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POSITION PAPER

USE OF SPRAYING TO COMBAT WEST NILE VIRUS

I. PESTICIDES USED BY ST. LOUIS CITY AND COUNTY

This summer, St. Louis City and County officials are once again responding to concerns of West Nile Virus (WNV) by spraying pesticides aimed at adult mosquito populations. News sources have kept residents well-informed of the potential dangers of the virus but have neglected to inform the public of the hazards of pesticides. Currently, St. Louis City uses the pesticide Anvil 2+2 ULV, which contains sumithrin and piperonyl butoxide as active ingredients. The County uses Aqua-Reslin, which contains permethrin and piperonyl butoxide. Both pesticides are mixed in a base of petroleum solvents and other undisclosed ingredients.

A. Short-term Exposure Toxicity to Humans

Permethrin and sumithrin are synthetic pyrethroids, a class of compounds which work by paralyzing the nervous system. They are chemically similar to pyrethrins, toxins found in chrysanthemum plants.¹ Human exposure to pyrethroids may cause skin irritation, eye irritation, and asthmatic symptoms.² Larger doses may affect the nervous system, causing loss of

¹ <http://ace.orst.edu/info/npic/factsheets/pyrethrins.pdf>.

² <http://ace.orst.edu/info/npic/factsheets/permethrin.pdf>.

coordination or tremors.³ Very large doses can result in dizziness, headache, nausea, muscle twitching, reduced energy, changes in awareness, convulsions and loss of consciousness.⁴ Whether a person may experience negative effects depends on the extent of the exposure and the person's age, sex, genetic makeup, lifestyle, and general health characteristics.⁵ The EPA recommends daily oral exposure limits for 10 different pyrethroids and has established tolerances for residues of pyrethrins and various pyrethroids in foods.⁶

Piperonyl butoxide is a chemical that has no pesticide effects on its own but is added to pyrethroids because it inhibits insects' ability to break down pyrethroids before they take effect. It has a low potential of short-term effects through direct contact.⁷ However, any exposure to piperonyl butoxide will also include exposure to a pyrethroid.

The petroleum solvent base may also be toxic. Short-term exposure to high levels may cause eye, skin, nose, throat or lung irritation; vomiting or central nervous system depression may result if petroleum solvents are ingested.⁸ The combination of a pyrethroid, piperonyl butoxide, and a petroleum solvent can lead to more severe health effects than each ingredient taken alone. The Material Safety Data Sheet (MSDS) for Anvil 2+2 warns that skin contact can result in irritation progressing into dermatitis, and ingestion can lead to nervous system disorders such as fatigue, dizziness, headaches, lack of coordination, tremors, and unconsciousness.

Government officials emphasize that the amount of spray is too low to cause severe reactions. However, New York newspapers report anecdotes of residents being doused by spray trucks while standing at phone booths or coming out of their homes.⁹ One woman was sprayed directly in the face from a truck four to five feet away. Victims suffered from eye irritation, chest

³ New York State Dept. of Health, available at <http://www.health.state.ny.us/nysdoh/pest/anvil.htm>. June 2002.

⁴ ATSDR, available at <http://www.atsdr.cdc.gov/tfacts155.html>. September 2001.

⁵ Illinois Department of Public Health, available at <http://www.idph.state.il.us/envhealth/factsheets/fog.htm>.

⁶ <http://www.atsdr.cdc.gov/tfacts155.html>.

⁷ <http://ace.orst.edu/info/npic/factsheets/pbogen.pdf>.

⁸ <http://www.health.state.ny.us/nysdoh/pest/scourge.htm>.

⁹ Patricia Hurtado, "A Price to Spray." *Newsday*. September 19, 2000. Available at <http://www.safe2use.com/ca-ipm/00-09-19.htm>.

tightness, and nausea which persisted for several days. A local hospital reported more than 200 calls from residents who suspected they had been poisoned by pesticides.¹⁰

B. Long-term Exposure Effects

Pyrethroids, including permethrin and sumithrin, are suspected to be endocrine inhibitors. In a laboratory study at Mt. Sinai School of Medicine, they were found to mimic the hormone estrogen when applied to cells grown in plastic dishes.¹¹ Estrogen-mimickers impair the body's natural ability to regulate the level of hormones. In humans, increased levels of estrogen is linked to breast cancer, decreased fertility, and reduced sperm count.¹²

Permethrin and piperonyl butoxide are both classified by the EPA as possible carcinogens due to their correlation with lung and liver tumors in mice during laboratory experiments. The EPA is currently investigating the cancer effects of sumithrin and has not yet classified the pesticide. The long-term and carcinogenic effects on humans are not well studied and many of the potential effects given (including short-term effects) are results of animal toxicity tests.

C. Effects on Wildlife

Both permethrin and sumithrin are highly toxic to fish and bees and slightly toxic to birds. Piperonyl butoxide is only mildly toxic to fish but highly toxic to other aquatic organisms and slightly toxic to birds.¹³ Wildlife (and pets) can be exposed through direct contact, ingesting sprayed vegetation and insects, inhalation, or grooming.¹⁴ The toxicity to fish and birds is particularly significant because certain species eat mosquito eggs, larvae, or adults, thereby playing a key role in the reduction of the mosquito population. Furthermore, spraying with pesticides could have the contrary result of increasing mosquito populations by eliminating their

¹⁰ Michael R. Blood, "Artist: I'm a Victim of Skeeter Spraying." New York Daily News. September 09, 2000. Available at <http://www.getipm.com/articles/ny-anvil.htm>.

¹¹ Vera Go, Joan Garey, Mary S. Wolff, and Beatriz G.T. Pogo. "Estrogenic Potential of Certain Pyrethroid Compounds in the MCF-7 Human Breast Carcinoma Cell Line." Environmental Health Perspectives, vol. 107, no. 3, March 1999, pages 173-177.

¹² William C. Sugg, III, Matthew L. Wilson, "Overkill: Why Pesticide Spraying for West Nile Virus May Cause More Harm Than Good." July 2001. Available at <http://www.meepe.org/wnv/overkillma.htm>.

¹³ <http://ace.orst.edu/info/npic/factsheets/permethrin.pdf>, <http://ace.orst.edu/info/npic/factsheets/pbogen.pdf>.

¹⁴ <http://npic.orst.edu/factsheets/wildlife.pdf>.

natural predators. Conservationists, most notably bird enthusiasts, are also concerned about the disturbance of natural ecosystems. Pesticides indiscriminately kill non-target insects also, eliminating a food source of fish, amphibians, and local and migratory birds. The poisons are also toxic to fish, diminishing another source of food for birds. Although WNV is extremely lethal to birds, environmentalists worry that using pesticides could be worse than the virus itself.

D. Efficacy of Mosquito Spraying

In a joint statement on mosquito spraying, the CDC and EPA state that in order to be effective, spraying must be done under extremely precise conditions: at the ideal temperature, with low winds, at the time of day when mosquitoes are most active, and with carefully calibrated equipment to form droplets the right size.¹⁵ Furthermore, the spray is only effective against adult mosquitoes and not eggs or larvae. In an April 2001 report the CDC stated, “Adulticiding, the application of chemicals to kill adult mosquitoes by ground or aerial applications, is usually the least efficient mosquito control technique,” and also “The most effective and economical way to control mosquitoes is by larval source reduction. ... Control of adult mosquito populations by aerial application of insecticides is usually reserved as a last resort.”¹⁶ The EPA and CDC advocate Integrated Pest Management (IPM). They explain, “IPM is an ecologically based strategy that relies heavily on natural mortality factors and seeks out control tactics that are compatible with or disrupt these factors as little as possible. IPM uses pesticides, but only after systematic monitoring of pest populations indicates a need. Ideally, an IPM program considers all available control actions, including no action, and evaluates the interaction among various control practices, cultural practices, weather, and habitat structure. This approach thus uses a combination of resource management techniques to control mosquito populations with decisions based on surveillance.”¹⁷

¹⁵ <http://www.epa.gov/pesticides/factsheets/mosquitojoint.htm>.

¹⁶ <http://www.cdc.gov/ncidod/dvbid/westnile/resources/wnv-guidelines-apr-2001.pdf>.

¹⁷ <http://www.epa.gov/pesticides/factsheets/mosquitojoint.htm>

In addition to the uncertainty over whether pesticides effectively exterminate adult mosquitoes, there is also a question as to whether the pesticide is effective in reducing the incidence of WNV. As with any pesticide the insects which survive will be the ones that are most resistant to the pesticide and will breed increasingly resistant generations. In the past, mosquito populations have quickly developed resistance to DDT, malathion (a pesticide sprayed in Houston and New York), and *Bacillus thurengiensis israelensis* (a bacteria that kills mosquito larvae).¹⁸ Cities must either continually increase the amount of pesticide or spray new chemicals. Some municipalities must add supplementary chemicals such as temephos which inhibit the ability of mosquitoes to develop resistance to the primary pesticide.¹⁹

Conservationists also question the methods of locating WNV. Health departments tend to assume that dead birds indicate a high incidence of WNV since birds are highly prone to mortality from the disease. In response, they mark the location of high mortality as a hotspot of WNV and increase the amount of spraying. This circular reasoning ignores the possibility that pesticides are also a cause of death of birds. Health authorities should conduct testing to ensure that the deaths are not from pesticide poisoning. St. Louis County surveillance data, which plots the occurrence of dead birds in an area, demonstrates this assumption: “the dead birds on the map are not known to have died from WNV. If there is a sudden increase, however, it will be obvious and there is a good chance that WNV is the cause.”²⁰

II. ST. LOUIS COUNTY/CITY MOSQUITO ABATEMENT PLANS

A. St. Louis County

The County is responsible for spraying all areas except St. Louis City. The current plan includes surveillance of the incidence of WNV through mosquito trapping, dead bird data, and human/mammalian disease incidence data. However, the spray method is not related to

¹⁸ <http://www.niaid.nih.gov/dmid/malaria/malaftr/vector.htm>, <http://www.nypirg.org/mosquito.html>, <http://icmr.nic.in/annual/vcrc/vectorbi.pdf>.

¹⁹ <http://www.epa.gov/pesticides/factsheets/larvicides4mosquitos.htm>.

²⁰ http://scchealth.org/docs/wnv/wnv_data.html.

surveillance data. Neighborhoods are sprayed on a weekly basis, though there is no schedule posted. There is also no mechanism for notification of residents and the County has eliminated the option of “no spray zones.”

B. St. Louis City

So far this summer, the City vector control office has no plans for area-wide spraying. The City will spray on an as-needed basis in response to surveillance data; however, the Board of Aldermen may call for area-wide spraying later this summer if they believe it is necessary. The benefits of an as-needed plan is that it limits the spraying to targeted areas only and minimizes unnecessary spraying. The disadvantage is that giving residents notice is difficult since there is no consistent schedule. City residents may call the vector control office to be placed on a call list and will be called around 3:00-4:00 PM if their neighborhood will be sprayed that evening.

III. THE ST. LOUIS CITY AND COUNTY GOVERNMENTS SHOULD TAKE PRECAUTIONARY STEPS PRIOR TO SPRAYING

In the absence of long-term medical and environmental data, medical professionals including Dr. Daniel McKeel, Professor of Pathology and Immunology at Washington University, advocate the “cautionary principle” route. Concerns remaining to be addressed include: long-term human health risks of repeated spraying, impact on complex ecosystems, whether spraying may be counterproductive to eradicating WNV, the rate mosquitoes are developing resistance to sprays, and the efficacy of killing adult mosquitoes through indiscriminate spraying. Before responding to public alarm about WNV, government officials should carefully weigh the threats posed by WNV against the health costs of mosquito spraying.

A. City and County publications should be forthcoming on the health effects of mosquito spray.

St. Louis City publications from last summer notified residents that the City would be spraying “Anvil 2+2, a product that kills 96% to 98% of the mosquitoes in an area but is also

completely biodegradable within four hours.”²¹ Also, “The City uses a botanical insecticide that is odorless and harmless to humans and pets.”²² However, the MSDS for Anvil states that it is a “pungent aromatic, similar to smell of mothballs,” is extremely toxic to fish (which are kept in backyard ornamental ponds), and can cause a variety of health effects to humans. Furthermore, the New York State Department of Health estimates that sumithrin, the active ingredient in Anvil, has a half-life of 9.4 days in soil and over 9 hours in water.²³ That is, half of the amount originally sprayed remains after those durations. Next, sumithrin is a man-made synthetic similar to toxins found in the chrysanthemum plant; the chemical itself is not a botanical. Last, the 96% to 98% success rate seems rather high for several reasons. First, EPA has emphasized that adulticide sprays are only effective under very precise environmental conditions. Second, pesticide expert Barrie Webster, former head of the Pesticide Research Laboratory at the University of Manitoba, estimates that success rates are 50-80% in favorable conditions and that the reduction in mosquitoes may last only 12-36 hours.²⁴

City and County governments should provide websites and hotlines to ensure that residents have access to health and safety information about pesticides, not just WNV. They should inform residents of who is most at-risk of adverse health effects (children, asthma sufferers, chemically sensitive people, etc.), provide information on how to limit exposure, and provide information on steps to take if a person believes he has been poisoned by spraying. Local clinics, hospitals, and physicians should also be notified of what pesticides are being used, along with the identification and treatment of such poisoning.

²¹ St. Louis City Department of Health. City Health, Volume 12 July/August 2001. Available at <http://stlouis.missouri.org/citygov/health/cityhealth12.PDF>.

²² St. Louis City Department of Health. City Health, Volume 15 April/May 2002. Available at <http://stlouis.missouri.org/citygov/health/cityhealth15.pdf>.

²³ New York State Department of Health, <http://www.health.state.ny.us/nysdoh/westnile/malathe4.pdf>.

²⁴ Barrie Webster, “Sting Operation: No Spray of Hope.” The Globe and Mail. May 1, 2003.

B. City and County Vector Control Offices Should Instruct Employees To Avoid Spraying Into Bodies of Water and Storm Sewers.

As noted above, pyrethroids are extremely toxic to fish and other aquatic organisms. Furthermore, the Clean Water Act prohibits the discharge of pollutants into waters of the United States without a permit. The Anvil 2+2 Material Safety Data Sheet states “Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge.” Because FIFRA prohibits the use of a pesticide not in accordance with labeling instructions, the City and County should first obtain an NDPEs permit if they know that trucks will be spraying near bodies of water. Even if the bodies of water are not under the authority of the Clean Water Act, spray operators should be instructed not to spray over ponds which contain fish or other aquatic wildlife. Mosquito spraying is suspected to have caused a fish kill in a goldfish pond at Lewis Park in University City.

C. Risk of Adverse Health Effects Warrants Adequate Notice and Opportunity for Residents to Opt-out of Being Sprayed.

The City’s current plan provides for only several hours notice and no opportunity to opt-out. The County, which has a weekly schedule for spraying, does not post the schedule online, notify local newspapers, and send newsletters to residents notifying them of the schedule for their area. This is inadequate to protect the health of people who are chemically sensitive, asthmatic, or pregnant. People may be sprayed while in their yards or coming out of their homes if they do not receive adequate notice. Schools and daycare centers should be specifically notified even if spraying occurs after hours, and they should be advised to wash children’s hands after playing outside. While the City’s plan to only spray as-needed is a positive step in minimizing the area affected, the environmental health office should take every step possible to

notify residents regardless of whether they have registered for the call list. Homeowners should have the right to opt-out of being sprayed regardless of health concerns.

D. Area-spraying Should Be a Last Resort

The Board of Aldermen for St. Louis still has the opportunity to switch to area-wide spraying. As the CDC has stated, this should only be used a last resort. Both the City and County should follow the Integrated Pest Management system advocated by the EPA and CDC. The program should focus on removal of breeding sites in public areas and educating residents on how to eliminate breeding sites in their yards. It should take into account natural ecosystem dynamics, including the effects of pesticides on non-target species and how predators might be used to control the mosquito population.

E. Pesticide Operators Must be Adequately Certified, Trained, and Protected

Pursuant to Missouri law, public operators of pesticides must be certified by the Missouri Department of Agriculture and “[a]ny employee of any agency... who is not licensed as a certified public operator may use restricted use pesticides only under the direct supervision of a certified public operator.”²⁵ Furthermore, pesticide operators should receive adequate training on personal safety and on the proper operation of pesticide trucks. Last, they should be given protective gear such as coveralls, chemical-resistant gloves, goggles, and chemical-resistant footwear plus socks.

F. Pesticides Must be Stored and Transported in a Safe Manner

Pesticides must be stored in accordance with label directions, which mandate closed, non-leaking containers placed in a cool, dry place. Since these chemicals are sprayed during the summer months, they must be kept indoors until use. Journalists in other states have uncovered stories of a pesticide being stored in the hot sun, leading to its degrading into more toxic

²⁵ Mo. Rev. St. §281.045.

chemicals which were subsequently sprayed.²⁶ The containers must also be stored in an area with secondary containment to catch any chemical that is spilled or leaked.

Although pyrethroids are not classified as a hazardous material under the Department of Transportation's regulations, trucks should take steps to avoid unintentional release of the pesticide. In case of a spill, trucks should carry absorbent materials such as sand, sawdust, or cat litter. Workers should also ensure that the sprayers are working correctly and not leaking before each round of spraying.

IV. CONCLUSION

The science on the efficacy of spraying on the incidence of WNV has been oftentimes disparate and muddled. In order to decide whether to spray, St. Louis County and City should establish a panel of citizens and experts to review data on the health effects on humans and animals and also take into account more effective methods of pest control such as targeting mosquito larvae instead of adults and educating the public on the elimination of breeding sites. If government officials decide that spraying must occur, they should notify residents as early as possible prior to spraying, notify schools and daycare centers of when spraying is about to be done, establish a source for medical information about pesticide hazards such as a website or hotline, give homeowners or entire neighborhoods a chance to opt out of having their property sprayed, and ensure residents are aware of this option. Since the goal of spraying is to protect public health, it must be done in a responsible manner that minimizes adverse health effects.

²⁶ Erik Baard, "Mutant Malathion: How New York's Mosquito-Spray Campaign Spawned a Deadly Neurotoxin." The Village Voice. July 18, 2001.