

Buzz Words



The Newsletter of the Florida Mosquito Control Association
May/June 2002

Volume 2, Issue No. 3

Upcoming Events

Mosquito Awareness Week
June 23 – 29, 2002
www.mosquito.org



2002 ESA ANNUAL MEETING
NOVEMBER 17-20, 2002
FORT LAUDERDALE
FLORIDA
www.entsoc.org

**Deadline for ALL Ten-minute paper
and Poster submissions, including
Student Competition, is NOW
12:00 midnight EDT, July 10, 2002**



2003 AMCA ANNUAL MEETING
Minneapolis, Minnesota
March 2-6, 2003
www.mosquito.org

**•FIRST CALL FOR PAPERS
•LATIN AMERICA CALL FOR
PAPERS
•STUDENT COMPETITION CALL
FOR PAPERS
Deadline: 15 October 2002**

Inside this issue: FMCA Web Site News•News from FMCA•News from FL DACS•News from PHEREC•News from FMEL •
Positions Available•Notice of Public Meeting•FMCA Awards•Equine EEE in Florida•Sentinel Chicken Report•Dodd Short Course Logo
Contest•From the Editor• Predicting the "Big Event"•Insecticide Rates of Application and Public Protection

FMCA Web Site News

On April 1, 2002 the EPA issued a Press Release that a lawful application of aquatic herbicides to ensure flow in an agricultural irrigation canal in a manner consistent with the pesticide label does NOT require a Clean Water Act permit. This is important regarding the California [Talent Irrigation](#) decision last year that might have affected mosquito control practices. Their decision can be found at their web site

<http://www.epa.gov/pesticides/>, in the "What's New Archives", EPA Press Release of April 1, 2002. (*Editor's note: The finding applied to agricultural waters only leaving leeway for future impact on mosquito control*).

A panhandle director passed this web site along to me. This appears to be another Mosquito Magnet-like device for the homeowner. The website is:

<http://www.sonicweb.com/> - the SonicWeb mosquito trap in case someone contacts you for information.

Dr. Roger Nasci reports that the slide sets from the 2002 Third National Planning Meeting for Surveillance, Prevention, and Control of West Nile virus in the United States are now available online in both PowerPoint and PDF formats at:

http://www.cdc.gov/ncidod/dvbid/westnile/conf/march_2002.htm

Cornell University - Center for the Environment has published a WNV site listing of reports by state "WEST NILE VIRUS Update: By Country and State by State" <http://www.cfe.cornell.edu/erap/WNV/WNVUpdate.cfm#fl>

The European Network on Imported Infectious Disease Surveillance <http://www.tropnet.net/> reports on emerging infectious diseases that concern the European public health community.

The URL

<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi> - MEDLINE PubMed, is a service of the National Library of Medicine, that provides access to over 11 million MEDLINE citations and produced 800 citations on West Nile virus.

Tom Floore
FMCA Web Master

News from FMCA

FMCA Silent Auction

It is time to start thinking about items to be donated for the Fall FMCA Annual Meeting Silent Auction. The form for submitting an auction item will be posted on the FMCA Website soon.

FMCA West Nile Information Mailing List

Jim Burgess (burgess@lcmcd.org), FMCA's WN Task Force representative, has established an e-mail information forwarding system to update Mosquito Control personnel on arbovirus current events. If you wish to be added to his e-mail list, please e-mail or call Jim to be added to his distribution list.

James Burgess, Lee County Mosquito Control District
PO Box 60005, Ft. Myers, Fla., U.S.A. 33906
941-694-2174, ext. 162 or suncom 725-1122

FMCA Awards

Nominations for the 2002 FMCA Awards are now being accepted! A full description each award is included in this issue of Buzz Words.

From the "Wing Beats" Editors

Wing Beats is looking for interesting field-related or technical articles about mosquitoes, mosquito control and/or related topics. The articles do not have to be scientific in nature. Articles usually are one to four pages (including graphics or figures) in length. A considerable amount of applied research, equipment modifications, application technique changes or alterations are being conducted at mosquito control programs, universities and military installations throughout the world that would be of interest to the *Wing Beats* audience. We encourage you to consider publishing in *Wing Beats*. Contact Dennis Moore, Editor-in-Chief, moore@iline.com or Tom Floore, Tomfloo@knology.net or 850-872-4184 ext 30.

News from FL DACS

A Note of Thanks

I would like to bestow a special thanks to the Florida Keys Mosquito Control District for their assistance and hospitality during my visit to their facilities May 22nd – 29th. It was a joy working with all of their personnel and assisting them on their daily responsibilities. This was my first exposure to the inner-workings of a mosquito control program and it was very educational and beneficial to me... and thanks for helping me get over my fear of flying!

Jennifer Simpson
Department of Agriculture and Consumer Services

Training Courses Are Now Being Offered by DACS, Bureau of Entomology and Pest Control: We Say "Yes!"

Yes, we are now offering training courses with no fees!
Yes, we can tailor our courses to meet your needs!
Yes, we offer CEU's!

The following courses are being offered at the Bureau of Entomology and Pest Control in Tallahassee and are no charge. Material covered in each course is flexible and can be tailored to meet the specific needs of each participant. Our current course line-up includes:

Mosquito Identification: A 2-day course covering larval and adult ID to the genus level, and ID of some of the more common Florida species. There will also be some field collecting (weather permitting!). 16 CEU's for full participation.

Mosquito Collecting Methods: A 2-day course covering collection methods, identification of various mosquitoes, and recognizing various breeding habitats. This course is designed to show how to use various traps and the importance of trap placement. 16 CEU's for full participation.

Preservation and Mounting Techniques: A 1-day course showing proper methods for collection, storage, preservation and mounting of insect specimens. Emphasis will be placed on mosquitoes but include techniques for other insects as well. 8 CEU's for full participation.

VCMS (Vector Control Management Software) Training: Due to limited computer access there will be a maximum of 6 students / class. Instruction is tailored to the level of experience of those taking the course. 8 CEU's for full participation.

Exam Review Session and Certification Exams: This is for people who are preparing to take the Core, Public Health, or Aerial exams. After the review session, students may take the exam. No CEU's are available for exam reviews.

All courses (except VCMS) need 6-10 participants. Please contact the Bureau of Entomology and Pest Control if you need any additional information and to schedule your group for your course of choice.

Bureau of Entomology and Pest Control
Mosquito Control Section
(850) 922-7011
SUNCOM 291-7011

Tom Loyless: loylest@doacs.state.fl.us
Jennifer Simpson: simpsoj@doacs.state.fl.us
Angela Weeks: weeksa@doacs.state.fl.us

News from PHEREC

Dr. Dukes Retirement

The John A. Mulrennan, Sr., Public Health Entomology Research and Education Center cordially invites mosquito folks to attend a celebration of the retirement of Dr. James C. Dukes on Thursday, July

25, 2002 at St. Andrews Seafood House, Panama City, Florida. Cocktails will be served at 6:30 p.m. Dinner will be served at 7:00 p.m. Guests will be responsible for the cost of their meal and drinks.

If you are planning on attending, you must make a reservation with Paige Packman before July 1, 2002 by calling (850) 872-4184 extension 10. For more information, go to the PHEREC Web site <http://pherec.org> and CLICK on "Dr. Dukes' Retirement."

Technical Memoranda

In an effort to bring more content to the PHEREC Web site, a new feature has been added. Beginning last month PHEREC Technical Memoranda have been posted to the Web site. These are operational notes that, hopefully, will prove useful to mosquito control programs in Florida. At present, 3 Technical Memoranda have been posted. They are:

Memo #1: Diluting ANVIL® 10+10 ULV for the bottle bioassay.
<http://pherec.org/bottleassay/sumithrin.html>

Memo #2: Diluting KONTROL® 30-30 for the bottle bioassay.
<http://pherec.org/bottleassay/kontrol30-30.html>

Memo #3: Diluting BIOMIST® 4+4 ULV for the bottle bioassay.
<http://pherec.org/bottleassay/biomist.html>

If this format is found to be useful, additional technical notes will be made available at the PHEREC Web site.

Dr. Jack Petersen
Extension Medical Entomologist

News from FMEL

Advanced Mosquito Identification and Certification Course

The next FMEL/FL DACS Advanced Mosquito Identification and Certification Course will be held March 10 – 21, 2003. Please contact Dr. Roxanne Rutledge for more details. A full course description and application will be posted in the July/August 2002 issue of Buzz Words.

Treatment Survey

Drs. Lord and Rutledge would like to express our appreciation to those of you who filled out the Treatment Survey. However, due to a lack of response by the majority of MC programs, we will not be able to analyze the data because of the small sample size.

POSITIONS AVAILABLE

County of Volusia. Helicopter Pilot (4525B) Salary: Based on Experience. Closes: Opened until filled. Minimum Qualifications: Graduation from high school or possession of GED. Completion of approved flight training and possess helicopter rating. Must have flight experience of 1500 hours in helicopters, with 150 of these hours in McDonnell Douglas 500 model rotorcraft or other turbine helicopters. Possession of a Commercial Pilot's License with rotorcraft, instrument helicopter rating. Must meet all FAA requirements. Possession of a current Class II flight physical. Possession of a valid Florida driver's license. Must, within six (6) months of appointment, be examined and certified in Aerial Application of Pesticides and in Public Health Control. A comparable amount of education, training, or experience may be substituted for the minimum qualifications. Pilots with MD500 time and agricultural/mosquito spraying experience are preferred. Position may be filled on a full time or part time seasonal basis. Apply: County of Volusia Personnel Services, 123 W. Indiana Ave., DeLand, FL 32720-4607. Applications available at website <http://volusia.org> or at Volusia County Libraries or call (386)736-5951, 423-3300 or 257-6000. EOE/AA. Veterans preference pursuant to State law.

Harris County Mosquito Control, Houston, Texas. Entomologist, Disease Control Coordinator. Available immediately. This is a permanent, full-time position requiring an entomologist/biologist with a MS Degree and two years experience in mosquito control or a Ph.D. in entomology or biological science. This is a high profile position and applicants should have experience in dealing with the public and government agencies at local, state and federal levels. We have recently been able to raise the salary for this position to make it more attractive for those with experience in mosquito control and medical entomology. For more information contact: Ray E. Parsons, Ph.D., Director, Harris County Mosquito Control, 3330 Old Spanish Trail, Bldg. D.; Houston, Tx. 77021; Phone: (713) 440-4800; Fax: (713) 440-4795; Email: rparsons@hd.co.harris.tx.us

Vector Disease Control, Incorporated. Director of Operations; Integrated Pest Management Programs. Compensation: \$45,000.00 - \$60,000.00. Requirements: Masters Degree in Biology/Entomology and five (5) years experience in an organized mosquito control program, or equivalent. Job Description: Supervision and implementation of multiple IPM programs. Duties to include: 1) Development of mosquito control plan of operation using accepted control methods based on local climate, topography, agriculture, mosquito species and other habitat considerations. 2) Supervision of mosquito control personnel. 3) Development and implementation of annual budgets. 4) Compile and present weekly and monthly reports. 5) Director must have management and supervisory skills to perform the duties of the position under stressful conditions associated with mosquito-borne epidemics or emergency situation. Contact: Allen Loe, V.D.C.I., 286 5th Ave., Greenville, MS 38701; 1-888-277-7557, or 1-662-820-5036

NOTICE OF PUBLIC MEETING

The Florida Department of Agriculture and Consumer Services announces a regular business meeting of the Florida Coordinating Council on Mosquito Control to which all persons are invited.

DATE AND TIME: July 25, 2002, 1:00 p.m. to 4:00 p.m.

PLACE: John A. Mulrennan, Sr., Public Health Entomology Research and Education Center
4000 Frankford Avenue, Panama City, Florida 32405-1933

GENERAL SUBJECT MATTER TO BE CONSIDERED

Welcome and Introductions

Approval of Minutes from Previous Meeting

General Comments and Business Items, to include:

- Report from the Subcommittee on Managed Marshes
- Report on the updated Arbovirus Response Plan for Florida
- Reports on the use of lower than label rates of Dibrom for aerial adulticiding
- Report on recent changes to Chapter 388, F.S. and mosquito control funding
 - Report on status of fenthion registration
- Discussion and recommendations on issues reported

Questions and Comments may be directed to T. Wayne Gale, Chairman, (850) 922-6877 or email gale@doac.state.fl.us

FMCA Awards - 2002

Any Florida Mosquito Control Association member in good standing may nominate a candidate for any award by submitting supporting information to the Awards Committee. There is no official nomination form. Endorsements and written support from other colleagues are encouraged. All submissions will be acknowledged.

The deadline for receipt of 2002 FMCA Award nominations is August 9, 2002

Send all nominations to Stephen Sickerman, chair, FMCA Awards Committee, via:

US mail: 3920 Frankford Avenue, Panama City, FL 32405-1953

fax: 850-872-4271; e-mail: sickers@doacs.state.fl.us; phone: 850-872-4250

The Maurice W. Provost Memorial Award

was established as a memorial to the first director of the Florida Medical Entomology Laboratory, to honor persons who have made outstanding contributions to mosquito control and/or biting fly biology in Florida. Recipients have been instrumental in developing sound management and operational methods to reduce pesticide levels and to minimize habitat alteration while reducing mosquito populations; in increasing our knowledge of mosquitoes and other biting insects and their habitats; and in educating students and the general public about the importance of various environmental issues facing the citizens in protecting the fauna and flora in Florida. *Nominations: Supporting information should include a short biographical sketch emphasizing those accomplishments deemed worthy of the award.*

The Joseph Y. Porter Distinguished Achievement Award

honors the first president of the Florida Anti-Mosquito Association and first State health officer of Florida, and recognizes scientists who have made significant contributions to entomology, with special emphasis on the abatement of arthropods of public health importance. The recipient must have meritoriously contributed to the advancement of entomology research in the field of mosquito and other biting arthropod control in the State of Florida. *Nominations: Supporting information should include a short biographical sketch emphasizing those accomplishments deemed worthy of the award.*

The FMCA Merit Award

is intended to recognize the outstanding individual contribution to promoting control of disease-transmitting and pestiferous mosquitoes or other arthropods of public health importance, for scientific advancement of the discipline, or for developing or extending the public interest in the control of such mosquitoes or other arthropods. The recipient should represent those characteristics generally associated with responsible leadership, good citizenship and personal integrity. The recipient need not be an Association member. *Nominations: Supporting information should include a short biographical sketch emphasizing those accomplishments deemed worthy of the award.*

The Sherrie Yarberry Award

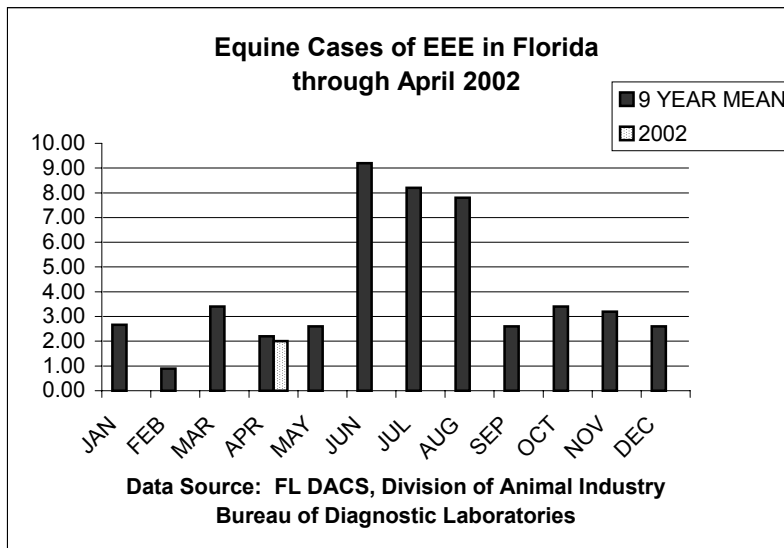
is named for a dedicated employee of Jacksonville Mosquito Control, and is intended to recognize continued outstanding contributions to operational program activities by veteran, non-administrative personnel of Florida mosquito control related agencies. The recipient must demonstrate exemplary performance resulting in enhanced unit efficiency or public recognition of excellence of the parent organization.

Nominations: Supporting information from senior mosquito control administrators and supervisors should include a specific statement acknowledging the nominee's contributions on which the nomination is based and an evaluation and appraisal of

The Fred Stutz Memorial Award

honors the former Dade County Mosquito Control Director, and is intended to recognize an outstanding contribution to mosquito control by development of procedures that increase effectiveness in mosquito and other arthropod control, or the design and manufacture of equipment that helped revolutionize the control of mosquitoes and other arthropods of public health importance. *Nominations: Supporting information should include a biography of the nominee, a list of accomplishments and/or inventions, a specific statement acknowledging his/her contributions on which the nomination is based and an evaluation and appraisal of the nominee's accomplishments*

All award recipients will receive a commemorative certificate or plaque, and expenses to attend the FMCA Annual Fall Meeting. The recipient of the Sherrie Yarberry Award will also receive \$500 cash and special recognition at the 2003 FMCA Dodd Short Courses. There is no official nomination form and endorsements and written support from other colleagues are strongly encouraged. Please take the time to recognize the achievements of your fellow public health pest control professionals.



Historical HAI results:

April 2002						
Year	Number of counties	# of birds	# of sera	# + EEE	# + SLE	# + WN
1988	6	95	136	0	1	0
1989	5	0	217	1	0	0
1990	7	216	270	1	0	0
1991	12	385	720	1	2	0
1992	9	445	1019	2	0	0
1993	7	391	829	1	1	0
1994	12	650	1187	1	0	0
1995	10	452	679	1	0	0
1996	17	825	1345	3	2	0
1997	9	436	789	0	0	0
1998	14	668	1577	5	2	0
1999	9	481	830	3	0	0
2000	7	406	770	0	0	0
2001	8	475	823	1	0	0
2002	17	869	2237	7	0	1
Average* (1988-2002)				1.8	0.5	0.5
Median* (1988-2002)				1.0	0.0	0.5

*WN average/median: 2001-2002

The numbers of sera submitted and counties participating in surveillance activities during April were slightly greater than the level of activity for March. Chickens are being set out earlier than in past years in order to detect early virus activity.

There were 7 seroconversions to Eastern Equine Encephalitis virus (EEE); this is greater than historical activity for April. There was one new HAI Flavivirus positive sentinel (St Louis Encephalitis (SLE) virus antigen used in the HAI assay) during April, 2002. This bird was confirmed as WN+ by serum neutralization, however, it was positive on first bleeding and thus was infected at an undetermined time in the past.

Dead birds continue to be submitted for WN virus detection in tissues. During April 2002, tissues from 139 birds and 4 mammals were received for virus detection/isolation: WN virus was detected in 3 dead birds: 2 crows from Putnam County and 1 Peacock from Palm Beach County.

Lillian M. Stark, Ph.D., M.P.H., M.S.
Florida Department of Health, Bureau of Laboratories, Tampa Branch Laboratory

FORTUNE AND FAME AWAITS YOU!!!!!!!

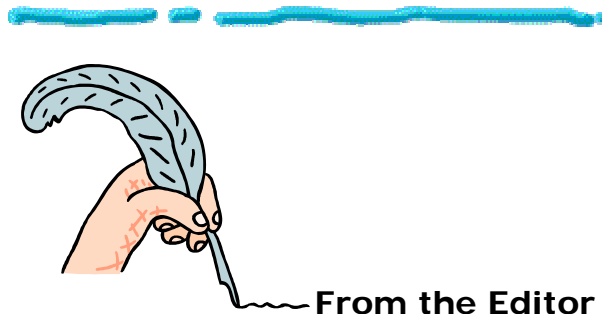
The Dodd Short Course Committee will be adopting a new logo for the next 20 years!!! 2004 will mark the 20th Anniversary of the Dodd Short Courses. During festivities planned for the 2004 courses, there will be an unveiling of the new logo, selected by Mrs. Dodd. It is EASY to submit a logo!!

Here's the current one:



We want a new one.

Design it, put it on paper, and send it in! You can send it to Kellie Etherson, Eric Schreiber, or Roxanne Rutledge, – if you don't know these people, send it anyway, none of them are really mean people! No legitimate submission will be rejected! You can't draw? What about your daughter or son? Or niece or grandfather? How about an art teacher? How about the kids in the art class? Anyone can participate!



From the Editor

BIG W, BIG N.

We will probably all be referencing West Nile in Florida for a long time, in a number of different media. According to Karabatsos, N., 1986, International Catalogue of Arboviruses, 3rd ed. American Society of Tropical Medicine and Hygiene, San Antonio, TX, the appropriate reference is West Nile (WN) virus. That's a BIG W, and BIG N. Virus is not part of the formal viral abbreviation though many continue this practice. Indeed, there may be occasion, as WN virus evolves in North America, to begin thinking in terms of more than one form of the virus – then the correct abbreviation would be the WN viruses.

Buzz Words welcomes articles, comments, and news items from everyone.

The deadline for submissions to be included in the July/August 2002 issue of Buzz Words is July 10, 2002.

Predicting the "Big Event"

If you watched the NASCAR Aaron's stockcar races from Talladega, Alabama on April 20 and 21, 2002 you witnessed "The Big One," not once, but twice in the same weekend. The "Big One" is defined as a crash involving the majority of the cars in a race. In short, a crash that can instantaneously remove half of the population from a racing event, a truly catastrophic event. The first wreck occurred on April 20 during lap 16 of the Busch series race when 29 cars in the 43-car field



mixed it up as they came off turn 2 and entered the famous long back straightaway at the Talladega Superspeedway. The second crash occurred in exactly the same spot the next day during lap 164, 6 laps from the end of the race, of the Winston Cup race. This time the crash involved 24 cars from the field of 43.

NASCAR has long known that "The Big One" was a statistical inevitability and even predicted where it would occur, either at Daytona or Talladega Superspeedways. How were they able to make this prediction? Two factors predispose these speedways for a big crash. First, both tracks are 2.5 mile (2.66 in the case of Talladega) tri-ovals. Second, both tracks require carburetor restrictor plates for all of the stockcar participants. How did these factors predispose Talladega for two massive crashes in less than 24 hours? First, the tri-oval track configuration makes the negotiation of turns, especially turn 2, more difficult. The wall is to the right as cars enter the turn. Because of the tri-oval track construction, negotiation of turn 2 requires that the driver make constant steering corrections throughout the turn. Second, NASCAR requires the use of horsepower-sapping carburetor restrictor plates to keep cars under 200 mph at both Talladega and Daytona. These restrictor plates bring cars into speed parity and, instead of the cars stringing out around the track, they run together in large groups. A group of cars traveling more than 160 mph, and 3 and 4 abreast, as they enter the technically difficult turn 2 was the recipe for disaster at both of the Aaron's races. NASCAR knows that restrictor plate accidents are inescapable and actually view them as "a show within a show." As long as no one is injured (and no one was hurt in either of the Talladega accidents), and the only result is approximately \$2 million worth of junk sheet metal, these "Big Ones" are actually good for business.

Predicting arboviral epidemics, or what we refer to as "The Big Event," in Florida is similar to predicting the big NASCAR wreck. We know where the epidemics are likely to occur because of our rich history of arboviral surveillance in Florida. We also know what factors predispose regions of the state for an arboviral epidemic (see Day, J.F., 2001. Predicting St. Louis encephalitis virus epidemics: Lessons from recent, and not so recent, outbreaks. *Ann. Rev. Entomol.* 46:111-38 for a complete review). Three mosquito-borne viruses, St. Louis encephalitis (SLE), eastern equine encephalitis (EEE) and West Nile (WN) viruses have the potential of causing serious human disease in Florida.

There are 4 annual transmission patterns observed for mosquito-borne viruses in Florida. 1) During most years no human cases are reported. 2) Focal outbreaks, usually involving fewer than 10 clinical cases in a small geographical area, make up the second transmission pattern. 3) Sporadic transmission frequently occurs in Florida and involves single human cases spread over a wide geographical area. 4) A full-blown epidemic or "The Big Event" is the most dangerous, in terms of economics and public health, arboviral transmission pattern (see Day and Stark, 2000, Frequency of St. Louis encephalitis virus in humans from Florida, USA, *J. Med. Entomol.* 37:626-33).

A "Big Event" is defined as 25 or more clinical cases within a population of 100,000. The EEE virus has never caused a human epidemic in Florida. In general, clusters of human EEE cases are extremely rare. This is probably because the EEE transmission cycle is more complex than that of any of the other mosquito-borne viruses. The SLE virus, on the other hand, is capable of causing large human epidemics in Florida and throughout North America. Five SLE epidemics have been reported in Florida, one each in 1959, 1961, 1962, 1977, and 1990.

We know that WN virus caused large human epidemics, similar to those reported for SLE in North America, in South Africa, Israel, Eastern Europe and Western Europe. It remains to be seen how WN virus will behave in Florida and the rest of North America. My guess is that there will be a Big Event caused by WN virus in Florida, or somewhere else in North America where SLE virus has had a historical presence. I believe that we have not yet seen the full disruptive potential of WN virus. The 62 West Nile cases reported from New York City in 1999 were certainly a wake up call, but I expect that a Big Event in a heavily populated area like Queens will result in many more clinical cases. Likewise, the 10 human cases from Staten Island in 2000 hardly qualify as a big event.

The WN virus transmission pattern observed in Florida during 2001 is best described as sporadic. We saw similar SLE transmission events in the state during 1979, 1980, and 1997. In 2001, 12 clinical WN human cases were reported throughout Florida in a population of about 14 million people. In north Florida a single human case was reported in Washington, Leon, Jefferson, Duval, and Putnam Counties, and 2 cases were reported from Madison County. In north central Florida, a single human case was reported in Marion County. No human cases were reported from peninsular Florida. But then there were the 4 human cases reported in the Florida Keys. WN virus transmission in Florida during 2001 was similar to the traditional sporadic EEE and SLE transmission patterns observed here since the early 1950s. This was especially true in north Florida where EEE and WN viruses were cycling together during the summer of 2001. Both viruses were likely sharing avian amplification hosts, mosquito vectors, and dead-end hosts including horses and

humans. Imagine the potential for human disease when the same mosquito transmission rate that resulted in 1 case in 15,000 Jefferson County residents is observed among the 2-3 million residents in the population centers of south Florida.

Sporadic human cases of arboviral infection are impossible to predict. The health care, mosquito control, and research workers in Florida cannot predict sporadic arboviral cases, nor should they feel that they have failed when the inevitable sporadic case appears. Sporadic cases of EEE, SLE and/or WN may be diagnosed every summer. Where and when these isolated cases appear is impossible to predict, in much the same way that the time and place of an individual wreck in a NASCAR race is impossible to foresee. Wrecks are inevitable every Saturday and Sunday of the racing season. Who will be involved and on what lap cannot be predicted. A large crash that wipes out half the field is a rare event, but the track on which this type of wreck will occur is more predictable, because the underlying causes of the accident are understood. Health care workers, mosquito control personnel, and researchers in Florida have spent a great deal of time and money tracking arboviral transmission throughout the state. We understand where and when large transmission events are likely to occur because we understand the underlying causes of arboviral transmission and have made the investments in time and money to continually track the biological and physical parameters responsible for significant transmission events. The Florida arboviral surveillance program is the best in the World. We should be proud and we should stay the course.

Jonathan F. Day, PhD
Professor, FMEL

Insecticide Rates of Application and Public Protection

At the Florida Mosquito Control Association 2002 spring meeting, the potential for "sublethal applications" of an insecticide to increase insecticide resistance in mosquito populations was raised. Some mosquito professionals have advised against sublethal applications in the belief that such applications increase the likelihood of the development of resistance.

Exposure to insecticide can only increase resistance in a mosquito population if the insecticide causes 1) the death of susceptible mosquitoes, and 2) if some aspect of the differences between susceptible and resistant mosquitoes is genetic in origin. Unfortunately, we do not have sufficient information for most mosquito control products to predict the application levels to evaluate the population dynamics of resistance and susceptibility.

It is critical to define the degree and type of genetic control of insecticide resistance and susceptibility. The simplest and most often used genetic model is that resistance and susceptibility are controlled by a single genetic locus. One can evaluate several different models of dominance and recessiveness with a single genetic locus. These range from a system where susceptibility is dominant, resistance is dominant, or they are equal or codominant so heterozygous SR genotypes have a phenotype between an SS and RR genotypes (an intermediate resistance or part resistant mosquito).

Let's define resistance and susceptibility so that after a specified dose, we will consider it 100% lethal if all dead mosquitoes are susceptibles, any survivors are resistant. Then if susceptibility is dominant, a 100% lethal dose will certainly kill all exposed SS and SR mosquitoes, and the population becomes instantaneously resistant to our dose, i.e., only RR mosquitoes are left. On the other hand if resistance is dominant, then only the SS mosquitoes die, the population becomes SR and RR. If RR resistant individuals are rare (likely before the insecticide) then most of the R genes will be present in heterozygote SR mosquitoes (purists can look this up in any standard population genetics treatment). The many SR mosquitoes mate with one another, and with the rare RR mosquitoes. The point is that even when one kills all the SS mosquitoes, it takes several generations for RR individuals to increase significantly, and SR with SR matings will produce some SS susceptibles. However resistance will increase. If one killed all the susceptibles, the codominant model will lead to a resistant population at a faster pace than the latter model but more slowly than the first model. Of course if there is extensive immigration into the population, bringing in more susceptibles, the development of resistance will be even slower. Any treatment of managing resistance comes to the same conclusion, keeping more susceptibles around will slow the development of resistance.

At the simplest level, keeping more susceptibles in the population with sublethal doses, reduced application rates, untreated refugia etc. will generally delay the development of resistance. (i.e., see Leeper, Roush and Reynolds. 1986. Preventing or managing resistance in arthropods. In: Pesticide Resistance: Strategies and Tactics for Management. National Academy Press, Washington D. C. at <http://books.nap.edu/0309036275/html/335.html>).

The challenge for mosquito control is to have information on the optimal application rates for every product and the mosquito targets. However, the immediate threat from sublethal doses is that the impact on the target population does not reduce the mosquito population to a level to protect the public. What is needed is information on the genetics of resistance for different species and insecticides, and better predictability on the dynamics of the population

genetics. We also require a cost benefit analysis. What is the optimal dose to delay resistance in populations while achieving acceptable mosquito control? Clearly doses exceeding label rates are environmentally unacceptable, and as the highest doses allowable these may serve to promote resistance in most resistance models compared to lower doses. However if susceptibles continue to immigrate into the population, resistance will be slowed at the highest allowable doses. Optimally, the best dose would be the lowest dose that provides the required control while delaying resistance. I expect that there may be situations where this dose might be lower then the labeled rate. It would be nice to have more research on this issue.

Walter J. Tabachnick, Ph.D.
Director, FMEL

