Integrated Valencia County Mosquito and Vector Control Program

Environmental Health Department 2011

PUBLIC EDUCATION Background

Integrated Mosquito Management (IMM)

IMM as defined by the NM Department of Epidemiology, Vector Control Training Manual April 27 - 29 2004:

"Integrated Mosquito Management is an idea whose time has come. The concepts are not new. Growing awareness of over reliance of insecticides has rekindled enthusiasm for sound fundamental principles of mosquito control."

"The concepts of Integrated Mosquito Management resulted from 2 consequences: 1. development of insecticide resistance to mosquitos, and 2. the accumulation of chemicals in the environment. Therefore it became necessary to develop alternative methods of control."

"While insecticides may temporarily limit the pest population, they do not reduce the resources and/ or habitat of the mosquito. Interpreted Mosquito Management's practices are sustainable and limit the resources available, thus resulting in a lowered mosquito population."

"Adulticiding, applications are temporary and usually the least efficient mosquito control technique and is considered the last resort. The tendency of poorly funded or misguided mosquito control organizations is to use only Adulticiding and by pass other, often more effective options, conflicts directly with accepted practices." pg. 8

"Control of larva populations are preferred because significant populations can be eliminated. Larva are concentrated, immobile and therefore occupy a minimum area, compared to adults."

"Integrated Mosquito Management" should consist of:

1. Knowledge of the target, behavior, habitat, and identification.

2. Surveillance and monitoring, Identify the species present, locations, densities and disease potential. Presence of West Nile Virus.

3. Implementation of integrated control. Source reduction, habitat modification, biological control (including Bti and fish), Larviciding and as a last resort Adulticiding.

4. Public Education: Utilizing public awareness to eliminate mosquito breeding grounds and preventing infection with the WNV."

West Nile Virus Facts

Center for Disease Control Estimates that:
1% of mosquitos carry West Nile Virus.
80% of people inflected have no symptoms at all and never know they had the virus.
20% develop a mild fever, 1% of these develop severe symptoms.
1 out of 150 people develop severe symptoms (encephalitis which is inflammation of central nervous system).
May 10, 2004 CDC reported 1 severe case in Ohio

MOSQUITO MANAGEMENT AND CONTROL PROGRAM:

(Sources of information below: Center for Disease Control Vector Control Task Force Manual of the State of New Mexico; State of Michigan Emerging Disease Website; Colorado State Extension Service)

Background

Mosquitos and the West Nile Virus

It is critical to understand the dynamics of how WNV is transmitted and spread if we are to plan and execute an effective management program to prevent the spread of the disease. Birds are the main carriers (host) of WNV. It is in birds where the highest mortality from WNV has occurred. Once a bird is infected with the virus it becomes ill and either dies, or survives and becomes immune to the virus. This lifelong immunity is important since it means that bird will never become sick again nor be capable of spreading the virus. This is the reason that WNV has "spread" across the country from east to west as bird populations become infected then immune.

When looking at states that have had WNV for several years, some have shown a large decrease in human cases after having a large number of the cases the previous year while others had even larger numbers of cases the second or third year. After that time, when all birds have been infected, the rate of infection in humans goes down significantly.

The main route of human infection with West Nile virus is through the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds, which may circulate the virus in their blood for a few days. The virus eventually gets into the mosquito's salivary glands. During later blood meals (when mosquitoes bite), the virus may be injected into humans and animals, where it can multiply and possibly cause illness. For this to happen, a mosquito must first bite a bird and then bite a human. Only some species of mosquitoes feed on both birds and mammals. While many species of mosquito can carry the virus 70% of the positive samples have been from Culex pipiens (the house mosquito) and related species of Culex.

This is important for several reasons.

First, the Culex is a species that feeds on both mammals and birds.

Second, Culex is called the house mosquito: it breeds near human habitation. In urban areas, catch basins, artificial water-filled containers like used tires and poorly draining ditches are common production sites for Culex mosquitoes.

Additionally, most of the house mosquitoes present in a community are produced locally because the house mosquito does not fly more than 1 to 2 miles from its larval development site.

Culex quinquefasciatus, breeds in sewers, storm drains and other areas of impounded water.

Culex tarsalis is associated with agricultural areas where irrigation ditches are.

Culex salinarius readily bites and enters houses.

Lastly, it is important to recognize that Culex mosquitoes breed in relatively warm water; therefore, they are not the first mosquitoes in spring to hatch. While we may have mosquitoes in Silver City in April or May, the chances of these being Culex are very slim. Culex breeds mostly in June, July and August. That is why the first case of WNV was not reported in NM in 2003 until July with the majority of cases reported in August. Adult mosquito surveillance was conducted in 18 counties during 21 weeks, 13,000 mosquitoes tested. 12% positive for WNV. In Silver City 17 mosquitoes were trapped during two events, none tested positive for WNV.

Human cases appear to be more concentrated in area near irrigation ditches were mosquito breeding sites were more numerous. There is a bias against less severe cases because of the expensive nature of the tests. It is important to remember that even in areas where the virus is circulating; very few mosquitoes are infected with the virus. Even if the mosquito is infected, less than 1% of people who get bitten and become infected will get severely ill. The chances you will become severely ill from any one mosquito bite are extremely small.

Mosquito Management: Responsibilities

In New Mexico the control of mosquitoes is the responsibility of the county or municipality. The New Mexico Department of Health, the Office of Epidemiology and Vector Control Program specialists provide technical assistance. Within New Mexico it is the responsibility of the New Mexico Department of Agriculture, Pesticide Management Bureau for registering pesticides within the state of New Mexico.

In 2003 there were approximately 30 Vector Control programs in the state. About half are County funded and run while half are city operated. There are two private contractors

in the state that cover several counties and several cities. Many of the county programs are decades old. Began in the 1950's to control malaria carrying mosquitoes, they moved on to preventing yellow fever, dengue fever, and now the WNV. What is common about most of these programs is that they serve large agricultural areas and may have had or have significant mosquito populations.

Silver City has been commended by the state for taking a proactive approach to mosquito management. Last year, the town hired Entomology Consultants (EC) to deal with the potential problem of WNV. The company was paid a little over \$8,000 dollars and was contracted for approximately three months. EC conducted a public meeting; applied one application of growth inhibitor (a larvicide), trapped adult mosquitoes on two occasions and planned an adulticide program that was never carried out. This year, the City has spent approximately \$1500 so far on larvicides, education and training. For perspective, Dona Ana County spent \$150,000 dollars on mosquito abatement in 2003.

In summary, Integrated Mosquito Management (IMM) is the most appropriate approach to controlling mosquito populations for reducing the risk of infections by the WNV. An IMM approach includes a variety of techniques including: education and outreach, surveillance of mosquito populations, source reduction to reduce the opportunity for mosquito breeding, larviciding breeding sites to kill the pre-adult stages of mosquitoes, and adulticiding to kill remaining adults in order to further reduce the breeding populations.

Mosquito Control Options

Biological: reduction of pest populations by using living organisms encouraged by man.

Gambusia affinis: a mosquito eating fish

Biological control agents also include bacteria that are toxic to mosquito larvae but innocuous to non target organisms: ex: Bacillus thuringiensis var israelensis and Bacillus sphaericus.

Mechanical Control, includes screening windows, construction to improve drainage.

Regulatory Control, laws prohibiting tire dumps, recycling and the production of mosquito breeding sites. Includes code enforcement of local ordinances and adherence to the Mosquito Abatement Act.

Chemical Control, materials to attract and poison mosquitoes.

Sanitation. Ridding containers, cisterns, roof gutters, and tires of standing water.

Note: In Silver City, one of the most effective, wide spread and dangerously placed hatcheries for mosquito propagation is the Silver City public sewer system. Old and broken manhole covers harbor small pockets of water where mosquitoes breed. A huge percentage of the old sewer covers have one inch holes (for ease of removal). Mosquitoes enter these holes, lay eggs there, and even overwinter there.

Larval Control: Efforts to control the mosquito before it becomes a significant size adult population. The larvae are usually concentrated, relatively immobile. This can minimize the area treated and avoid treating populated areas. Broader range of control options Larvicides is less controversial that the use of adulticides. Larval control should begin early in the spring.

Adult mosquito control (also called "fogging," "spraying" or "adulticiding") is the method of mosquito control that is most familiar to the public and can be part of a comprehensive integrated mosquito control program. Adulticiding kills only mosquitoes that contact insecticide droplets; the fog soon dissipates. Although the local mosquito population is reduced for a few days, fogging does not prevent mosquitoes from re-entering the area. Because only a part of the local adult mosquito population is reduced only for a few days by adulticiding, municipalities should give priority to larval mosquito control of Culex mosquitoes. Nonetheless, when the risk of human disease is present, the only method that will reduce the population of WNV-infected mosquitoes is knowing where mosquito density poses a risk to humans and focused adulticiding to reduce the mosquito population. Treatment for control of WNV-infected adult mosquitoes is a valid and legal option for local officials to employ as a supplement to larviciding.*

Facts About Larviciding

Pre-larvicides: most granular, pellets and briquette formulation of larvicides may be applied to low-lying areas that will become flooded.

Biorational larvicides: Mosquito specific bacteria and Insect Growth Regulators.

Larvicide formulations can come in liquid, granular, or solid, must be applied appropriately for habitat.

1.Bacillus thuringiensis var israelensis (Bti) (Several brands: Summit, VectoBac, AQUQBAC) aqueous suspension, technical powder, pellets, granules, water dispersible granules and briquettes/dunks.

2. Bacillus sphaericus (Bs) (Vectolex) granules, water soluble pouch and water dispersible granules. Particularly useful in highly polluted waters.

Mosquito specific bacteria are the least expensive and least invasive in the environment.

BT is an environmentally responsible bio-larvicide derived from Bacillus a naturally occurring spore and crystal forming soil bacterium. The active ingredient of Bacillus is a crystalline delta-endotoxin. Mosquito larvae are killed through the ingestion of the delta endotoxin. When larvae ingest the Bacillus the delta-endotoxin reacts with the stomach secretions and causes gut paralysis and death. Bacillus is the most widely used mosquito larvicide in the United States. Research and field trials have shown that Bti and Bs have no toxic effects on beneficial and predacious arthropods and insects such as honeybees, beetles, mayflies, dragonflies, damselflies, stoneflies, caddisflies. No toxicity from Bti or Bs was observed in crustacea including larvivorous copepod species, fish, oysters, shrimp and crabs.

3. Methroprene, an insect growth regulator (IGR) (Altosid, Pre-Strike) briquettes, granules, liquid, liquid concentrate.

IGRs mimic an essential hormone present in high concentration in early larvae states but low in late stages. Exposure to late larva to the IGR upsets the molting process and kills mosquitoes in the pupa stage. IGR's inhibit the ability of the larvae to reattach their muscles to the exoskeleton during molting. Films prevent the insect from remaining at the surface of the water by reducing surfaces tension. The larva and pupae deplete their energy reserves trying to stay at the surface. The positive characteristics of IGR is its specificity and its minimal impact on non-target species. However, methroprene is toxic to all members of the Diptera order which includes a wide variety of flies and can be toxic to other insects if not applied correctly.

Its use in Silver City should be limited to more urban environments such as sewers, drain basins, etc.

Adult Mosquito Management and Control

Former mosquito control programs relied heavily on the use of insecticides with their application being done periodically without regard to the numbers of mosquitoes or even their presence. Today, programs use a combination of resource management, source reduction, habitat modification, biological control, larviciding and adulticiding. the decision to apply pesticides for mosquito control is based on surveillance data that substantiates the need for and the timing of application.

Obstacles to Adulticiding (Fogging/Spraying)

From the NM State Vector Control Handbook:

- "adulticiding (with pesticides) provides only a temporary population reduction"

- "(adulticiding) is usually the least efficient mosquito control technique, and is considered the last resort"

- "the tendency of misguided mosquito control organizations to use only adulticides and bypass other, often more effective options available, conflicts directly with accepted practice"

- "for effective adult mosquito control, the Ultra Low Volume droplets must drift through the habitat and impinge on flying mosquitoes". (For this to happen, conditions must be virtually dead calm, the operator must be highly skilled, the fogging machine must be properly calibrated -droplets too fine or too heavy do not have the desired effect of blocking the mosquito "vent" tubes - and the target areas must be accurately mapped and executed.)" Additionally, if fogging with adulticides (pesticides) is employed, a host of measures must be attended to in order to avoid accusations of negligence:

- proper training in use of toxic substances and equipment

- stringent public notification and consent procedures enacted

- selection and use of an adulticide (insecticide) which promises desired kill ratios if used properly while causing the minimum of environmental and human immune system degradation (both of which are inevitable to some degree)

- an agreed upon process by which pesticide "fog" or "no fog" decisions are reached as the season progresses.

- capital outlay for training and equipment, or contract services.

In the case of Silver City, the initial investment into the equipment and pesticides for adulticiding is estimated to run between \$10-\$12,000. At the present time, the town of Silver City has no options for contract services. The task force was not able to identify any private contractors currently interested in serving the Silver City area.

Potential Adulticides

1) Malathion (which attacks the central nervous system of insects and is increasingly implicated in human nervous disorders such as allergic reactions, Lou Gehrig's Disease, dementia and Alzheimer's disease) is no longer in use for fogging, with rare exceptions.

2) Pyrethroids (synthetic versions of a natural root substance) are the current insecticide of choice, and

a) get absorbed by humans through the skin (especially by infants and the young) or by inhalation

b) bond with plastics, such as toys, lawn furniture, etc.

c) may have a direct effect on brain and nervous system function

d) can cause allergic reaction, dizziness, nausea, skin and throat irritation

e) are extremely toxic to fish, bees, and many birds and should never be applied near water

f) in summary, like any toxin, it must be detoxified by the liver and immune system, and with repeated exposure (adult mosquitoes hatch from eggs in less than a week's time) encourages the rise of chronic inflammation within humans.

g)Their positive attributes are:

- 1) they break down readily in light (for this reason, they are applied at night)
- 2) they are metabolized by the human liver
- 3) are the least toxic adulticide currently available

PUBLIC NOTIFICATION Background

A crucial component in the town's action plan for prevention of West Nile Virus is a fully developed Notification Plan for use only in the event that the three-person designated Decision Team rules that strict fogging standards have been met, climate and environmental conditions are favorable, and that spraying pesticides is unavoidable.

Full public notification must be done to guarantee that the town meets its legal and moral obligations to alert residents about the planned application of adulticides and to assure that citizens may take necessary precautions, particularly when there are special health concerns.

1. What Does the Public Need to Know about Adulticides?

In an effort to provide essential information on West Nile Virus and mosquito adulticiding in Silver City, residents will need access to the following frequently asked questions and answers:

2. WHAT ARE MOSQUITO ADULTICIDES?

Adulticides are specific insecticides applied to kill adult mosquitoes. The most commonly used are synthetic pyrethroids. Pyrethroids are most suitable because they are short lived, break down rapidly in light and rapidly break down in humans. Negative effects of pyrethroids include that they do not readily break down in water, are lethal to bees, fish, and most aquatic life and readily bind to soils.

3. WHAT IS ADULTICIDING?

Adulticiding is the application of insecticides to control mosquito adults. This is usually the least efficient mosquito control technique, however it is an important part of an effective mosquito management program if it is based on careful mosquito surveillance information. The town has already done extensive larviciding with an environmentally friendly bacillus and has set up an efficient monitoring and analysis program.

4. HOW DOES MOSQUITO ADULTICIDING WORK?

The idea behind mosquito adulticiding is to release the insecticide in as many very fine droplets as possible. Adult mosquitoes are killed when they come in contact with one of these droplets as they are flying. Very fine droplets (via fogging from a truck dispenser) are used because the more droplets there are and the longer they stay in the air, the better the chances of reaching mosquitoes.

5. WHERE ARE ADULTICIDES USED TO KILL MOSQUITOES?

Mosquito adulticides usually are applied as a last resort in areas where public health officials have decided that strict standards have been met and the health risks from WNV or other mosquito borne illness outweigh the risk from exposure to insecticide. In Silver City, the decision is made by a council-designated three-person team using a carefully delineated set of standards to make certain such action is absolutely necessary. The public is to be given widespread 72-hours' notice before fogging will proceed. The same widespread notice will be given before each application.

6. ARE ADULTICIDES ANY BETTER AT KILLING MOSQUITOES THAN PESTICIDES -CALLED LARVICIDES -- THAT ATTACK LARVAL MOSQUITOES?

The use of larvicides generally is considered preferable to the use of adulticides because use of larvicides prevents the appearance of blood feeding adults, larvicides can provide a month of control, rather than the few hours provided by fogging with adulticides, and larvicides are generally much less toxic than adulticides and are applied in such a way that there is much less human exposure, and larvicides are easier to use and are normally applied to smaller areas. In terms of costs? Larviciding costs but a fraction of the overall expense of notification and actually applying adulticides.

7. IF WE USE ADULTICIDES FOR MOSQUITO CONTROL NOW, DOES THAT MEAN WE DO NOT NEED TO USE LARVICIDES?

Effective mosquito control programs emphasize larval control. Larvicides are used first, with adulticides used only as a last resort. The use of larvicides minimizes the need for adult control but may not eliminate it altogether. Adult mosquitoes are strong fliers and may move several miles to feed. Also, certain breeding areas may be inaccessible or may be untreatable for environmental or economic reasons.

8. WHAT PRECAUTIONS DO I TAKE IF SPRAYING BECOMES NECESSARY?

These agents are used only in certain high risk areas and residents will be given the choice of opting in or out of fogging for their properties. Precautions to minimize exposure to mosquito adulticides, if it becomes necessary to treat, include:

--Remaining indoors during spraying and for several hours after; longer for children and people with respiratory problems.

--Bring inside or covering outdoor furniture and play equipment before application or washing them with soap and water after.

--Closing windows and doors. Turning off air conditioners or swamp coolers (or setting

them to recirculate indoor air only.

--Avoiding eye contact with spray if you are outdoors during spraying, rinsing eyes with water or eye drops if there is contact.

--Washing skin surfaces if they come in contact with insecticide.

--Rinsing thoroughly-- with water -- all fruits and vegetables from the garden, before cooking or eating them.

--Bringing in laundry and toys before spraying or thoroughly washing them afterwards.

--Bringing in pets, protecting horses and livestock and bee hives and covering ornamental fish ponds during application. Pyrethrins are toxic to bees and fish!!

--Consulting your doctor if you think your health was affected by spraying.

9. WHAT HEALTH PROBLEMS COULD I HAVE IF I AM EXPOSED TO MOSQUITO ADULTICIDES?

The known health threats associated with commonly used mosquito adulticides are considered to be less serious than those posed by coming down with WNV and other mosquito borne illnesses. Contact with pyrethroids can cause skin irritation, eye irritation or respiratory and throat irritations. The Environmental Protection Agency has a website with toxicology information. You may wish to check: www.epa.gov/pesticides/factsheets/skeeters.htm.

10. WHAT SHOULD I DO IF I AM EXPOSED TO MOSQUITO ADULTICIDES?

If you are concerned that you are suffering adverse health effects from exposure from mosquito adulticides, contact your local health department to find out what products were used. After you know, you may contact your doctor and/or poison control authorities at 1-800-222-1222.

10. ARE MOSQUITO ADULTICIDES AVAILABLE TO THE PUBLIC FOR HOME USE?

Yes, there are a number of products available and are labeled for mosquito control. Be sure to read, understand and follow all label instructions and precautions.

What You Need to Know About West Nile Virus

What Is West Nile Virus?

West Nile virus (WNV) is a potentially serious illness. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall. This fact sheet contains important information that can help

you recognize and prevent West Nile virus.

What Can I Do to Prevent WNV?

The easiest and best way to avoid WNV is to prevent mosquito bites.

• When you are outdoors, use insect repellents containing DEET (N, N-diethyl-meta-toluamide). Follow the directions on the package.

• Many mosquitoes are most active at dusk and dawn. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours. Light-colored clothing can help you see mosquitoes that land on you.

• Make sure you have good screens on your windows and doors to keep mosquitoes out.

• Get rid of mosquito breeding sites by emptying standing water from flower pots, buckets and barrels. Change the water in pet dishes and replace the water in bird baths weekly. Drill holes in tire swings so water drains out. Keep children's wading pools empty and on their sides when they aren't being used.

What Are the Symptoms of WNV?

WNV affects the central nervous system. Symptoms vary.

• Serious Symptoms in a Few People. About one in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent.

• **Milder Symptoms in Some People.** Up to 20 percent of the people who become infected will display symptoms which can include fever, headache, and body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms can last for as short as a few days, though even healthy people have been sick for several weeks.

• No Symptoms in Most People. Approximately 80 percent of people (about 4 out of 5) who are infected with WNV will not show any symptoms at all.

How Does West Nile Virus Spread?

• Infected Mosquitoes. Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes are WNV carriers that become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

• Transfusions, Transplants, and Mother-to-Child. In a very small number of cases, WNV also has been spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.

• Not through touching. WNV is not spread through casual contact such as touching or kissing a person with the virus.

How Soon Do Infected People Get Sick?

People typically develop symptoms between 3 and 14 days after they are bitten by the infected mosquito.

How Is WNV Infection Treated?

There is no specific treatment for WNV infection. In cases with milder symptoms, people experience symptoms such as fever and aches that pass on their own. In more severe cases, people usually need to go to the hospital where they can receive supportive treatment including intravenous fluids, help with breathing and nursing care.

What Should I Do if I Think I Have WNV?

Milder WNV illness improves on its own, and people do not necessarily need to seek medical attention for this infection though they may choose to do so. If you develop symptoms of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately. Severe WNV illness usually requires hospitalization. Pregnant women and nursing mothers are encouraged to talk to their doctor if they develop symptoms that could be WNV.

What Is the Risk of Getting Sick from WNV?

People over 50 at higher risk to get sick. People over the age of 50 are more likely to develop serious symptoms of WNV if they do get sick and should take special care to avoid mosquito bites.

Being outside means you're at risk. The more time you're outdoors, the more time you could be bitten by an infected mosquito. Pay attention to avoiding mosquito bites if you spend a lot of time outside, either working or playing.

Risk through medical procedures is very low. All donated blood is checked for WNV before being used. The risk of getting WNV through blood transfusions and organ transplants is very small, and should not prevent people who need surgery from having it. If you have concerns, talk to your doctor.

Pregnancy and nursing do not increase risk of becoming infected with WNV. The risk that WNV may present to a fetus or an infant infected through breastmilk is still being evaluated. Talk with your care provider is you have concerns.

What Is the CDC Doing About WNV?

CDC is working with state and local health departments, the Food and Drug Administration and other government agencies, as well as private industry, to prepare for and prevent new cases of WNV.

Some things CDC is doing include:

• Coordinating a nation-wide electronic database where states share information about

WNV

• Helping states develop and carry out improved mosquito prevention and control programs

- Developing better, faster tests to detect and diagnose WNV
- Creating new education tools and programs for the media, the public, and health professionals
- Opening new testing laboratories for WNV

What Else Should I Know?

If you find a dead bird: Don't handle the body with your bare hands. Contact your local health department for instructions on reporting and disposing of the body. Valencia County Environmental Health Department (505) 866-2472

For more information call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)