THE BITING TIMES

THE OFFICIAL NEWSLETTER OF THE NCMVCA

How To Recognize Bed Bug Infestations

Jung Wook Kim Ph.D, NCDENR– PHPM

Hard to detect the bed bug infestation

It is not unusual for people to take a month or two before they realize that they have a bed bug infestation at their house. Bed bugs are cryptic and nocturnal and come out at night to feed on humans or other warm blooded animals. Bed bugs like to stay in their hiding places, such as cracks and crevices, most of their time. They normally look for blood meals every three days and they forage out only about an hour. Their bites are not painful, when you are in deep sleep. Bed bugs are also small, so they can escape your detection. Adults are reddish brown and oval shaped (size: 5-6mm) about the size of an apple seed when engorged. Nymphs (young ones) are smaller (size: 1-4mm) with lighter body color. Consequently, bed bugs can stay undetected for a long time, thanks to their behavior and morphology.

Signs of bed bug infestation

At an early stage of bed bug infestation, you will have a low number of bed bugs. Therefore, you will not see many black dots of fecal material near their hidings or on furniture. These black stains are typical signs of bed bug infestation and the first sign inspectors should look for. Signs of bed bug infestation are often ignored. People think that they were getting mosquito or flea bites. When people find blood stains on their bed sheets, they believe their noses were bleeding. Some think they had ticks or cockroaches. Some think that they had a skin problem or allergy to cosmetics or shampoos. Skin reactions to bed bug bites varies. Some people are sensitive, but others are not sensitive at all.

If you have bed bugs, you may have some of the following signs: black fecal stains, sweet rotten raspberry smell of the bugs, bite marks on your skin, blood stains on your bed sheets, shed skins of bed bugs, eggs of bed bugs, and live bed bugs. When you have a light infestation, you may find one or two eggs on a head board. You need to examine thoroughly for the signs of bed bug infestation on box springs, mattress, bed frame, and the head board. Check cracks and crevices thoroughly. Look into the seams, joints, and screw or nail holes in the furniture.

Bed bug specimens need to be collected

It is very important that you collect bed bug specimens for 100 % positive identification of bed bug infestations. There are other kinds of biting insects; therefore, you cannot automatically assume that you have bed bugs if you cannot find any other insects in your place. For collecting bed bugs, you need to have a flashlight, alcohol vials, and forceps. You can also stick a bed bug specimen on Scotch tape, and then you can place the tape on a piece of paper to send for identification. When bed bugs are in low numbers, it is hard to detect them. To tentatively confirm a bed bug infestation, we need to have a combination of the aforementioned signs.

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Inside this issue:

Exotic Mosquito Disease Introduction

Barry Engber Sc.D , NCDENR– PHPM

West Nile virus has proven that the introduction and establishment of an exotic mosquito transmitted viruses in the US is very possible. Other arboviruses might also enter the US causing a disease outbreak and possibly become established like WNV. Three arboviruses are most often mentioned as possible introductions into the US: dengue, Rift Valley and chikungunya. Table 1 summarizes some of the important characteristics of these viruses in relationship to an introduction into the US.

Table 1. Possible Arbovirus Introductions to the US

	Dengue	RVF	Chikungunya
Likely US Vectors			
Primary	*Aedes aegypti*	*Aedes/Och.* mosquitoes	*Aedes aegypti/Ae. albopictus*
Secondary	*Aedes albopictus*	*Culex*; other biting insects	*Aedes albopictus*
Human-Mosquito-Human Transmission	yes	yes	yes
Overseas Reservoirs	human primates	human livestock	human
Sentinel Flock Use	no	no	no
Symptoms See below	arbo	arbo	arbo
Arbovirus family	Flavivirdae	Bunyaviridae	Togaviridae
Arboviurus genus	*Flavivirus*	*Phlebovirus*	*Alphavirus*
Possible Sera Cross-reactions	St Louis, WNV	California	EEE, WEE
Possible Outbreak Indicators	focal outbreaks	same	same
	rapid case increase	same	same
	numerous cases	same	same
	family clusters	same	same
		animal cases	

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Exotic Mosquito Disease Introduction continued from page 2

All three of these viruses have a very significant characteristic that makes them a serious threats if introduced. Unlike WNV or Eastern equine encephalitis virus where only birds develop enough virus to infect mosquitoes, humans can develop enough dengue, Rift Valley or chikungunya virus in the blood to infect mosquitoes and for those mosquitoes to then infect other humans. Transmission of these viruses does not require an animal reservoir; the main vectors will be those that will feed readily on mammals. As a result, it is very possible that an infected traveler could enter the US and then infect local mosquitoes. Also, because humans act as the reservoir of these viruses it is common for outbreaks to be very explosive, affecting many people in a small area. Cases among family members and neighboring households would be expected during an outbreak of these viruses and such a pattern would be a likely early indication of the presence of these viruses in the US. The State Lab of Public Health (SLPH) is not currently testing routinely for these viruses, but blood samples from people would show cross-reactions to tests already being performed for WN, EEE and California viruses by the SLPH. Because birds do not play a role in the transmission cycle of these viruses and the vectors are likely to be mainly mammal feeding, sentinel chicken flocks are unlikely to be of much value in detecting the presence of these viruses.

Dengue virus – Found worldwide in the tropics. Over the past few decades dengue cases transmitted in the US have occurred along the Texas/Mexico border. The threat from dengue actually seems to have declined in much of the Southeast US because populations of *Aedes aegypti*, the main vector, have declined and even disappeared in many states, including NC, since the introduction of *Aedes albopictus* during the 1980's. This leaves the abundant, but less effective *Aedes albopictus* as the most likely vector in much of the Southeast.

Rift Valley virus - Usually found in North Africa and the Middle East. Human infections result from the bites of infected mosquitoes, most commonly *Aedes/Ochlertatus* mosquitoes, but *Culex* is also an effective vector. In lab studies *Aedes albopictus* has been shown to be a capable Rift Valley virus vector. Transmission of Rift Valley virus by other blood-sucking insects is also possible. Many human infections may also result from direct or indirect contact with the blood or organs of infected animals. . The virus infects humans through wounds caused by infected knives, contact with cuts or broken skin, and through inhalation of aerosols produced during the slaughter of infected animals. There is some evidence that humans may also become infected with Rift Valley virus by ingesting the unpasteurized or uncooked milk of infected animals. Rift Valley virus may have a large impact on livestock and wild animals as well as those people with an occupational exposure to mammals

Chikungunya virus - Normally occurs in Southeast Asia as well as Central and Southern Africa. *Aedes aegypti* was considered to be the main vector of chikungunya and *Ae. albopictus* was considered a less effective secondary vector. However, in the absence of *Aedes aegypti* a large outbreak of Chikungunya involving thousands of cases occurred on the Indian Ocean islands of La Réunion, Mauritius, Seychelles and Mayotte during 2005 and 2006, while a small, but surprising outbreak involving hundreds of cases occurred in northern Italy in 2006 in both cases it was determined that *Ae. albopictus* served as a very efficient vector Subsequent study showed that a strain of chikungunya has become adapted for transmission by *Ae. albopictus* as the primary vector. This opens the Southeast US to an arbovirus that could be readily transmitted by our most common backyard species. CDC has studied travelers coming to the US from chikungunya endemic areas and found many to have enough virus in the blood to infect mosquitoes.

More information about these viruses can be found at these CDC web pages:

http://www.cdc.gov/ncidod/dvbid/dengue/

http://www.cdc.gov/ncidod/dvrd/Spb/mnpages/dispages/rvf.htm

http://www.cdc.gov/ncidod/dvbid/Chikungunya/

Barry Engber, Sc.D., Medical Entomologist, Public Health Pest Management Section, NCDENR

Barrier Sprays: An Alternate Adulticiding Option

In these trying economic times when failing budgets make our mosquito control decisions perhaps it is time to consider an alternative. Barrier or perimeter sprays are nothing new; they may just be new to us. In other areas of the world, barrier sprays are the way it is done. Dr. Harrison reflects on their use in Thailand back in the 60's to protect the perimeter of the military installation and other less fortunate countries use it as a regular course of business for the suppression of disease like Malaria and Dengue.

Barrier sprays are picking up in the South East especially with pest control companies that have entered the arena of mosquito control for hire. The reasons are simple.

- ULV machines cost a lot
- The products run through the machines aren't cheap either
- These ULV products by their nature, have no lingering control
- Barrier sprays can be applied with a pump up hand sprayer or a backpack mister or a pressurized tank system' and these are things a pest control company have already

Barrier spray products are comparatively cheap with some having an effective residual of a month or so.

With this ease of application and the extent time of the control, it makes great sense for a pest control operator to use this method whenever appropriate. In fact, it makes good sense for public health operators as well.

Barrier sprays can't be used everywhere of course. The idea is to apply the high residual product of choice to the resting areas of mosquitoes. So, the wood line around a ball field, shrubbery around a daycare or group home, the forest edge defining the edge of a subdivision are all good places to apply barriers. Just ask yourself how many times a ULV truck has been sent to a ball field during the day to knock back mosquitoes that will not show until that evening when our kids are out practicing tee ball or soccer. We know full well when we send the truck in the daylight that it will have a very limited positive effect; most of the product just sails away into the ether without killing a thing… It is mid day but that is our only opportunity since our kids are there at dusk when we might gain some control. Now imagine going mid-day to that same ball park and applying a colorless, odorless, water based product to the woods line that once dry will linger for a month. As dusk and night descend the product is still there working. As the mosquitoes land on the treated foliage, they pick up a lethal dose and die. As morning breaks the product is still there whittling away at the mosquitoes. This continues for days and weeks.

Another point to ponder about your annual budget: The most expensive aspect of a mosquito control program is usually labor or man hours. ULV work done right is done at dusk or at night or in the wee hours of the morning. Typically the operators are working on overtime. Time and a half will eat a budget quickly. Consider these same employees treating the edge of a subdivision during regular business hours with a pressurized tank sprayer or a backpack mister. Then add to the equation the possibility that within a few days (maybe overnight) the mosquito situation in that community has wondrously abated eliminating the need for further nighttime ULV work. Then, you have achieved your goal of public health stewardship though mosquito control and saved precious funding in the budget.

The question some are asking is how "safe" is it? My answer is it is just as safe as a ULV spray. In fact, it may be better. Your applications are targeted to mosquito resting areas; they are not just sprayed into the atmosphere with hopes of meeting a mosquito during drift. Plus, the actives in barrier sprays vary but most are still permethrins or OP's that we use in ULV machines anyway.

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Product Spotlight– Spheratax

Steve Molnar– ADAPCO

ADVANCED MICROBIOLOGICS, LLC. is pleased to announce EPA approval of *Bacillus sphaericus*, Strain 2362, Serotype 5a5b formulations for use in mosquito control programs. The new formulations are SPHERATAX® SPH (50 G), SPHERATAX® SPH (50 G) WSP, SPHERATAX® SPH WP.

SPHERATAX® SPH (50 G), SPHERATAX® SPH (50 G) WSP AND SPHERATAX® SPH WP are highly selective microbial insecticide formulations effective against mosquitoes in a variety of habitats. The SPHERATAX® SPH formulations can be applied to any water sites except treated, finished water reservoirs or drinking water receptacles when the water is intended for human consumption. The formulations can be applied to areas that contain aquatic life, fish and plants and to areas used by or in contact with humans, animals, horses, livestock, pets, birds or wildlife. SPHERATAX® SPH formulations can be applied in conventional aerial and ground application equipment.

SPHERATAX® SPH (50 G) and SPHERATAX® SPH (50 G) WSP are corn cob granular formulations. The WSP is available in 10 gram water soluble packets. The SPERATAX ® SPH (50G) is available in 40 pound bags. The granular formulation minimizes drift, improve penetration of vegetation.

The active ingredient used in SPHERATAX is a bacterium, *Bacillus sphaericus,* Strain 2362, Serotype 5a5b. The bacterium is grown under strict process control conditions to ensure high potency of the technical powder used for formulation of SPHERATAX SPH (50G). The production methods used to produce the SPHERATAX SPH formulations are equivalent to those used in the human health industry.

The technical powder has excellent insecticidal potency. This activity is determined by a third party laboratory using a standard bioassay method and a *Bacillus sphaericus* powder standard of known potency. Every lot of the technical powder and every lot of SPHERATAX SPH (50 G), SPHERATAX® SPH (50 G) WSP and SPHERATAX® SPH WP are bioassayed to ensure that the label potency of the formulations is achieved. This attention to quality ensures consistent larvicidal control against target insect species.

All SPHERATAX® formulations have been tested at the University of Florida and by selected researchers in other states. Sampling to mosquito abatement districts was also completed and all results have been excellent.

Contact **ADAPCO** today to introduce SPHERATAX into your program.

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2009 NCMVCA Annual Meeting

The 2009 North Carolina Mosquito & Vector Control Association annual meeting will take place October 28– 30, 2009 in Greenville, N.C. The meeting will take place at the City Hotel & Bistro.

To make reservations go to www.cityhotelandbistro.com or you can call 1-877-271-2616. The NCMVCA Executive Committee is currently working on another exciting agenda for this years meeting. Please see the application in this issue for further info.

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Container-Inhabiting Mosquitoes on Western Carolina University's Campus

Alan Goggins and Jamie Wyatt*

Since 2008, two students from Western Carolina University's Environmental Health Sciences program have been involved in a project to identify what species of container-inhabiting *Aedes* mosquitoes are present on their campus in Cullowhee, NC. The project involves the use of ovitraps at several sites on campus in order to identify what species are present and in what proportions. The eggs laid during oviposition are collected on strips of seed germination paper and then reared to the 4th instar stage, where they are morphologically identified to species.

The results of this project could prove to be especially significant given the university's location in a La Crosse encephalitis endemic region of North Carolina. La Crosse encephalitis is North Carolina's number one arboviral disease and the nation's leading cause of arboviral related encephalitis in children. The primary vector of La Crosse encephalitis is *Aedes triseriatus,* commonly known as the eastern tree-hole mosquito.

Surveillance started in the fall of 2008 and continues to the present day. Our data show the presence of three primary species on Western Carolina University's campus: *Aedes albopictus, Aedes japonicus,* and *Aedes triseriatus. Aedes albopictus* was the most abundant species collected, followed by *Ae. japonicus* and *Ae. triseriatus.* The findings are interesting for a number of reasons, both *Ae. albopictus,* and *Ae. japonicus* are invasive species, yet they make up the overwhelming majority of specimens collected (approximately a 9:1 ratio of invasive to native species). La Crosse virus has been detected in field specimens of *Ae. albopictus* and *Ae. japonicus* is known to be competent vector of the virus based on laboratory studies. Even though *Ae. triseriatus* was collected in the least abundance, it is still believed to be the most important La Crosse vector. The project has also helped identify the approximate beginning and end of the ovipositioning season in Western NC. Ovitrap surveillance is scheduled to continue into next season and the results from this data should prove useful for La Crosse related projects in the future. This work was funded by an undergraduate research grant from the Western Carolina University Honors College.

Selected References:

Gerhardt, R.R., et al., *First isolation of La Crosse virus from naturally infected Aedes albopictus.* Emerg Infect Dis, 2001. **7**(5): p. 807-11.

Hughes, M.T., et al., *Comparative potential of Aedes triseriatus, Aedes albopictus, and Aedes aegypti (Diptera: Culicidae) to transovarially transmit La Crosse virus.* Journal of Medical Entomology, 2006. 43(4): p. 757-61.

Sardelis, M.R., et.al., *Laboratory transmission of La Crosse virus by Ochlerotatus j. japonicus (Diptera: Culicidae).* J Med Entomol, 2002. 39(4): p. 635-9.

Watts, D.M., et al. *Transovarial Transimission of La Crosse Virus in Aedes triseriatus.* Annals of the New York Academy of Sciences. 1975. 266: 135-143.

*Alan Goggins and Jamie Wyatt are both seniors in the Environmental Health Sciences (Bachelors of Science) program in at Western Carolina University, Cullowhee, NC

Golden Dipper Award Renamed to the William F. Strickhouser Golden Dipper Award

The NCMVCA mourns the recent loss of William (Bill) F. Strickhouser. Mr. Strickhouser was a founding and honored member of this association throughout his life. Mr. Strickhouser started the first and only full service business serving mosquito control in North Carolina at the time, the Wm. F. Strickhouser Company. In this capacity he was an asset to local mosquito control programs for many years, selling and maintaining many generations of equipment through the years. These included a variety of thermal foggers, Buffalo Turbine mister/dusters, and ending with London Fog ULV spray equipment – some of the latter still in use today! His impact on the local programs and their people is best described in the testimonial copied below.

In honor of his passing, the association's executive committee has unanimously voted to rename the annual "Golden Dipper Award" in Mr. Strickhouser's honor. The Golden Dipper Award, created to honor the professional in the field, is an award for all the values and professionalism exhibited by Bill Strickhouser throughout his long career in mosquito control. Please honor Mr. Strickhouser's dedication and integrity through your nominations for the 'best of the best' as recipients of the William F. Strickhouser Golden Dipper Award!

From Mr. Rick Hickman, testimonial for William F. Strickhouser:

I first met Bill Strickhouser in October of 1975. That was the year of the fear of a Saint Louis encephalitis outbreak in the State led to funding being made available for statewide mosquito control efforts. Bill drove a green 1969 Buick Electra and pulled a trailer behind it. At the time Brunswick County was just starting its mosquito program. We talked products and machines. At the time our program had a minimal budget so while I learned a lot about what I needed to run a program, I was just dreaming about the future.

In August of 1976 with *Ochlerotatus sollicitans* inundating all of coastal Brunswick County, I called Bill. Not only did he set me up with a machine and the chemical I needed to address the problem, we sealed the deal with a handshake. Knowing my financial issues he said we'd work something out with respect to payment. I will never forget that.

Bill was instrumental in laying the groundwork for the following mosquito programs in Brunswick County: Ocean Isle Beach, Sunset Beach, Holden Beach, Long Beach, Yaupon Beach and Southport. By 1980 all the municipalities listed above had started their own mosquito programs.

The 1981 season was the worst season since the inception of the Brunswick Program. Although Bill owned and operated the company, I always felt that Bill put the needs of new programs first. He always had an encouraging word, which made new programs believe they could successfully run a mosquito control program. He always seemed to show up at the right time with the tools we needed to make our program work.

Early on when Bill stopped by to visit, we would talk for hours. He always told me about what was happening in the rest of North Carolina pertaining to mosquito control. Who tried what, who had a new strategy, a new product, something new to try. Bill showed me opportunities in mosquito control that I did not know existed whether it was chemical, biological or physical control strategies. For that I will always be grateful. To me Bill Strickhouser was not a vendor, he was my friend.

Sincerely,

Rick Hickman

Hamm Stevens Award & William F. Strickhouser Golden Dipper Award

It's that time again! Our annual conference is coming even sooner than usual this year and to date, I have received no nominations for the coveted Hamm Stevens award and the William F. Strickhouser Golden Dipper Award. The Hamm Stevens Award is given to those who have in some big way forwarded public health stewardship in North Carolina. It is not too late to submit to me your nominations for review. If you know of someone deserving, provide me an outline of the individuals accomplishments and in a paragraph give the details of the individual. Thanks in advance for you contributions! Send your nominations **no later than October 1, 2009** to: Joe Andrews joe.andrews@univarusa.com .

2009 NCMVCA Mosquito Control and Insect Photography Contest

Sponsored by NCMVCA

North Carolina Mosquito and Vector Control Association

TO ENTER: Submit digital images (JPGs, file size of 1-3 MB) of living insects or related subjects/ arthropods to jkimfoto@gmail.com. All images must be received no later than **Friday, October 23, 2009 (12:00 a.m.)**. Include your name, your address, and your telephone number. Also, include the titles of the submitted images.

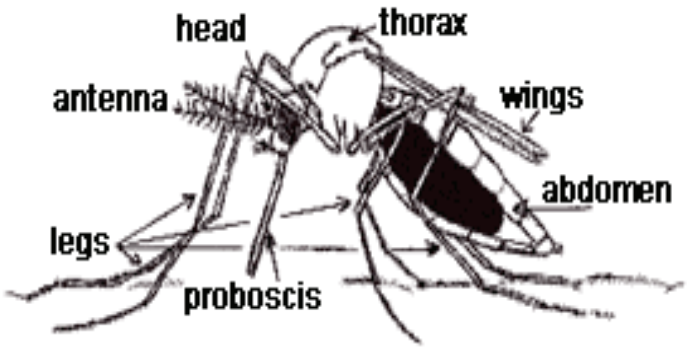
JUDGING: All submissions will be reviewed by a team of judges. An image may be entered in only one category. The criteria for judging images will be determined by the judging team. The participants can submit two images per category (total of eight images at maximum).

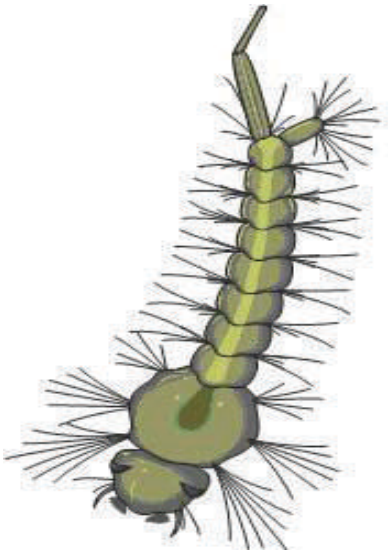
The top 3 slides in each category will be shown at the NCMVCA Banquet. Attendees will cast votes for the "Best Image" for each category.

CATEGORY:

1. Mosquito breeding sites
2. Mosquito ID characters or tick ID characters
3. Mosquito control equipments and applications
4. General insects and arthropods
5. Close-ups

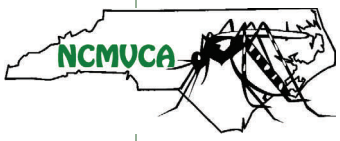
RECOGNITION: Winning images will be displayed on the NCMVCA web page with proper credit to the photographer (submission of an image for the contest gives the Society permission to display the image on its web site with proper recognition).





Entomological Society of America Names 2009 Fellows

The ESA Governing Board has elected ten new fellows of the Society for 2009. The election as a Fellow acknowledges outstanding contributions in one or more of the following: research, teaching, extension, or administration. The ESA has decided to recognize ***Dr. Charles S. Apperson*** of North Carolina State University as one of its ten Fellows for 2009. Dr. Apperson is a vector biologist with research and extension responsibilities in the Department of Entomology at NCSU. He obtained a Ph.D in entomology at the University of California, Riverside in 1974. After graduation, Apperson accepted a position as research entomologist for the Lake County Mosquito Abatement District in Lakeport, CA. In 1976, he joined the entomology faculty at NCSU as assistant professor. In recognition of his accomplishments in public health entomology, Apperson was awarded the William Neal Reynolds Professorship by the College of Agriculture and Life Sciences at NCSU in 2005. Apperson has published 110 refereed research publications, numerous conference proceedings and book chapters, and 50 extension publications. His entomological interests include behavior, biology, and control of vector arthropods, especially mosquitoes and ticks. Apperson has established an international reputation for the breadth of his vector biology activities. In particular, Apperson is recognized for his contributions to an understanding of the host feeding habits of mosquitoes and the biotic cues mediating oviposition of inhabiting *Aedes* mosquitoes. Dr. Apperson and the other Fellows wil be recognized during the 2009 ESA Annual Meeting , which will be held Decenber 13–16 in Indianapolis, Indiana. Congratulations Dr. Apperson, and thank you for your life long contributions to the field of vector biology. To learn more about the nine other Fellows for 2009 and the Entomological Society of America please visit their website at www.entsoc.org.



2009 NCMVCA Conference

October 28th, 29th & 30th

City Hotel & Bistro, Greenville, NC

Preliminary Speaker List

Topic	Speaker Name	Affiliation
New Insights in the N.A. *Orthopodomyia*	Dr. Brian Byrd	Western Carolina University
Molecular Studies of the N.A. *Wyeomyia*	Bill Wiseman	Western Carolina University
Do Water Quality Parameters in Riverine Rock Pools Influece *Ae. atropalpus* and *Ae. japonicus* habitat selection	Mike Singleton	Western Carolina University
Container Inhabiting *Aedes* mosquitoes on the WCU campus	Alan Goggins & Jamie Wyatt	Western Carolina University
Hookworm, Malaria & Yellow Fever as social forces in the Culture of the South	Dr. Alice Anderson	Eastern Carolina University
Pesticide Safety	Joe Andrews	Univar, USA
Barrier Treatments	Joe Andrews	Univar, USA
AMCA Update	Doug Carlson	AMCA, President
Parasites	Joe Conlon	AMCA, Technical Director
Comparative Identification Characteristics	Robert Collins	Rocky Mount Code Enforcement
Ticks in NC	Marcee Toliver	NC DENR, PHPM
Identifying females of *Oc. atlanticus* and *Oc. tormentor* and similar species	Dr. Bruce Harrison	NC DENR, PHPM
Norway Rats	Joe Rowell	Mecklenburg Co. Mosquito Control
Bedbugs	Dr. Jung Kim	NC DENR, PHPM

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2009 NCMVCA Conference

October 28th, 29th & 30th

City Hotel & Bistro, Greenville, NC

Registration for Conference

Sign up for:	Member	Non-Member
☐ Registration (before Oct. 8th)	$65.00	$70.00
☐ Registration (after Oct. 8th)	$75.00	$80.00
☐ Companion/Spouse (before Oct. 8th)	$35.00	$35.00
☐ Companion/Spouse (after Oct. 8th)	$45.00	$45.00
☐ One Day Only	$45.00	$50.00
☐ Companion/Spouse Dinner	$35.00	$35.00
☐ Student - all 3 days	$30.00	$30.00

☐ Vendor Registration: Contact Joe Strickhouser for more information 704-333-2523

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NCMVCA
P.O. Box 40245
Raleigh, N.C. 27629– 0245

New Membership Application and Membership Renewal Form
N.C. Mosquito and Vector Control Association

Name: _____

Organization/Company _____

Mailing Address _____

_____ Zip Code _____

Telephone Number _____ E-Mail: _____

Dues Payment for Year _____ Amount: ($10.00/year) _____

Make check payable to NCMVCA and mail to:

North Carolina Mosquito & Vector Control Association
P.O. Box 40245
Raleigh, N.C. 27629– 0245