" [http://vector.ifas.ufl.edu/chapter\\_03.htm](http://vector.ifas.ufl.edu/chapter_03.htm)

Saginaw County Mosquito Abatement Commission (SCMAC). Mosquitoes, "Vectors of Disease" <http://www.scmac.org/Biology.htm>