

Rachel's Environment & Health News

#709 - West Nile Virus -- Part 1

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West Nile virus (WNV), a disease previously unknown in the Western Hemisphere, appeared in New York City last year and has now spread to animal populations in six other states. Some municipal officials have responded to the disease by spraying entire neighborhoods with pesticides intended to kill mosquitoes. West Nile Virus can cause serious illness and death in some cases, but spraying pesticides to kill mosquitoes is not a good solution. Spraying exposes large numbers of people to toxins with both short- and long-term health effects, and studies suggest it is unlikely to be effective.

Transmitted by mosquitoes, WNV primarily attacks birds but can also infect humans and other animals. Most infections with WNV go unnoticed or feel like an ordinary flu, but some cases lead to encephalitis (inflammation of the brain) or meningitis (inflammation of the membranes surrounding the brain and spinal cord) and can be fatal. The elderly and individuals with compromised immune systems may be particularly vulnerable to serious illness resulting from the virus.

In 2000, WNV has reappeared in New York City, and infected birds have been found in upstate New York as well as New Jersey, Massachusetts, Rhode Island, New Hampshire, Connecticut, and Maryland.[1] In the 1999 outbreak, sixty-two people became seriously ill and seven died. The individuals who died of the virus ranged from 68 to 87 years of age.[2] Of the fifty-five individuals in New York City who survived severe cases of the virus, some continue to suffer neurological problems a year later.[3]

As of October 7, a total of 17 human cases of WNV had been detected this year, 3 in New Jersey and 14 in New York.[4] One individual, an 82-year-old man in New Jersey, has died of the virus this year.[5] Recent outbreaks have occurred in other countries as well; in Israel, over 120 people have shown symptoms of WNV infection this year and 10 have died.[6]

In a study conducted last summer, researchers tested blood from 677 randomly selected individuals in a 4-square-mile area around the focal point of the outbreak in Queens, N.Y. Of these 677, 19 showed evidence of having been infected with West Nile virus. Based on these results, the researchers estimated that 2.6% of the individuals in the area studied were infected with the virus. About a fifth of these exposed individuals had experienced symptoms attributable to the virus. This study supports the view that most individuals infected with the virus never develop noticeable symptoms.[7] The Centers for Disease Control (CDC) estimates that the case-mortality rate for WNV (the proportion of individuals showing symptoms who die of the disease) is three to fifteen percent, with the fifteen percent figure applying to the elderly.[8]

Mosquitoes begin life as eggs laid in stagnant water; later they change into water-dwelling larvae, then pupae, and finally adults. Thus they can be controlled by several means -- by minimizing standing water, by maintaining populations of egg- or larva-eating fish, or by applying chemicals that kill either larvae or adults.

New York City responded to the appearance of the virus last year by spraying the organophosphate insecticide malathion from trucks and helicopters to kill adult mosquitoes. Organophosphates act as nerve toxins, disrupting the nervous system by inhibiting the enzyme cholinesterase. Short-term symptoms resulting from human exposure to organophosphates can include breathing problems, headache, nausea and dizziness. High exposures can produce fatal poisoning.[9] In April 2000, a U.S. Environmental Protection Agency (EPA) committee reviewed a series of studies on mice and rats exposed to malathion. Based on this review, the committee concluded that there was "suggestive evidence of carcinogenicity" which was "not sufficient to assess human carcinogenic potential." [10] For the moment malathion remains listed by EPA as "not classifiable" with regard to carcinogenicity. Malathion is also a

suspected hormone disrupter.[11]

This year, New York and other municipalities have used pyrethroid insecticides such as Scourge (active ingredient, resmethrin) and Anvil (active ingredient, sumithrin) to kill adult mosquitoes. The pyrethroids also act as nerve toxins, and may have other long-term health effects. Resmethrin has been found to act as a weak hormone mimic in test tube studies.[12] A 1999 study on how pyrethroids affected breast cancer cells in a laboratory setting led researchers to suggest that the pyrethroids as a group should be considered hormone disrupters.[13] EPA is scheduled to re-evaluate the health effects of the pyrethroids in 2002.

Pyrethroids are also very toxic to fish and to bees, and there are regulations against applying them on or near bodies of water.[14] It is particularly important to pay attention to their effects on fish when designing a mosquito control program, since healthy fish populations can serve as an important natural mosquito control.

Like several other pyrethroid insecticides, Scourge and Anvil contain piperonyl butoxide (PBO), which is added to enhance the toxicity of the active ingredients. Studies have linked PBO exposure to liver cancers in rats and mice,[15] and it is classified by the EPA as a possible human carcinogen. There is also some evidence that PBO-pyrethroid mixes can affect the human immune system.[16]

Intentionally spraying thousands of people with suspected carcinogens or hormone disrupters seems dubious from a public health perspective. Potential effects on fetuses, infants, and children are of particular concern. Increasing evidence supports the view that even tiny exposures to toxic chemicals can have devastating effects on infants and developing fetuses, depending when the exposures occur.[17]

There has been considerable variation in responses to WNV this year. When infected birds began appearing in the Boston area, several municipalities began aggressive spraying to kill adult mosquitoes in an area defined by a two-mile radius around the site where an infected bird was found. Buffalo, N.Y., on the other hand, has limited itself to the use of larvicides placed in standing water without spraying.[18]

Some municipalities have used chemical larvicides such as Altosid (active ingredient, methoprene), to kill mosquito larvae in catch basins and other standing water. When exposed to sunlight, methoprene breaks down into a class of chemicals closely related to vitamin A, known as retinoids, which can cause birth defects in humans and may be contributing to the global epidemic of skeletal deformities in frogs (see REHW #590 and #623). Other municipalities have opted for least-toxic control measures, including the use of BACILLUS THURINGIENSIS ISRAELENIS (BT) and BACILLUS SPHAERICUS , naturally-occurring bacteria that are toxic to mosquito larvae.

Long-term health effects of spraying pesticides in urban areas are probably the greatest concern, but acute exposures can also be a problem. Municipal officials in charge of spray programs in New York and other cities warned residents to remain indoors during the scheduled spray times, closing windows and turning off air conditioners to prevent the chemicals from entering their homes. But in one case, a New York resident was sprayed at close range when trucks began spraying at 10:00 pm rather than at midnight, as they had been scheduled to do.[19] At an April, 2000 meeting in New York, several people said they thought they were suffering neurological problems resulting from the spraying, and one doctor said she had seen 160 patients with minor neurological problems possibly attributable to the spraying.[20]

[To be continued.]

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[4] United States Department of Agriculture Animal and Plant Health Inspection Service (APHIS), "Update on Current Status of West Nile Virus, Week of 1 October through 7 October, 2000." Available at <http://www.aphis.usda.gov/oa/wnv/wnvstats.html>.

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[6] "West Nile virus continues to spread south in US," Reuters Health Information September 22, 2000. See www.reutershealth.com.

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[8] Centers for Disease Control, "West Nile Virus: Questions and Answers." Available at <http://www.cdc.gov/ncidod/dvbid/westnile/-q&a.htm> (omit the hyphen).

[9] J. Routt Reigart and James R. Roberts, RECOGNITION AND MANAGEMENT OF PESTICIDE POISONINGS. (Washington, D.C.: U.S. Environmental Protection Agency Office of Pesticide Programs, 1999). Available at <http://www.epa.gov/oppfead1/safety/healthcare/-handbook/handbook.htm> (omit the hyphen). For a thorough overview of malathion's health effects see Loretta Brenner, "Malathion," JOURNAL OF PESTICIDE REFORM Vol. 12, No. 4, Winter 1992, pgs. 29-37.

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[16] F. Diel and others, "Pyrethroids and piperonyl butoxide affect human T-lymphocytes in vitro." TOXICOLOGY LETTERS , Vol. 107, Nos. 1-3, June 1999, pgs. 65-74.

[17] See Schettler, cited above in note 12, pgs. 12-16, or John Wargo, OUR CHILDREN'S TOXIC LEGACY (New Haven: Yale University Press, 1998), pgs. 173-8.

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[19] Elisabeth Bumiller, "Mayor Says Pesticide Spraying Victim Was Right," NEW YORK TIMES September 12, 2000, pg. B5.

[20] "Officials Defend Spraying to Curb West Nile Virus," NEW YORK TIMES April 1, 2000, pg. B3.