

The Newsletter of the Florida Mosquito Control Association



Aug/Sept 2000

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Upcoming Events

- *4th Workshop on Salt Marsh Management & Research*

The Subcommittee on Managed Marshes' 4th Workshop on Salt Marsh Management & Research will be held in the Vero Beach area the week of October 23, 2000. Anyone interested in obtaining information about this meeting can contact Doug Carlson, Indian River Mosquito Control District at: (561)562-2393 or dcarlson1@hotmail.com

- *Utah Mosquito Abatement Association 53rd Annual Conference*

October 1 - 3, 2000. Yarrow Resort Hotel and Conference Center, Park City, Utah. For more information on the conference, contact Glen Collett at 801-355-9221.

- *Florida Mosquito Control Association Annual Fall Meeting* November 12-14, 2000. Edgewater Beach Resort. Panama City Beach, FL. See inside this issue for details and first call for papers.

- *International Conference on Dengue and Dengue Haemorrhagic Fever*

The Ministry of Public Health of Thailand in collaboration with WHO, Nat. Research Council of Thailand, and USAMC-AFRIMS is organizing an international conference on DF/DHF November 20-24, 2000 in Chiang Mia, Thailand. Topics will include epidemiology, entomology and vector control, economic impact, dengue vaccine, and more. For more information, <http://203.157.41.5/dhfconf/index.html>.

- *Louisiana Mosquito Control Association Annual Meeting*

The LMCA 2000 Annual Meeting will be held in New Orleans, LA, November 28-30, 2000, at the Ponchartrain Hotel, 2031 St. Charles Avenue, New Orleans, LA 70140. 1-800-777-6193 www.PonchartrainHotel.com. For more information on the meeting visit the LMCA homepage at <http://usersa.usunwired.net/cpmc/>.

FMCA Web Page News



Are you planning a program or workshop that you would like advertised, especially one offering Continuing Education Credits (CEUs)? The web site now has a section for advertising CEU crediting workshops and/or programs. Send the web master the details to be posted.

The **AMCA** has moved its Central Office to Rutgers University. The mailing address is: J. B. Smith Hall, Rutgers University, New Brunswick, NJ 08901-9536 or P. O. Box 586, Milltown, NJ 08850-0586. Phone number: 732.932.0667, FAX: 732.932.0930 and email: amca@mosquito.org. Send an email to Robertamarie Kiley and say "Hello". The new Technical Advisor, Joe, Conlon, starts work early in August.

FMCA Fall Meeting at The Edgewater Resort, Panama City Beach goes online!! Plans are for the First Call for Papers and Registration Form to be available electronically at the web site. Watch for details on the web site in August.

Some interesting web sites that have been seen since the last Buzz Words issue include the following: Harvard School of Public Health - www.hsph.harvard.edu/mosquito/ which has as the lead article an article on arboviruses and other pages on West Nile, LaCrosse and SLE. Another site is www.insectclopedia.com/ Insectclopedia - a search engine for insect oriented sites. The FMCA is listed on Insectclopedia. A site on Material Safety Data Sheets (MSDS) which seems to be updated regularly, www.ilpi.com/msds/index.html check it out. The Virginia Mosquito Control Association - <http://www.mosquito-va.org/>

If you have web sites that would interest readers send them to Tom Floore.

Tom Floore
Tomfloo@knology.net
FMCA Webmaster

FMCA News

Florida Mosquito Control Handbook

There are many chapters for the Florida Mosquito Control Handbook currently listed as either "planned" or "in draft". If you have been contacted in the past about writing a chapter, please get in touch with Dr. Roxanne Rutledge - whether you have started writing or not. It is necessary to know the status of these chapters to keep the additions up to date.

Mosquito Control Displays

The tabletop and pop-up displays that were located at the Sarasota Mosquito Management Services with Sue Whitaker are now at the Florida Medical Entomology Lab and can be checked out by contacting Dr. Roxanne Rutledge, 561-778-7200 ext. 158.



FMCA Silent Auction

It's time to start thinking about the Florida Mosquito Control Foundation Annual Auction held during the Fall Meeting of the FMCA. This year's auction should be our best yet with your help and enthusiasm. You will get an opportunity to view the items and start bidding on Monday, November 13, at the President's Reception. The Auction will conclude on Tuesday, November 14, prior to the Banquet. Please consider donating an item to the auction. So far, FMCF has a weekend package for the Safety Harbor Resort and Spa, a mosquito sculpture, a bean bag mosquito, a dragonfly sun-catcher, and several other items. No item is too large or too small. Contact Shelly Redovan (941-694-2174) for more

details.

Articles for Wing Beats

Wing Beats is looking for interesting technical or field-related articles about mosquitoes, mosquito control and related topics. The articles do not have to be "scientific" in nature and are usually not too long - usually a page or two. A considerable amount of applied research, equipment modifications, application technique alterations, along with other operational advancements are being conducted at mosquito programs, universities and military installations throughout the world. Much of this information is publishable, but perhaps not in a refereed journal. *Wing Beats* encourages you to consider publishing in *Wing Beats*. The magazine also invites you to express your opinions and viewpoints. We know some of you must have something to say about a recently published article or some other activity within our industry! Is there an important announcement, meeting or job posting you would like to include in *Wing Beats*? If so, forward the information to the Editor-in-Chief, Dennis Moore moore@lcmcd.org or ph. 941.694.6959.

NEWS FROM PHEREC

Side by side bioassays of ATRAPA VCP and FYFANON ULV are currently under way at PHEREC. If you are interested in participating in this study or would like additional information, please contact Dr. Jack Petersen, Extension Medical Entomologist, John A. Mulrennan, Sr. Public Health Entomology Research and Education Center, Florida A&M University, email: drjack3@hotmail.com or Tel. (850) 872-4184 extension 36. Updates on this project will continue to be posted to the PHEREC Web site <http://pherec.org>.

Dr. Jack Petersen
Extension Medical Entomologist
PHERIC

FROM THE EDITOR OF BUZZ WORDS: CORRECTION!

The last issue of Buzz Words included 2 versions of the same article. One of those replaced the FMEL director's column. Please refer to the FMEL and FMCA websites to read the article that was left out due to circumstances beyond our control!

Deadline for contributions to the October/November 2000 Buzz Words is September 25, 2000.

NEWS FROM FMEL

Our condolences go out to the family of Dr. Lamar Meek, who passed away June 27, 2000, while conducting field work in Mississippi. Dr. Meek was Professor of Medical and Veterinary Entomology at Louisiana State University and was the president of the Louisiana Mosquito Control Association.

Check out the University of Florida, Department of Entomology and Nematology "*Featured Creatures*"!
<http://www.ifas.ufl.edu/~insect/>

There are many insects featured on this site, including: *Culex nigripalpus*, by Dr. Jonathan Day:
www.ifas.ufl.edu/~insect/AQUATIC/FL_SLE_MOSQUITO.HTM

and the Crabhole mosquito, by Dr. George O'Meara: http://www.ifas.ufl.edu/~insect/aquatic/crabhole_mosquito.htm



JOB OPPORTUNITY

Helicopter Pilot

Individuals with MD500 time and spray experience are preferred. Contact John Gamble or Hal Cobb, East Volusia Mosquito Control District, 801 South Street, New Smyrna Beach, FL 32168 at 904-424-2920 or

jgamble@co.volusia.fl.us. The position is currently open and will be until filled. Applications can be downloaded from Volusia County's web page at www.volusia.org/personnel/.

Chemically Speaking, May/June 2000 <http://pest.ifas.ufl.edu/news.htm>

EPA, Dow AgroSciences Announce Agreement on Chlorpyrifos

On June 8 EPA and Dow AgroSciences, the manufacturer of chlorpyrifos, announced an agreement to eliminate the pesticide for nearly all household purposes. Also known as Dursban, Lorsban, and other trade names, chlorpyrifos is one of the most widely-used insecticides in the U.S., both in agriculture and in and around the home.

EPA and the registrants agreed to several modifications including: Protecting Public Health Uses. Public health uses including applications to fire ant mounds and ultra low volume applications for mosquito control will be allowed to continue. These applications do not pose risks of concern and provide important public health benefits. See www.epa.gov/pesticides for more information.

Chemically Speaking, July 2000 <http://pest.ifas.ufl.edu/news.htm>

Malathion Risks Generally Acceptable

"Malathion presents very few unacceptable risks to human health," EPA determined in its evaluation of the insecticide. Some of the most anticipated findings were those relating malathion's use for mosquito control. The EPA's Office of Pesticide Programs Health Effects Division (HED) estimated that the risks from aerial and terrestrial application are well below the agency's threshold for concern. According to the risk assessment, respiratory exposures to malathion by aerial or terrestrial sprays for mosquito control do not present any risks of concern. For information on other products labeled for mosquito control see the "pesticides and mosquito control" factsheet at <http://www.epa.gov/pesticides/factsheets/skeeters.htm>

FMCA FALL MEETING

November 12 - 15, 2000
Registration will begin November 12
General Session starts November 13

The 2000 Fall Meeting of the Florida Mosquito Control Association will meet at the *Edgewater Beach Resort & Conference Center at 11212 Front Beach Road, Panama City Beach, Florida*. Please be sure to read the following

information carefully as the accommodations and fees are different from standard hotel rooms.

The Gulf Front Tower's suites range from 863 to 1,867 square feet with a private balcony, living room, large bedroom, washer and dryer, and fully equipped kitchen. The Windward & Leeward Suites have 886 square feet, one-bedroom to 1,703 square feet, three-bedroom units. The Golf and Tennis Villas offer 630 square foot efficiency or 853 square foot two bedroom villa. You may find it very economical to split a two or three bedroom suite with coworkers or to bring the family. **Please be sure to check with reservations to make sure you are getting the type of room that you need. Ask how many it will sleep.** You will be charged a check out cleaning fee: efficiency \$15, one bedroom \$15, two bedrooms \$20, and three bedroom \$25. This is a one time fee and not added on daily. Do not pay any daily resort fees. The following room rates are subject to state and local taxes, which are 11.1%.

Room Rates:	Towers I, II, III Gulf Front Suites	Leeward/Windward Midrise Gulf Front	Golf/Tennis Villas
1 bedroom	\$ 81	\$ 87	\$ 73
1 bedroom, deluxe	\$ 99		
2 bedrooms	\$ 110	\$ 99	\$ 87
2 bedrooms, deluxe	\$117		
3 bedrooms, deluxe	\$158		

To make reservations call 1-800-874-8686. To ensure the FMCA group rate, you must identify yourself as attending the Florida Mosquito Control Association Meeting and make your reservation by **October 10, 2000**. Individual room reservations canceled prior to 72 hours of arrival date will receive a full refund, less a \$25 cancellation fee. No refunds are made for cancellations received after the 72 hour deadline. Resort check in time is 4:00 p.m. **You will need a credit card or a \$25 deposit to cover incidental charges.** Please be sure anyone attending from your office is aware of this policy. This could cause a problem for staff members who are sent with an agency check or agency credit card and are not expecting this fee. If you do not have any incidental charges, your credit card will not be billed for the deposit or your cash will be returned. Check out time is 10:00 a.m. Unauthorized, late check out will result in a minimum fee of \$50.00. Complimentary parking will be available for all resort guests and meeting attendees. Edgewater Resort offers airport transportation at a cost of \$10 per person one way. Call (850) 235-4044 ext. 321 twenty-four hours in advance for reservations.

In March 2000, Edgewater Resort opened a fitness center and spa with exercise equipment, and aerobics rooms, and massage therapy room. There are 11 tennis courts, six of which are lighted, 11 pools, a nine-hole, par-three Executive Golf Course, complete pro shop for golf and tennis and a free tram service to take you to all three property's housing options. Check out their web site www.edgewaterbeachresort.com for more information about the resort.

Registration will be open at 3:00 p.m. on Sunday, November 12. There will be a Board of Directors meeting at 1:30 p.m. The meeting will officially begin at 6:30 p.m. with an Early Bird reception. The main meeting will begin 8:00 a.m. on Monday, November 13. Monday night will be the President's Reception with appetizers and cash bar. Tuesday night will be our annual Banquet. The Director's registration will include a luncheon meeting on Monday. The Commissioner's registration will include a luncheon meeting on Tuesday.

There will be two Companion's tours offered.

Monday, November 13: Destin Outlet Mall Cost: \$20/person (based on 40 people)

Depart Edgewater Resort at 10:00 am and arrive at Destin Mall at 11:00 a.m. Lunch is on your own. Bus will depart at 2:30 p.m.

Tuesday, November 14: Panama City Zoo Cost: \$16/person

Depart Edgewater Resort at 9:00 a.m. Tour of Panama City Zoo followed by a barbecue lunch of tossed salad, sliced smoked turkey, baked beans, bread pudding and drink. We will return at 1:00 p.m.

The Florida Mosquito Control Foundation will be sponsoring a silent auction and raffle to raise funds for scholarships. A preview of the auction items will be given at the President's reception. The auction will be held at the Banquet on Tuesday evening. If you would like to donate an item for the auction, please contact Shelly or Sandy at 941-694-2174. Remember donations to the Foundation are tax deductible. Please come to these fun events and support our Foundation! **IF YOU HAVE ANY QUESTIONS CALL SHELLY OR SANDY AT 941-694-2174**



You are invited to submit a title for a paper to be presented at the 2000 Annual Fall Meeting of the Florida Mosquito Control Association, Inc. to be held at the Edgewater Beach Resort, November 12 - 15, 2000. Type the title, author(s), organization(s), and address (es) exactly the way they are to appear on the program. If more than one author is listed, place an asterisk after the name of the author who is to present the paper. **Send this form to Ed Hunter, Beach Mosquito Control District, 1016 Cox Grade Road, Panama City Beach, FL 32407. E-mail: edhunter4@home.com. Telephone: 850.533.5030; S/C 770.5030; FAX: 850.233.5030.** Please submit as soon as possible so there is time to plan and organize the program.

Power Point or Corel Presentations at FMCA meetings. At the FMCA Spring Meeting, over 70% of the presentations were in Power Point. As more talks are being presented using this format, the Audio/Visual Committee has established some guidelines :

1. Ideally, the presentation should be as small as possible. A 40-slide presentation can be around 1 MB, assuming that there are few inserted pictures. Graphics can be very ponderous and slow a presentation to a crawl. **Small pictures are better.** While pictures are memory-expensive, this is not to say that they shouldn't be used. Remember, the fancier the presentation and animations, the larger it becomes. Keeping the bells and whistles to a minimum will reduce the size and make it faster to load.
2. Give some thought to what should be illustrated and the order of the presentation. Once the file is sent to the A/V Committee for the meeting, it cannot be returned. If some of the data is incomplete -- consider using 35mms slides. **Speakers can use both**, for example, Power Point at the start and finish with 35mm.
3. While it is not necessary, speakers can use the pack-and-go compression program. Do not include the viewer. A note here: ***Corel Presentations*** may be used as well.
4. Name the file so that anyone can find it (use your last name or part of it). Print a copy of the presentation. Use a laptop to review the talk. There are no extra LCD projectors at this time.

Standards:

1. Once a request is received for presenting in Power Point, speakers will receive a notice to send the file to the A/V Committee. Files may be sent by email as well as other methods of mail. Files should reach the committee by the announced deadline.
2. After receiving the file, it will be checked for viruses and to make sure it will run. Speakers will receive a confirmation and notice of the date and time slot on the program within a day or two after the file is received. **Contact Tom Floore. ***Don't assume**!***
3. Speakers who deliver Power Point files on the way to the speaking slot, *might not* be accommodated. If received 24 hours in advance, *the committee will try to accommodate you.* Slides *can not be added or replaced* at BREAK after it has been loaded on the laptop. The **goal** is to work with speakers, but also to minimize disruption in the flow of the Program.

4. Since there are no concurrent sessions, projectors are setup up each morning and the presentations are in sequence for that day. If speakers want to use their own computer, arrangements must be made with the A/V committee prior to the start of the day's Program.

5. There will be one person to operate each projector (laptop and 35mm). Contact the A/V committee if giving a presentation that requires both types of projectors. After the meeting all the presentations will be archived on a CD.

Forms and Vouchers

No, this message is not from FMCA's Bookkeeping Department. The title of the essay is borrowed, in part, from a recent book, *Endless Forms* (DJ Howard and SH Berlocher, editors, Oxford University Press, 1998) on current and past concepts about species and speciation. In concert with thoughts elaborated by Walter Tabachnick in his column in this BuzzWords on Mosquito Variability, I suggest that modern concepts of biological species and populations have important implications for vector control. The 'voucher' portion of the title will be developed later in this essay.

Since Linnaeus and for most of the history of mosquito control, vector identifications relied on a typological concept of species tied to morphological traits used to distinguish between related forms. For some closely related mosquito species, key morphological characters were not recognizable in the adult stage. It was not until the 1920s, when malaria was still rampant in Europe, that investigators realized that *Anopheles maculipennis* mosquitoes responsible for transmission of this disease consisted of a complex of cryptic species, some members of which could be separated by morphological characters in the egg stage.

A quantum leap in perceptions about speciation occurred with the subsequent applications of the biological species concept, which defined boundaries between forms based on reproductive isolation. In mosquito research, reproductive isolation was originally determined by hybrid sterility and by analyses of chromosome configurations that identified barriers to cross mating. The latter field was enriched in the 1960s and 1970s by the late Jim Kitzmiller and his student Dick Baker, both of the Florida Medical Entomology Laboratory. The application of these methods and concepts led to the discovery that the world's most important mosquito vector, the African *Anopheles gambiae*, actually consisted of six cryptic species, only two of which, *Anopheles gambiae* s.s. and *Anopheles arabiensis*, are considered of major importance in malaria transmission in Africa. Whereas field studies of Gambiae Complex mosquitoes were slowed in previous decades by the tedium of chromosome-based species identifications, current methods of modern DNA-based technology have made species separations fast and efficient.

Species complexes also occur among Florida *Anopheles*. The research group led by Jack Seawright at the former Medical and Veterinary Entomology Research Laboratory of the USDA in Gainesville demonstrated that *Anopheles quadrimaculatus*, the primary vector when malaria was still endemic in Florida until the 1940s, consisted of five distinct species. Thanks to John Reinert, also of the USDA, morphological keys and species epithets are now available for these species, which were formerly distinguishable only by chromosomal or biochemical analyses. *Anopheles crucians* also represents a complex of a, as yet undetermined, number of cryptic species.

The significance of this systematics research to mosquito control is that these cryptic species differ in ecology and behavior and, thus, propensity to bite humans and be involved in cycles of disease transmission. (An important message in the book *Endless Forms* is that the initial events of many speciations are changes in ecology or behavior.) If malaria were reintroduced and local transmission occurred in Florida (as occurred at least twice in the 1990s), the knowledge of the composition of cryptic anopheline species in disease transmission foci would be essential for incriminating and controlling the vector(s).

As indicated in Walter Tabachnick's accompanying essay, genetic variability within species may also be substantial and account for local differences in the bionomics of pests and vectors. Like it or not, the behavior and ecology of a species varies geographically and temporally as a consequence of different environments, local adaptations, or chance effects. For example, in part of its native range in East Africa, *Aedes aegypti*, regarded in some quarters as one of the world's most anthropophilic mosquitoes, feeds primarily on reptiles. In South America, the biting periodicity of the Amazon

Region's most important malaria vector, *Anopheles darlingi*, varies regionally. In areas of Brazil where *An. darlingi* prefers to bite around midnight, bed nets are more effective for malaria control than in areas where biting of this species peaks around dusk. These biological variations are intraspecific, i.e. both *Ae. aegypti* and *An. darlingi* are considered as one species throughout their vast ranges.

Recently I returned from a trip to southern Brazil, made to further a research project that compares the invasion process of *Aedes albopictus* in that country with the biological effects of this same species here in Florida. My mosquito collections in Brazil were facilitated by excellent logistical support from the Fundação Nacional da Saude (FNS) whose municipal branches perform functions analogous to our mosquito control districts. During visits to local offices, I was shown entomological cabinets filled with well curated, pinned specimens of representatives of mosquito species captured during routine collections and surveillance where FNS personnel performed mosquito control.

There are several reasons why Florida mosquito control districts ought to maintain a collection of 'vouchers', or representative samples, of species or 'forms' captured in traps or by routine sampling in their areas. The list "Distribution of Florida mosquito species by counties", used in most districts and reprinted in Dick Darsie and Charlie Morris' (1998) Keys of the Mosquitoes of Florida is unverifiable for many county records because the majority of specimens were discarded after identifications. In the absence of voucher specimens, some anomalous records on this Florida counties inventory should be regarded with skepticism.

Furthermore, any list of local mosquito fauna ought to be considered as a work in progress. Species are being lost as a consequence of habitat changes or unknown causes and added by accidental introductions or invasions. For example, *Anopheles bradleyi*, listed as present in 14 Florida counties, has not been collected for decades in the southeastern USA, and the distributions of *Aedes aegypti* and *Aedes albopictus* have been radically altered in Florida in the past decade due to invasion processes. Other new arrivals should be anticipated, such as perhaps *Aedes japonicus*, which is now widespread in the northeastern USA only two years after its discovery there.

A collection of voucher specimens is arguably a much more potent and valuable tool now than in previous decades when museum specimens served only to support morphological taxonomy. Extraction of DNA from dried or alcohol-preserved specimens is now routine and permits new levels of genetic discrimination that were previously impossible. With the rate of recent progress in genomics, it may become feasible down the road to identify from dried specimens DNA-based correlates of vectorial potential, insecticide resistance, etc. The preserved 'vouchers' are a repository loaded with information about the 'forms' of pests and vectors in mosquito control districts. A reference collection could be a mosquito district's future gold mine.

Phil Lounibos
Florida Medical Entomology Laboratory

Mosquito Variability: Did the mosquito do it?

Studies by the Yellow Fever Board, Cuba 1900.

This summer marks 100 years since the discovery of *Aedes aegypti* transmission of yellow fever (YF) virus. The events in this discovery began on May 24, 1900 when the Adjutant General appointed a Board, consisting of Drs. Walter Reed, Aristides Agramonte, James Carroll and Jesse Lazear. Their mission was to study infectious diseases in U. S. troops in Cuba at the close of the Spanish-American War. The Board focused on YF. On July 21, 1900, Reed and Agramonte evaluated the case history of a U. S. soldier who had been a prisoner confined in the guardhouse since June 6. He showed YF symptoms on June 12 and died of the disease on June 18. None of eight other prisoners, all sharing the same cell became sick, and one had slept in the same bunk that had previously been used by the dead prisoner. Three men who handled the linen of all YF patients remained in perfect health. Thus the Board focused on mosquito transmission for YF proposed nearly 20 years previously by Dr. Carlos Findlay. Despite numerous attempts, Findlay had been unable to show mosquito transmission of YF. The work by Ross and Manson with malaria and mosquitoes were known to the Board adding credibility for mosquito transmission of YF.

The first experiments used *Ae. aegypti* that had fed on YF patients three days previously and then fed on human recipient volunteers. No disease occurred. We now know that this incubation period was too short for these mosquitoes to have virus in their salivary glands at three days post-infection. The Board however was discouraged. Dr. Lazear applied an *Ae. aegypti* female to himself on August 16. It had fed on an infected patient on August 6. Ten days incubation might be sufficient virus to infect the salivary glands. Yet Lazear remained in fine health. The Board was becoming less convinced of mosquito transmission.

Now for an important *Ae. aegypti* female. It was hatched in the laboratory and was blood-fed on a YF case in the second day of a severe illness on Aug 15, 1900. It had also fed on patients on Aug. 21, 23, and 25. On August 27, Lazear commented to Carroll that this mosquito was refusing to take blood, seemed weak, and was likely to die. Dr. Carroll decided to try feeding it himself to avoid losing it. Lazear held the tube containing it for a period against Carroll's forearm. Then Carroll held the tube against his own forearm and the mosquito began to blood feed. On August 30, 1900 Carroll felt ill, and by September 2 had severe YF. Luckily he survived. Walter Reed was in Washington D.C. during this period writing a report on Typhoid. His letter (Figure 1) was written after he learned of Carroll's recovery. Note the closing line - "Did the mosquito do it?" At the time, even Carroll believed he might have contracted YF during his work in the autopsy room or in the hospital, and not from this mosquito.

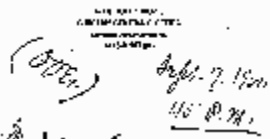
Four days after Carroll's experiment, Jesse Lazear met Pvt. William E. Dean, Troop B, 7th Cavalry. Dean knew about the experiments and Carroll asked if he would allow himself to be bitten. Dean had not been in the tropics before and had not been off the YF free base for nearly two months - a perfect non-immune. Dean did not believe in mosquito transmission, and Lazear and Agramonte were skeptical as well. Several *Ae. aegypti* females, all previously fed on YF patients, were used on Dean. By September 8 Dean had YF and he too survived. Lazear and Agramonte cabled Reed that mosquito transmission had been confirmed. However, bad news was to follow. On Sept. 25, 1900 Dr. Jesse Lazear died of YF. He had become ill on Sept. 18, and had related that he had observed a wild *Ae. aegypti* feeding on his hand as he was blood feeding a captive mosquito on a YF patient in hospital on Sept 14. Rather than interrupting his experiment, he watched as the wild mosquito engorged itself. He had thought he was immune in view of the failed experimental transmission attempt on himself on Aug. 16.

Reed returned to Cuba in November and Reed, Agramonte and Carroll initiated experiments to substantiate the mosquito transmission theory. Experiments using human subjects, some succumbing to YF, that conclusively proved the mosquito - YF link.

What lessons can we learn today from the early experiments? First, experimental conditions are critical. Many YF transmission attempts failed because the need for viral replication in the mosquito was unknown. We now know that, depending on temperature, 10-14 days is needed for YF virus to infect mosquito salivary glands. Second, the choice of the individual mosquito was critical. We now know that *Ae. aegypti*, like all mosquito species, show individual variation in a variety of traits, including susceptibility to infection. Some *Ae. aegypti* females are incapable of being infected and transmitting YF due to their genetic makeup. Therefore, the choice of an individual mosquito, like the one infecting James Carroll, played a critical role in demonstrating mosquito transmission. It is likely that Jesse Lazear's first transmission attempt failed because he used a resistant *Ae. aegypti*.

Lessons for Modern Day Mosquito Control

What does this mean to us today? We know that there are differences between mosquito species, and accurate vector identification is important (see Dr. Lounibos' accompanying essay). There are differences in many important characteristics, i.e., host preferences, activity periods, habits, vector ability, insecticide resistance, etc. What we sometimes ignore is that there are population and geographic differences in these same traits within a species. *Culex nigripalpus* is widely distributed throughout Florida, yet we have no understanding of population or geographic variation. The same is true for *Aedes taeniorhynchus* and other Florida pest mosquitoes. Do west coast *Cx. nigripalpus* respond differently to pesticides, control strategies, vector status etc. compared to east coast mosquitoes, to those in the south? The similarity among pest mosquitoes is virtually unknown. We urgently need this information.



One method to estimate geographic variation is to analyze mosquito genetic markers. There now exists an extensive literature on the importance of such studies (see W. J. Tabachnick and W. C. Black.1995. Making a case for molecular population genetic studies of arthropod

disease vectors using molecular techniques. Parasitology Today 11:27-30). Polymerase chain reaction methods to detect DNA markers in individual mosquitoes are very useful, and their evaluation in Florida mosquito pests will be a first step in being able to apply the nascent field of genomics to mosquito control. As we develop new vector control methods, it will be essential to have an understanding of the mosquito material used in experiments and how this material applies to different regions of Florida. Knowing the genetic relatedness of west coast and east coast *Cx. nigripalpus* for example, will allow experimental findings to be applied to the field. When mosquitoes are evaluated for pesticide resistance, we need to know the genetic nature of the tested mosquitoes. How do they compare to the field? What do they represent? This information is critical to determine the applicability of the results to different Florida regions. Understanding mosquito genetic variation is essential to providing efficient, effective, and proper mosquito control and vector borne disease intervention in Florida.

Walter J. Tabachnick, Director

Florida Medical Entomology Laboratory

Figure to left is a copy of correspondence from Dr. Walter Reed to Dr. James Carroll asking "Did the mosquito do it?"

[July 2000 Abrovirus Report](#)

[2000 FALL MEETING REGISTRATION FORM](#) *Click to open, print out and fax to Shelly.*

[2000 FALL MEETING FIRST CALL PAPERS](#) *Click to open, print out and fax to Ed Hunter.*