Ineffectiveness of Pesticides at Controlling Mosquito Populations

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[Excerpts from a talk with the same title at the February 5, 2003 forum on "Pesticides in the City of St. Louis" at Genesis House in St. Louis.]

What do advocates of pesticide spraying say when confronted with the dangers of these chemicals? The pat answer is: "We do everything we can to reduce mosquitoes; but there are always some left and you have to get them with sprays." Statements like this assume that pesticide sprays reach mosquitoes. If virtually none of the spray makes it to mosquitoes, the argument has no merit. This is, in fact, the case. Spraying pesticides either has no long-term effect on mosquito populations or results in an increase in their numbers.

Portion of pesticide sprays that hit flying insects

First, the portion of sprays that actually reach mosquitoes is miniscule. Sprays must be composed of tiny particles that will float in the air rather than falling to the ground: "â€¦fine mists are used to control flying pest insects in the home, yard and urban areas. To ensure insects fly into the insecticide spray droplets, they must have a size of 2- to 16 micron." [Lofgren, et al, 1973]

The wind easily blows such "ultra low volume" (ULV) mists away from the target population. This problem is so extreme that a study of DDT used to control Heliothis (corn moth) estimated that less than 0.0000001% (one part per billion) reached the target.

Many other studies have looked at the amount of sprayed pesticides that reach insects. The highest I have found in published research is 10%. This unusually high rate was accomplished by bringing leaves with red spider mite eggs on them to be sprayed in the laboratory. [Munthali & Scopes, 1982] Since eggs do not fly very fast, to say they are an easy target is an understatement.

To understand the significance of this for mosquitoes, we need to ask where mosquitoes are and where the sprays are applied. Spray trucks go down the street. But mosquitoes tend to be near standing water: in back yards, dilapidated buildings or vacant lots.

This means that to have as much as 10% of the spray actually hit mosquitoes, sprayers would need two novel devices. The first would be a whistle, like the high-pitched ones used for dogs. Someone sitting on the hood of a spray truck would blow on it to get mosquitoes to come from the back yard to where the truck was. But they would still be flying around. So the next device would be a flute (like the Pied Piper used) that would make all the mosquitoes sit passively on the curb so the truck could spray them. If this sounds absurd or silly, please remember that it is only by getting mosquitoes to be bunched up together and as still as red spider mite eggs that a sprayer could get as much as 10% of the mist to hit them.

Cornell University professor David Pimentel reviewed published research on pesticide sprays and concluded that the average for all pesticides is that less than 0.1% reaches target pests. [Pimentel, 1995] But this included crawling insects. When he looked specifically at flying insects like mosquitoes, the average was less than 0.0001%. This is one part per million. In order to get the equivalent of one container of pesticides to reach mosquitoes, it is necessary to spray one million containers.

What does this mean for the City of St. Louis, which spent $450,000 on its mosquito program in 2002? [Shipley, 2002]

What is one millionth of $450,000?
[Someone from audience says:] "45 cents."

That's right. Your $450,000 of tax money got you 45 cents worth of dead mosquitoes. It is little wonder that the financial wizards of the Democratic Party machine that brought you this program are the same

geniuses that plan to spend several hundred million dollars to tear down a perfectly good baseball stadium to give the Cardinal owners a new stadium with fewer seats.

The St. Louis Health Department might complain that these calculations are off because they did not spend their entire budget on sprays. That is true. They spent about $150,000 on sprays, with the remaining $300,000 going to costs like trucks, sprayer salaries, hopefully health insurance for sprayers, and for bureaucrats to sit in their offices. [Pesheva, 2003] This means that the $450,000 actually bought St. Louis taxpayers 15 cents worth of dead mosquitoes.

During Summer 2002, I saw head of Vector Control Mark Ritter on TV claiming that 80% of the spray reached mosquitoes. This was such an amazing statement that when he repeated it during the meeting that Dr. McKeel, Robin Barrett and I had with him and two other Health Department officials, I asked him to send me the data verifying it. After the meeting, I sent him an e-mail and a postal letter repeating my request for his documentation.

[Speaker puts notes on table and holds up empty hands.]

Right now, I am holding in my hands all of the documentation that Vector Control sent me verifying the claim of 80% effectiveness of its spraying. What Mr. Ritter did fax me yesterday, a month after my request, was a letter stating that data on the effectiveness of sprays was a trade secret and that I should write the manufacturer, Clark, for their research.

In all honesty, there is one study that did find that 80% of a spray reached its target. [Haverty et al, 1983] The target was not flying insects. The target was weed trees.

Resistance

Okay, let's pretend that we've breathed enough pesticide mist to fantasize that 80% of it reaches mosquitoes. Were the "80%" hallucination to become reality, mosquito sprays would still have no long-term effect on the numbers of mosquitoes. The reason is "resistance," something a lot of us learned abut in high school biology.

If most insects are killed by chemicals, those that survive to reproduce will be more resistant to effects of those chemicals than the ones that die. When they reproduce, they will pass any genes for chemical resistance to their offspring. Since insects lay millions of eggs and have short life spans, resistance to any chemical used can happen rapidly. With a two week life span, mosquitoes could increase resistance to sprays within a single season. A spraying program would use more and more pesticides to have less and less effect on the mosquitoes.

St. Louis is probably typical of US cities that can only afford to spray the average neighborhood eight times during the season of April through October. When the 26 - 27 day gap between sprayings is compared to the mosquito life cycle of 10 - 14 days, it is highly unlikely that spraying can contribute to significant species selection. The irony is that spraying which is too infrequent to affect mosquito evolution cannot be reducing mosquito populations during a season. If advocates of spraying claim that they spray enough to reduce the number of mosquitoes, they are simultaneously saying they are spraying enough to cause mosquitoes to evolve resistance to the sprays.

Ever since WWII, the chemical industry has poured increasing quantities of pesticides into the environment. By the 1990s, over 2.5 million tons of pesticides were being used annually [Pimentel, 1995]. If pesticides stopped mosquitoes, they would be extinct. Yet, mosquitoes thrive. The strongest evidence that pesticides do not control mosquitoes is that they are being used.

Increasing mosquito populations

Information presented so far demonstrates that pesticide sprays cannot reduce the number of mosquitoes for more than a few days following spraying, if that. This would suggest that sprays have no long-term

effects. In actuality, spraying is associated with an increase in mosquito populations in three ways: mosquito predators; sympatric species; and, global warming.

Mosquito predators. Many species eat mosquitoes: dragonflies, ladybugs, lacewings, goldfish, guppies, fathead minnows, golden shiners and several types of birds. Bats eat up to 1000 mosquitoes per night. Mosquito predators tend to live longer than mosquitoes. This means that when pesticides harm both, predators take a longer time to replenish their numbers. If a park pond were sprayed with a pesticide containing the warning "This product is toxic to fish," (as is on the label for Anvil 2+2 used by the City of St. Louis) guppies or goldfish in the pond would be killed along with mosquitoes. But new mosquitoes would fly in to replace those killed. Very few fish would fly in. With natural predators destroyed, the next generation of mosquitoes would come back in even greater numbers. The small, short-term reduction of mosquitoes would be followed by a new generation that was both greater in numbers and more resistant to pesticides.

Sympatric species. Spraying can affect a "sympatric" species that occupies the same ecological niche. John Howard and Joanne Oliver collected data on spraying the pesticide naled near New York's Cicero and Toad Harbor Swamps for mosquitoes which carry eastern equine encephalitis (EEE). Though there were short-term reductions after sprayings, from 1984 to 1994 there was a 15-fold INCREASE in their numbers. The researchers also discovered a large decrease in a different species of mosquitoes living in the same area. When the populations of non-EEE carrying mosquitoes were killed off, the EEE-carrying mosquitoes took their place. In their research summary the authors noted that the increase in disease-spreading mosquitoes "discredits the rationale that preventive applications of naled reduce the risk of EEE." [p. 315]

The authors also concluded that "Ecological balance between the 2 species [of mosquitoes] may be restored by reducing naled applications to these swamps." This observation that the best way to reduce disease-carrying mosquitoes is to halt the use of pesticides is important to remember when confronted with the question "If you don't spray pesticides, then what do you do to control mosquitoes?" An important part of answering needs to be that spraying can cause an increase in mosquitoes. Elimination of spraying is a mosquito control technique.

Global warming

Though related to spraying in a more indirect way, global warming is by far the most important factor leading to the increase of mosquitoes. Any mosquito control program that leaves out global warming is an exercise in futility. The production of pesticides is part of a vast military-industrial complex that sees killing things as a basic problem-solving strategy. As it seeks to dominate and subdue nature, its "solutions" repeatedly bring disasters which dwarf the original problem. The self-expanding system creates enormous quantities of meaningless objects whose production and use leads to global warming. Nothing is more significant to the increase of mosquito-borne diseases.

As unquenchable greed for profits raises global temperature, several biological results follow:

1. mosquitoes breed more rapidly;

2. mosquitoes bite more frequently;

3. pathogens inside mosquitoes reproduce and mature at a more rapid rate;

4. mosquito populations expand into areas that were previously not warm enough for them;

5. mosquitoes are active more days of the year and more hours of the day in their actually existing territory; and,

6. increasing floods expand pools of stagnant water where mosquitoes breed. [Epstein, 2000]

According to Paul Epstein, malaria kills 3,000 people, mostly children, every day." [p. 52] This is over a million deaths per year. Malaria, as well as other mosquito-borne diseases like dengue fever and yellow fever, are concentrated in tropical areas of the planet.

Why would the US media ignore these deaths and give a daily body count of the 270 people who died from West Nile Virus in 2002? Could it be an unspeakable racism that finds death of people of color not newsworthy in comparison to deaths in the US? Could it be that government-pushed news stories never had any concern with real solutions and were only interested in creating an atmosphere of fear that would feed into a war mentality?

It is hard to believe that Health Departments are serious about protecting public health when their major expense is pesticides. The World Health Organization reports that there are a million pesticide poisonings per year and that these lead to 20,000 deaths. [WHO/UNEP, 1989] This is almost certainly a very large underestimate. The poisonings and deaths are mainly from agricultural use. If a person has an acute asthma attack and dies after breathing a cloud of pesticide poisons, the death certificate will list the cause as "asthma," not "pesticides." Similarly with cancer and immune system disorders. The magnitude of pesticide poisoning is severely underestimated because pesticides rarely work in isolation. Pesticides are part of a toxic soup that drips from the air into our lungs so that multiple poisons interact with each other in ways that no current medical model can explain.

I started out explaining that only miniscule portion of pesticide sprays reach target mosquitoes. Most of what I have covered has focussed on the effects of this one part per million. At this point, I will turn over the program to Dr. McKeel, whose presentation is a million times as important because he will deal with the remainder of the sprays which do not reach mosquitoes and go into the environment where they can affect people.

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