Shaker Heights
2002 West Nile Virus Response Plan

Presented:
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Shaker Heights Town Meeting

Prepared by:

West Nile Virus Community Task Force of Shaker Heights, Ohio

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Foreword

In the summer of 2001, Shaker Heights experienced an unusual number of crows and mosquitoes infected with the West Nile virus. While there were no human cases reported, the Department of Health initiated limited spraying in an attempt to reduce the mosquito population. A number of residents strongly objected to this use of pesticides. In December, concerned citizens joined together with the Health Department to craft a strong prevention plan for the coming mosquito season.

This document contains the West Nile Community Task Force of Shaker Heights' recommended Response Plan for 2002. The Plan emphasizes:

1. **Responding to actual risk**: for most people, the risk of contracting West Nile is very low. While there is need for caution, residents need not be overly fearful, and the City's response will reflect changes in risk throughout the mosquito season.

2. **Eliminating mosquito breeding sites**: through public action to eliminate standing water.

3. **Controlling mosquitoes at the larval stage**: through vigilant surveillance and relatively non-toxic bacterial and insect growth inhibitor treatment.

4. **Teaching personal protection techniques**: broadly advertised in a thorough publicity campaign.

5. **Using pesticides cautiously**: waiting until there is a documented case of West Nile encephalitis before insecticide spraying is considered.

6. **Assisting higher risk groups**: addressing the needs of senior citizens for screen repair, gutter cleaning, and mosquito repellent.

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Thanks especially to our sponsors:

Shaker Heights Health Department
Heinen's Grocery Store
Shaker Heights PTO Council
Onaway Community Organization
Nature Center at Shaker Lakes
Boulevard, Fernway and Malvern Associations
Lomond, Ludlow, Mercer, Moreland on the Move, and Sussex Community Associations

HUMAN WEST NILE VIRUS INFECTION: AN OVERVIEW

The West Nile virus (WNV) was first described in a Ugandan woman with fever in 1937. Over the ensuing decades the virus was found to cause human infection over much of Africa, the Middle East, and western Asia. Infection with WNV was felt to almost invariably result in a brief, rather mild illness consisting of fever, headache, rash, and muscle and joint aches. Beginning in the mid-1990s, more severe illness with prominent involvement of the central nervous system began to appear in locales including Algeria, Romania, and Russia. In the summer of 1999, an outbreak of encephalitis (a severe central nervous system infection) appeared in individuals in the New York City area, coincident with a die-off of both native crows and exotic birds in the area. After initial misdiagnosis as St. Louis encephalitis, WNV infection was identified. By late September 1999, 62 human cases and 7 deaths in the greater NYC area had been recognized. WNV has persisted in the U. S. and in fact has quickly expanded its range, with states from New Hampshire to North Carolina showing presence of the virus in 2000, while virtually all states east of the Mississippi were involved in 2001. The life cycle of WNV involves spread from bird to bird by mosquitoes, chiefly *Culex pipiens* and *Culex restuans*. Crows and blue jays appear particularly susceptible to infection, and dead crows have proven especially helpful in suggesting the presence of the virus in a given location. Humans (and horses) are infected incidentally, and do not appear to play a role in maintaining the virus in nature. Whether *C. pipiens* and *C. restuans* (both species that prefer to feed on birds) are responsible for human infections, or whether the latter occur through the bites of other species, is not clear at present.

Disease in humans appears 3 to 15 days after the bite of an infected mosquito, and a wide spectrum of illness may occur. Most infections are asymptomatic and thus not suspected, while other individuals display symptoms that may include fever, headache, muscle and joint aches, gastrointestinal complaints, and rash, lasting one week or less. As this constellation of symptoms mimics infection with a variety of other viruses, the vast majority of these individuals will not be recognized as having WNV infection. A few patients will display more severe illness affecting the central nervous system, either aseptic meningitis (fever, severe headache, stiff neck; with abnormal spinal fluid) or encephalitis (fever, mental status changes ranging from drowsiness to coma, and in some cases muscle weakness). The elderly are at disproportionately increased risk of severe forms of disease, with virtually all severe disease (and all deaths) occurring in those over age 50. Importantly, only a very small percentage of those infected with WNV will develop severe disease, with available data suggesting approximately 150 infections for every case of meningitis or encephalitis. The range of persons showing evidence of WNV infection in the blood in

areas where the virus is known to be actively circulating in birds and mosquitoes has varied widely; from a high of 1 in 40 in northern Queens in 1999, to none of a group of 730 individuals in Connecticut in 2000. The reasons for this disparity are not fully understood at present. Virus transmission may be reduced by a preventive program of surveillance and mosquito reduction. Avoidance of infection in areas with circulating virus may be accomplished through prevention of mosquito bites. Important personal protective measures include wearing long pants and sleeves when out during evening hours, appropriate use of DEET-containing mosquito repellents, and avoidance of areas with high concentrations of mosquitoes. At present no human vaccine against WNV exists.

Summary West Nile Virus Response Plan 2002

	Larval Surveillance and Control	Adult Mosquito Surveillance and Control	Bird and Human Surveillance; Other	Information and Outreach
Risk Level 0: Off season. No current year activity detected.	Develop Response Plan; set up mapping program	Develop Response Plan; baseline mosquito population and distribution data; set up mapping program	Develop Response Plan; set up mapping program; investigate non-toxic control techniques	Develop Response Plan (contact neighboring cities); update Hot Line and Web Site; prepare public info campaign; develop assistance programs for seniors, low- income residents; hold public meetings (3/02)
Risk Level 1: WNV activity in prior year in Shaker or adjacent community and mosquito season begins.	Maintain weather data base; assess catch basins, marshes, backyards, and begin breeding site reduction (citizens participate); random sampling of larval habitats to gauge population and species; bacterial larvaciding (pre and post tests to measure success); mapping	Mosquito trapping to identify species and to test for virus; adulticing not necessary	Collect dead birds to test for virus; watch for human cases	Begin public info campaign: -community mailing, emphasizing prevention -info to medical personnel & vets -posters -Hot Line and Web site -info at public events - "no standing water" ordinance publicity -initiate assistance programs
Risk Level 2: WNV-infected birds identified in Shaker and/or unusual rise in mosquito populations.	Continue bacterial larvaciding (with pre and post tests); possibly consider lowest environmental impact chemical agents; intensify search for breeding sites; begin notifying residents not in compliance with Standing Water	Continue trapping, species identification and testing for virus; adulticiding not necessary	Continue dead bird collection and testing; watch for human cases	Continue public info campaign: -emphasize how to find and eliminate mosquito breeding sites -personal protection -Hot Line and Web site info
Risk Level 3: WNV identified in multiple birds, or WNV in a pool of bird-biting mosquitos in Shaker.	Continue larvaciding as above; consider increasing range of sampling effort to find breeding sites overlooked; increase sampling in habitat of mammal-biting mosquitos; begin enforcing Standing Water Ordinance.	Continue trapping, etc., as above; adulticiding not necessary	Continue bird collection as long as deemed necessary; watch for human cases	Continue public info campaign: -add how to recognize symptoms of WNV -alert high risk groups (immuno-suppressed, elderly, etc.) about need for personal protection

	Larval Surveillance and Control	Adult Mosquito Surveillance and Control	Bird and Human Surveillance; Other	Information and Outreach
Risk Level 4: Identification of increasing numbers of WNV- infected birds, rising or high WNV rates in mosquitos, and a WNV positive pool of mammal- biting mosquitos, or confirmed WN Encephalitis in a non-human mammalian species	Increase larvaciding and surveillance as above	Intensify adult sampling; obtain surveillance data from neighboring communities; adulticiding not necessary, however, prepare for possibility of targeted ground-based adulticiding; develop protocol for determining efficacy of adulticiding should it occur	Continue bird collection asl long as deemed necessary; watch for human cases	Community Health Warning: -report heightened mammal-biting mosquito activity -prepare residents in case spraying should become nececessary...specify: ---decision factors ---notification process ---what to do if spraying occurs ---personal protection, etc. -expand press coverage -post alerts a high risk locations
Risk Level 5: Locally acquired human case of WN Encephalitis. Continued rise of WNV-infected birds and mosquitos, esp. human-biting mosquitos.	Continue larvaciding and surveillance as above	Consider targeted ground-based adulticiding with pyrethroid pesticide, considering: -risk of more human cases -weather conditions -mosquito population density and trends -efficacy of adulticiding (conduct pre & post tests) -community acceptance	Continue bird collection as long as deemed necessary; watch for and monitor human cases	Community Health Alert: -notify residents that spraying may become necessary IF SPRAYING NECESSARY, INITIATE SPRAY PROTOCOL: -24 hour notice -Hot Line and Web site info -Notices posted at street corners -TV crawls; radio, press coverage -Alerts for special risk groups
Risk Level 6: Multiiple human cases of WN Encephalitis and rising populations of WNV- infected mosquitos and mammal-biting mosquitos	Continue larvaciding and surveillance as above	Consider targeted adulticiding as above	Continue bird collection as long as deemed necessary; watch for and monitor human cases	Community Health Alert (as above)

Surveillance Committee Report

by Joe B. Keiper, Ph.D.
Curator of Invertebrate Zoology
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Adults

Overview: Adult surveillance is a practical method of following adult activity within a given area. Female mosquitoes (a.k.a., host-seeking adults) require a blood meal to produce eggs, and take their blood from a variety of animal species (including humans, livestock, wild mammals, birds, and reptiles) depending on the mosquito species. To find a host, females use visual and olfactory cues, and they have the ability to follow plumes of carbon dioxide produced by host respiration. Dry ice is an effective means of simulating a host, and is the bait for dry ice suction traps. These traps are positioned in late afternoon near areas of suspected or known breeding and left to operate until the following morning. Host-seeking adults are drawn to the bait, and a battery powered suction trap obtains the adults in a mesh bag. These traps are typically run weekly during the breeding season (late April to October).

Often, dry ice baited traps are augmented with a UV light that is very attractive to insects. It is recommended not to use the UV light in urban areas due to the increased chance of theft or vandalism, unless a relatively secure location is used.

Benefits: Adult surveillance obtains host-seeking female mosquitoes which are fairly easy to identify. The traps are easy to set up and tear down, and require minimal maintenance. Unfortunately, once adult trapping detects problematic levels of mosquito production in an area, reproduction and viral transmission may have already occurred. However, such a situation will give insight into how to improve surveillance.

It is recommended that, although adult surveillance is beneficial and should be done in Shaker Heights, larval surveillance will provide a potentially better tool for control, and stands a better chance of controlling mosquito populations and thus reducing the chances of the transmission of West Nile Virus.

Larvae

Overview: Mosquito females typically lay eggs in standing water. Flowing water habitats such as streams are rarely utilized (unless stagnant pools form at the periphery after a period of high water has ended). Egg hatch may occur in 24 hours if temperatures are warm and humidity is $\geq$50%. The first stage, or instar, larva hatches from the egg and begins feeding immediately, generally on organic particles suspended in the water column. The larva will go through a series of molts, forming the second, third, and fourth instars. Mature, fourth instar larvae are produced approximately 2 weeks following egg hatch. Only third and fourth instars can be identified to species reliably.

When the fourth instar has matured, the pupa is formed. This is a non-feeding "resting" stage where metamorphosis from larva to adult occurs. The pupal stage may last as little as two days under warm, humid conditions, such as those in Shaker Heights during the early and middle summer months. The pupa does not feed.

Both the larva and the pupa require atmospheric air for respiration. Both stages have specialized breathing structures that allow the immature insect to remain suspended from the water surface to maintain contact with the atmosphere.

Larval surveillance provides a significant benefit over adult sampling in that significant production can be detected prior to adult activity. It is also possible that fast action can kill off large portions of larval populations prior to metamorphosis to the adult stage. West Nile Virus is no threat to humans without adult mosquito vectors.

Surveillance of the larval stages is accomplished using mosquito dippers. This simple device consists of a 350 ml dipping cup positioned at the end of a pole. A trained person uses this to take a sample of the water near the surface (mosquito respiration requires the immature stages to reside near the water surface most of the time). Mosquito larvae are thus collected and preserved in collection vials, and the specimens may be identified to genus or species (depending on the stage the larvae are in) with a low power microscope in the laboratory.

Benefits: As mentioned above, large larval populations are harbingers of significant adult production. The greater the number of adults, the greater the chance of disease transmission. Therefore larval surveillance is recommended (although, adult sampling is strongly encouraged).

After Shaker Heights is visually inspected, areas suspected to represent problematic mosquito breeding areas should be designated for routine (i.e., weekly) sampling using dippers. Generally, 10-20 samples per 0.1 ha will be required to obtain a representative sample. The number of samples can be reduced if conditions permit (e.g., uniform habitat). If averages of >1 larva per sample are obtained, the area the sample is taken should be considered problematic and treated with larval insecticides (see below).

Due to the number of standing water habitats present in Shaker Heights, representative areas should be sampled. If a particular area is found to support significant populations of larvae, that area, and all areas similar to it, should be treated with insecticides. Sampled sites should be selected randomly. For example, if a targeted area supports 100 sewer catch basins, something on the order of 10% should be randomly selected and sampled. If any of the 10% sampled exhibit significant production, all catch basins should be treated.

Treatment of a high production area should be done with a *B.t.i.* or *B.s.* (*Bacillus thuringiensis israelensis* or *Bacillus sphaericus*) oriented product, such as Vectolex®. Use of methoprene, an insect-specific growth inhibitor, may also be used in conjunction with the bacterial insecticides. It is strongly recommended that application be done under the supervision of Ohio Mosquito Control Association, particularly with respect to application rates and duration. Bacterial insecticides are more or less specific in their effects on pestiferous mosquito larvae, and appear harmless to non-target species (e.g., beneficial aquatic insects). Bacterial insecticides and growth inhibitors are useful only on the larval stages. The *bti* and *bs* produce proteins that, when ingested by larvae, quickly break down the gut of the mosquito; cause of death is starvation.

If a significant larval population is missed, workers may discover a large pupal population in a given location. The only effective means of pupal reduction is physical removal (if the container is small, such as a bird bath), or use of alcohol- or oil-based products that eliminate the surface tension of the water. The breathing apparatus of mosquito pupae requires the relatively firm surface film of water from which to support themselves; cause of death is drowning.

Sample sites

1. Catch basins

Any catch basins that will support water for a week or more should be targeted for sampling. If possible, all catch basins should be assigned a number. A random number generator should be used to assign 10% of all catch basins to a sampling program. The catch basins should be sampled weekly. If larval production occurs, particularly *Culex* species, treatment of all Shaker Heights catch basins should be done with bacterial insecticides.

2. Lakes

Lakes and ponds will support mosquito populations, particularly if any of the following conditions are present:

a. Dense beds of emergent (e.g., cattails) or floating (e.g. water lilies) vegetation are present. This provides physical structure for protection of both the adults and immatures. Die back of plants provides vast amounts of organic matter that will provide larval food sources.

b. The absence of significant fish (e.g., sunfish or bluegills) that would normally act as predators of larvae and pupae.

c. High organic input, such as sewage, will provide a strong algal/bacterial food supply.

Lake and pond shorelines are more complex than catch basins, and will require multiple dip samples to detect production. Taking only a few samples will frequently miss problematic areas due to the patchy nature of mosquito production in natural habitats. When multiple samples are taken, larval and pupal counts should be recorded separately for each individual sample so that an average number of larvae per sample can be calculated. This will prevent over-zealous applications of insecticides if a “sweet spot” is hit during sampling (a “sweet spot” may occur in a spot where an egg mass just hatched, and literally hundreds of larvae can be obtained in one dip which will obscure the results).

3. Other sites

Depending on the results of larval surveillance, other sites productive of significant numbers of mosquito larvae, such as pools of standing water resulting from spring snowmelt or ditches, or sewer sites, may warrant application of larvacides.

Final thoughts

The use of larval and adult sampling in conjunction with each other should prove to be an effective means of assessing vector risk in Shaker Heights. Use of the bacterial insecticides outlined above has proven effective and reliable in other areas. Larval and adult sampling are both relatively simple methodologically. Identifications of the common species can be attained with little training, and the common species will undoubtedly represent approximately 90% of all specimens captured.

Chemical Interventions Committee

Summary

by Ryan Sullivan, Committee Chairman

The mandate of our committee was to investigate the risk of West Nile encephalitis to the population in Shaker and then explore and recommend the most effective methods for minimizing this risk with the least adverse effects on human health and our local ecology.

Risk Assessment

Studying the West Nile outbreaks in the greater New York City area in 1999-2000 and the spread of the disease geographically along the East Atlantic coast is instructive. West Nile is a rare disease characterized by normally very low risk to human populations although rare, localized pockets of infections do occur. The disease has been in the US for three years and scientists are still struggling to develop models, which quantify risk and determine all the factors, which contribute. Some early indicators would include avian and mosquito infection rates as well as human population density. In Shaker in 2001, we had both high bird deaths and mosquito infection but no diagnosed human case, thus highlighting the difficulty in transmission of serious infections to the human population.

Larvaciding

The best strategy to prevent adult mosquito populations from developing is by using an active and thorough surveillance program for locating mosquito breeding sites, and then treating these locations with the most effective, environmentally benign larvacides. Our committee conducted a thorough investigation and found that there are many effective materials that meet these criteria. Two bacterial larvacides, designated Bti and Bs are selective and proven effective in eliminating mosquito larvae. Methoprene, a biochemical agent, is effective and mostly selective for mosquitoes as are specifically formulated oils and films. Treatment with these materials will then be followed by a diligent surveillance of adult mosquito populations to insure that the right places have been targeted. Private property can be a significant source of mosquitoes, and by cooperating in a community wide effort to eliminate standing water in yards, driveways and other places, the public can actively participate in risk reduction.

Personal Protection

The second proven strategy for disease prevention is personal protection. There are a variety of products, which are effective as repellents, and many more being investigated.

The most popular and effective repellents contain varying amounts of a synthetic organic compound DEET. DEET users report infrequent but sometimes serious adverse reactions when using products containing this material. Therefore, experts recommend care in using repellents containing DEET, especially with children, even though most incidents have resulted from misuse. Products containing from (25-30%) are recommended for adults and less than 10% for children. There are also natural plant based mosquito repellents, but many have not been adequately tested.

When surveillance indicates that mosquito populations are rising, the use of repellents, common sense clothing, and avoidance of places and times that mosquitoes congregate is a highly effective preventive strategy. People over 50 and immune compromised individuals are at the highest risk for serious infections, so they should be particularly cautious. In the event that the surveillance methods fail to identify the major mosquito breeding habitats, then a community alert should be called to inform citizens of the need to be ever vigilant.

Adulticiding

Only in the event of a locally acquired human case, which would validate the ability of the virus to move from animal populations to the human populations in Shaker, should more drastic measures be considered. The use of pesticides to kill adult mosquitoes is the least effective method of mosquito control and should be used only as a last resort. Our focus was on a specific class of pesticides called pyrethroids, which are widely used for mosquito control. These materials have been shown to have significant negative effects on test animals in laboratory studies and epidemiological studies of chronically exposed populations do show increases in several serious acute and chronic conditions, but these human studies are complicated by exposures to a wide range of pesticides. The risk of the use of pesticides for mosquito control is uncertain, at present, although the potential for serious population-wide effects exists. There are major questions about the efficacy of spray operations in urban/suburban areas as well as a lack of evidence that spraying actually is effective in controlling this disease. A number of researchers are focusing on this area but the answers will not be known for several years. In the presence of such uncertainty about the effectiveness and health risks posed by these pesticides, the committee recommends that these materials be used in the event of a public health emergency and only in areas where their use would be effective.

Information and Outreach Committee
Summary

by Rosemary Woodruff, Chairman

Goals:
The overall goal of the West Nile response plan is to reduce the risk of human disease, and correspondingly to keep Shaker Heights from reaching a risk level when pesticide spraying might become necessary. Our committee's specific goals are:

1. To address the community's fears about the WNV (and possible responses) by providing accurate information as to the nature of the disease and its prevention.

2. To build community understanding and support for the rationale behind the chosen response plan and decision thresholds it sets.

3. To create the best possible community-wide prevention campaign.

4. To prepare a public notification strategy for a possible emergency spray situation.

Public Education and Outreach Plan--Overview:

1. Emphasizes prevention and personal responsibility:
   Our Slogan: **EVERY BACKYARD COUNTS**

2. Helps make prevention measures more accessible (through multiple public notices in various media) and affordable (through special programs such as screen repair discounts).

3. Keeps the community, near neighbors, and key players well informed <u>as events transpire</u>.

4. Clarifies thresholds for action and keeps decision factors in the public eye (which will help maintain calm as we learn to cope with this new disease).

Summary:

The WNV Information and Outreach campaign must help protect our residents from the virus and avoid the possibility of pesticide spraying this year. To that end, the message to Shaker residents about their crucial role in containing the reemergence of the disease must be timely, thorough, and well publicized. The **means of communicating** with Shaker residents will include:

-a web site (currently being developed by the City)
-a Hot Line (set up during last year's West Nile episode)
-flyers, posters, possibly community mailings, and meetings
-press releases to the media

Since Shaker Heights is surrounded by other communities, it cannot develop its plans in a vacuum. An effort will be made to coordinate with neighboring cities.

In the City of Cambridge, MA, health officials conducted surveys to gauge residents' knowledge of the means for eliminating mosquito breeding sites. Interviewers discovered that while most people were well informed, a full 37% had not taken the necessary measures to remove the standing water in their backyards. In the event that Shaker residents show a similar resistance to taking care of their puddle problems, the City may have to begin enforcing its **Standing Water Ordinance**. One task of the Information and Outreach campaign will be to publicize our City's enforcement program and our determination to follow it through.

The groups most at risk for West Nile, the immune-suppressed and the elderly, might also have the most **physical and/or financial difficulty with taking needed precautions**. The Response Plan calls for an investigation of ways the community can assist people with such things as screen repair, gutter clean-outs, and backyard audits. A Caring Neighbor Network might be an excellent organizing strategy for neighborhood organizations and provide needed help to our ill or frail residents. A screen repair discount has already been arranged with Shaker Heights Hardware. Other avenues need to be examined as well.

A crucial component of the Response Plan is this year's **Spray Protocol** which will be set up well in advance, in case spraying becomes necessary. The City has guaranteed that if spraying cannot be avoided, residents in the target areas will be given 24 hours' notice in a format that will be "impossible to miss." Large placards on fire hydrants on street lights will announce the imminence of spraying and direct people to the places where they can get more detailed information. Even partial barricades with signs have been contemplated. With the excellent

surveillance program the City will devise, the need for spraying should be minimized, and if carried out, limited to the “hot spots” identified by the surveillance team.
If, as the mosquito population rises, a decision to use pesticides on adult mosquitoes is contemplated, it will be essential to keep the community informed . This will help **prepare Shaker’s residents for all eventualities** and **keep them “in the loop” of the City’s decision-making**. Likewise if the City chooses not to spray, the community will be well-informed about, and we hope, comfortable with, the rationale for the cautious approach. If needless fear of West Nile virus takes hold among our residents, we will not have been effective in our information campaign.

In sum, the WNV information and outreach effort will help Shaker citizens take the necessary precautions against mosquitoes and the disease, reduce unnecessary worry, and help avoid the need to spray. Good public information will permit a effective citizen response, and since **Every Backyard Counts**, this is the essential goal of our campaign.

Addendum #1

An opinion dissenting from the West Nile Task Force Report, in favor of considering adulticiding (insecticide spraying of adult mosquitoes) at "Risk Level 4" for West Nile Virus*

SUMMARY: The cornerstone of reducing risk for West Nile disease is a strong surveillance and prevention program, as well as personal protection advice for residents. The Task Force has worked hard to develop such a program. However, if spraying of adult mosquitoes becomes necessary, it does not make sense to wait until there is a human case (as recommended in the Task Force Response Matrix) because spraying would be too late to protect many others at risk. Therefore, this opinion argues that the warning sign of virus-positive mammal-biting mosquitoes should be sufficient to trigger consideration of spraying. There are unresolved issues about effectiveness of spraying, but most experts believe it will temporarily reduce the local mammal-biting mosquito population, and therefore the risk of human disease. Known acute side effects of spraying are eye and respiratory irritation, but these can be largely prevented by vigorous community advisories to avoid direct exposure, and are far less worrisome than the risk of serious West Nile disease. Many factors dealing with methods, efficacy, weather and season, etc. must be considered even when spraying is an option. The threshold recommended here coincides with that of several states, and yet requires more evidence of risk than that recommended by Cuyahoga County and Ohio.

OPINION:

Everyone agrees that adulticiding is the least effective method to prevent West Nile disease, and that the major effort should be prevention of mosquito infestation and of human exposure. Yet, there is good reason to consider adulticiding when prevention is not effective enough and signs of high risk appear. These signs include first and foremost the appearance of Virus-infected human-biting mosquitoes, especially if they are present in moderate or large numbers ("Risk level 4" in the proposed Shaker Heights response matrix). In fact, many mosquito programs (e.g. CDC, Cuyahoga County, states of Ohio and No. Carolina) recommend consideration of adulticiding at even lower risk levels when just infected bird-biting mosquitoes appear, since these mosquitoes will occasionally bite humans. This was the basis for adulticiding in Shaker Heights last summer.

The Shaker West Nile Task Force report proposes we wait until a human case appears (“Risk level 5”), based on the hope that at worst only a single serious case will occur (as has happened in several localities). However, if Shaker Heights becomes similar to Staten Island in 2000, when high levels of infected crows and bird-biting mosquitoes (which Shaker Heights had in 2001) as well as infected mammal-biting mosquitoes (which we don't know about) occurred, then waiting for the first human case (Risk Level 5) before adulticiding could be too late. This is because the total time for incubation after the bite (about 5-15 days) and for positive virus identification of a human case (up to 2 weeks) could take as much as four weeks. Since the 10 human cases in Staten Island occurred over about 6 weeks after the first case, more than half of those cases might have been prevented with more effective adulticiding triggered by the appearance of and directed at infected

mammal-biting mosquitoes. On the other hand, based on the Staten Island experience with an overall risk of disease of about 1 per 40,000 persons, the risk of more than one serious human case in Shaker Heights is small.

In any event, the response plans of Massachusetts, New York and Connecticut are essentially identical to what we propose in this dissenting opinion. Few places (e.g. Cambridge, MA) delay adulticiding until Risk Level 5, as in the Task Force proposal, although there may be others unknown to us. As noted earlier, the Task Force choice of Risk level 5 far exceeds that of CDC, Ohio and Cuyahoga County in the risk threshold for adulticiding.

Consideration of adulticiding may prove quite different from a decision to do so. First, ground-level spraying would be justified only if mammal-biting mosquitoes were found in residential areas, and if other factors (e.g. weather, temperature, early or late season) were also taken in account. Spraying of bird-biting mosquitoes at ground level is tricky because depending on the time of application, female mosquitoes may be in the trees seeking hosts. This is less of a problem with mammal-biting mosquitoes - the major target of spraying at Risk level 4 - because they tend to rest in vegetation near the ground where they would be susceptible to ground-based spraying. We think it unwise for the response plan to restrict the method of spraying (different types of ground or aerial spraying for large areas) since new information on effective spraying or special conditions should be major deciding factors.

In the end, we are talking about a public policy decision, in which the risk of minor human reactions to spray need to be balanced against the risk of serious human disease. A large Environmental Impact study by NYC (summarized at www.ci.nyc.ny.us/html/doh/pdf/wnv/ffind701.pdf) concluded that it is unlikely there would be acute health effects of spraying other than respiratory or eye irritation. Certainly, special efforts should be taken to warn everyone and as a precaution highly chemically sensitive or asthmatic individuals to stay indoors. It is also unlikely that, with sufficient community warnings, several hours of exposure a night over three nights would lead to the chronic health effects observed in other populations (e.g. agricultural workers exposed to pesticides for long periods of time). We actually have far more serious concerns about protection of the adulticide workers and also the chronic exposures to pesticides that we receive in non-organic foods every day of our lives. Finally, ecological effects in residential areas could be minimized by spraying at times of day when few other flying insects are active. Spraying of marshes or woodlands should be conducted, if at all, only with careful choice of insecticide. In these habitats, posting of prominent warnings advising non-entry or personal use of strong repellants may be the better choice.

Forthcoming national information could substantially strengthen or weaken the conclusions given above. In addition, careful monitoring of all interventions in Shaker Heights this coming season will provide knowledge giving us better guidance for future years.

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*Risk Level 3: Identification of WNV in multiple birds, or WNV in a pool of bird-biting mosquitoes in a community.
Risk Level 4: Identification of continued high or increasing numbers of WNV-infected birds, rising or high WNV minimum infection rate in mosquitoes; and a WNV positive pool of mammal-biting mosquitoes, or laboratory confirmed WN Encephalitis in a non-human animal species.
Risk Level 5: Laboratory confirmed, locally acquired human case, and continued rise of WNV infected birds and numbers of mosquitoes, especially human-biting mosquitoes

Addendum #2:

A dissenting opinion objecting to the use of pesticides as an option

Members of the task force would like to take this opportunity to voice our objection to the use of pesticides as an option to be included in the Shaker Heights Response Plan to West Nile virus. Our decision is based on two essential issues: that ground based spraying has been shown to be ineffective in controlling mosquito populations and that pesticides are toxic to humans. Current science continues to show that there is no correlation between spraying pesticides on adult mosquitoes and reducing the incidence of West Nile virus in humans.

The Response Plan recognizes six different risk levels with consequent responses. Level 5 includes the appearance of a human case of West Nile virus and, at that level, the option of using broadcast, ground-level spraying with pesticides in an attempt to control and eliminate the mosquitoes carrying the West Nile virus. The mosquitoes carrying the virus are referred to as the "bridge-vectors". According to both the American Mosquito Control Association and the Centers for Disease Control (CDC) ground level, truck mounted spraying is not an effective means of control of these mosquitoes. In fact one expert* doubted there would be any measurable difference in the mosquito population before and after ground spraying. The option of aerial spraying is even less acceptable on grounds of health concerns and cost.

The issue of toxicity of pesticides continues to be a topic of concern and debate. Permethrin is the pesticide considered for use in the Shaker Heights Response Plan. It is a type of pyrethroid, a class of synthetic pesticides, that has been found to have toxic effects on non-mosquitoes including humans, other mammals, and fish. Initial toxicity to permethrin includes redness and burning sensation of the skin, nerve irritation, redness and pain in the eyes, and inhalation problems. These symptoms were identified when extremely low dilutions of the chemical were used. With stronger concentrations, more severe symptoms were noted. Sub-acute or delayed results that have been reported include liver enlargement, nerve damage, and impairment of the immune system. Long-term effects are not as clear. On the issue of causing cancer, the experts state that the information is "inconclusive". Its effect on endocrine function has been questioned. It is to be banned for agricultural use by the European Union in 2003. It should be noted that the United States Environmental Protection Agency (EPA) states that no pesticides can be considered “safe.”

Certain non-human animals are much more severely affected. According to one of the manufacturers of the pesticide, cats are much more sensitive to permethrin than humans or than other common pets such as dogs. Toxic symptoms including severe skin irritation, nerve damage and death have occurred at very low dilutions of the chemical. In addition, it is lethal to fish. Because the chemical strongly binds to the soil, there is not much run-off from the ground once it adheres. However, fish

in water areas that are sprayed are at risk of completely being destroyed. In addition, because of the adherence of the chemical to the soil, it actually can remain in the ground for up to 36 days before it decomposes, with the average time 6-30 days.

*Dr. David Pimental, Cornell University Entomologist

Our Task Force has created a well thought out response to the potential problem of West Nile virus. We strongly endorse the implementation of the surveillance, the application of non-toxic larvacides, and most importantly, the education of residents about cleaning up our community to minimize habitats for mosquito breeding. These actions have been shown to be the most effective and safest approaches to mosquito control. Much study and research remains to be done regarding the occurrence of West Nile virus. Conclusive evidence is not yet available regarding the impact of pyrethroid pesticides on endocrine dysfunction, neurological damage, and cancer. Without clear evidence that pesticide spraying will have a significant impact on the targeted mosquito population and with the toxicity associated with the use of pesticides, we do not want our community exposed to these potentially dangerous chemicals.

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