

Special Feature

Current Topics in Medical and Veterinary Entomology: Results of a Roundtable Discussion

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Introduction

The original idea of organizing a roundtable discussion in association with the annual Mississippi Entomological Association (MEA) meeting was to promote interaction across disciplines among people with common interests. We wanted to involve entomologists, veterinarians, parasitologists, epidemiologists, public health advocates, livestock agents, and pesticide manufacturers in addressing issues common to all these groups. We hoped a roundtable setting would allow better discussion of the ecology and epidemiology of arthropods that attack or annoy people and livestock, as well as transmission of disease organisms of mammals by arthropod vectors. Our goal was to promote awareness of potential threats of arthropods to livestock and to people, both in the transmission of disease organisms and as nuisance pests in both the rural and urban setting, and to stimulate advancement of solutions to these threats as a multidisciplinary and community effort. By openly discussing these ideas among a group of experts in several fields, we hoped to provide information and promote additional involvement. The roundtable discussion took place at the Bost building on the Mississippi State University campus during the 56th annual MEA meeting and ran concurrently with an integrated pest management (IPM) roundtable in the next room. We carefully chose expert panelists who represented a wide range of expertise in the areas outlined. The names and contact information of the participants are provided at the end of this article. Nine topics were chosen for discussion: Lyme disease, human ehrlichiosis, bed bugs, vector-borne diseases of livestock and wildlife, Chagas disease, IPM, malaria, wasps and bees in the urban environment, and West Nile virus. These are all timely topics that have impact not only on the local but on the worldwide community. Discussion of these topics is summarized below.

Lyme disease

Lyme disease is not endemic in the southern United States, although this fact is not widely known. We need to educate people so that unnecessary animal vaccinations are not requested. For example, it is not necessary to vaccinate dogs and cats for Lyme disease, although a canine vaccination is available; some manufacturers might unwisely push clinics to buy them. We don't usually see Lyme disease in the

Southeast because there are several factors in the tick life cycle that are apparently interrupted in the South. For example, the primary vector of Lyme, *Ixodes scapularis*, is present in the South, but the immature stages, which feed primarily on the white-footed mouse in the North, feed on lizards in the South. Reptiles are not competent vectors of *Borrelia burgdorferi*, the etiologic agent of Lyme. It has been shown that transstadial transmission of the agent occurs and the nymphal stage transmits the organism. So, even if the organism occurs here and is circulating in the South, it is not being picked up because the nymph does not aggressively bite people. Note: *Ixodes scapularis* used to be called *I. dammini* in the North because it was thought to be a distinct species from *I. scapularis*. They are, in fact, the same species, although *I. scapularis* has different ecology in different parts of the country. Important work was done on the distinction between these two species by Jim Oliver from Georgia Southern University. It is important to educate people about the actual risk of Lyme disease in the South (which is slight). We also need a better educational effort for Lyme disease regarding personal protection since the risk is different here than in the Northeast. Clearly in parts of the country where Lyme disease is endemic, there is a seasonal pattern associated with it because of the relationship to its tick vector(s). That pattern is lacking in the South, which implies lack of association with a tick vector. The Lyme vaccine for people was removed from the market in 2002 due to its lack of long-term efficacy. As an initial effort to get information out to the community, at the roundtable John Guyton agreed to work with Andrea Varela-Stokes to publish educational materials regarding Lyme disease in Mississippi in the *Glowworm*, a newsletter which reaches 700–800 people.

Borrelia lonestari is a possible cause of STARI (southern tick-associated rash illness). In the 1980s, spirochetes were observed in the lone star tick (LST) (*Amblyomma americanum*), and in the mid-1990s, Alan Barbour identified them as a new *Borrelia* species. One human case of illness from this agent has been confirmed. However, people generally have only acute flu-like symptoms with STARI, rather than the chronic symptoms (arthritis, neuropathies, etc.) seen with Lyme disease. There is an erythema migrans-like rash as seen with Lyme disease, but no one has been able to culture *B. lonestari* from people diagnosed with STARI. Therefore, we can't say definitively that *B. lonestari* is the etiologic agent of STARI since only one case supports it. In fact, *Rickettsia amblyommii* has been considered a possible causative agent of STARI. There is no evidence that dogs become infected with *B. lonestari*, but veterinarians generally treat tick-borne illnesses with doxycycline anyway; the signs resolve, and the causative agent is never identified.

Human ehrlichiosis

Human ehrlichiosis (HE) in Mississippi has historically not been a reportable disease, although it is in most other states. There are currently two *Ehrlichia* species known to cause disease in humans: *Ehrlichia chaffeensis* and to a lesser extent *Ehrlichia ewingii*. The LST is the primary vector of HE and is abundant in Mississippi. Since tick-borne diseases are readily treated with antibiotics such as doxycycline, it is difficult to confirm and follow-up potential cases of HE. Patients are reluctant to pay for testing since the treatment is so readily available and effective. However, it would certainly help the research community to be able to document case incidence and geographic distribution. Like other zoonotic diseases, the symptoms of HE are general and described as "flu-like." However, immuno-compromised individuals might develop life-threatening complications from ehrlichiosis. Infants and toddlers are apparently not at high risk because they are less likely to be exposed to ticks. Also, ticks must be attached (usually for about 24–36 hours) in order to transmit the ehrlichial organism. At the roundtable, Jeffrey Brown of the Mississippi Department of Health said that he would work with Andrea Varela-Stokes and the epidemiology staff of the health department to ensure that HE is reportable in Mississippi. According to the 2008 list of reportable diseases in Mississippi, ehrlichiosis is included as a Class 2 disease (immediate public health response is not necessary). 2008 was apparently the first year that it became nationally notifiable. However, no cases were reported from MS in 2008, according to CDC.

Bed bugs

Bed bugs have become a huge problem in the United States, not only in hotels, but also airplanes, movie theaters, and homes. Mississippi health department inspectors investigate these places when complaints

are filed, but it is challenging to design a remedy for the infestations. Educating people by offering a seminar on bed bugs is a good place to start. In fact, a health department bed bug seminar is currently being planned and developed. One of the health department's educational efforts included the distribution of "Bed Bug" cards with the bed bug life cycle printed on them. Similar educational cards for tick-borne diseases were developed by Johnson Wax. For example, each card has a hole in it to illustrate the size of a nymphal tick.

Vector-borne diseases of livestock and wildlife

There are a number of endemic livestock diseases in Mississippi. For example, bovine leukemia virus (BLV) and anaplasmosis are endemic to the state. Anaplasmosis is primarily transmitted by ticks in the West, but mechanical transmission by the Tabanid fly, for example, or with surgical tools, is more likely in the East. Immunity for anaplasmosis in cattle might last for several years but outbreaks occur every 7–10 years. Bulls are likely implicated and vaccination of bulls might be an effective disease prevention strategy. There is an outreach department at the college of veterinary medicine (CVM), as well as an MSU Extension Service "affairs group" that responds to inquiries regarding suspected anaplasmosis. Various aspects of disease control are monitored at the CVM, including regulatory, diagnostic, and service components. Jim Watson, the state veterinarian, currently oversees regulatory aspects, and the diagnostic lab at Pearl, MS has multiple functions. An organizational chart that depicts these various roles and functions for the diagnostic lab is available (<http://www.cvm.msstate.edu/mvrld/index.html>).

Equine piroplasmiasis (EP) is a tick-borne protozoal infection of horses that could be a threat in Mississippi. Thirty-one cases of EP were identified in October, 2009, in Texas. The threat is complicated by additional travel into the state, especially by stud horses. *Dermacentor variabilis* has been shown to be an experimental vector of the disease in horses. Equine piroplasmiasis is a concern for the World Equestrian Games, scheduled for September, 2010, in Lexington, Kentucky. Regulations are already in place for transportation of horses from Canada. Small gatherings of horses, such as at field races, are common activities in the South and provide potential exposure of vector-borne diseases in horses.

Chronic wasting disease (CWD), often seen in deer, is currently not seen in Mississippi. Bluetongue is a vector-borne disease of ruminants caused by a virus of the Reoviridae family and biologically transmitted by the *Culicoides* midge. Deer in Mississippi have succumbed over the past few years to Blue Tongue (BT), which might look like foot and mouth disease (FMD). The biting midge (Ceratopogonidae) has been shown to be a BT vector and there was a large deer die-off in Louisiana during the summer of 2008. Although we don't know the vectors for epizootic hemorrhagic disease virus (EHDV), it is thought that they might also be midges or mosquitoes. However, no one has yet recorded the virus from these arthropods. EHDV is a reportable disease in cattle but is more often seen in sheep and goats and is a differential for BT. There is a disaster medical assistance team (DMAT) program in Mississippi that requires hunting clubs to report BT. These hunting clubs, and the large game hunting business in general, might be important in the ecology of BT in the southern United States.

Chagas disease

There have been a total of six officially reported (published) cases of Chagas disease in the United States. However, blood banks are now being tested and more cases are being found. Also several surveys have shown that about 50% of raccoons, possums, and triatomines from these animals are positive for *Trypanosoma cruzi*, the causative agent of Chagas. Dogs and raccoons acquire the disease by ingesting the triatomines. The agent manifests itself in a similar fashion to *Bartonella* in that the organism crosses the mucous membranes when an animal ingests it. *Bartonella* are Gram-negative bacteria that can infect healthy people but are usually considered opportunistic pathogens. *Bartonella* might also be transmitted by arthropod vectors such as ticks, fleas, sand flies, and mosquitoes. There have been two Mississippi cases of Chagas reported to the health department this year. Treatment is usually considered too toxic to be practicable. It has been speculated that cancer chemotherapy drugs used for treatment of Leishmaniasis, a disease caused by a protozoan and vectored by the sand fly, might also be effective for Chagas.

Integrated pest management (IPM)

The world health organization (WHO) uses the term integrated vector management (IVM) as an all-encompassing term to describe integrated vector and pest management. Many federal programs now require IPM, and many schools address IPM, although not in Mississippi. In a recent meeting of the Mississippi Science Foundation (MSF), discussions of new programs for IPM were met with enthusiasm.

There are non-traditional products being developed for use in IPM programs. Spinosad, which is considered a green product, kills thrips and is used as a pour-on for cattle. It is also marketed as Comfortis™, a flea product for dogs. The flea must bite the dog, but kills all fleas within 24 hours and generally lasts a month. Clients complaining of reduced efficacy of some traditional products, which appears to be due to resistance, are very happy with the results they are currently achieving with Comfortis™. John Riner conducted a flea insecticide resistance study. Also Alberto Broce from Kansas State University has examined pyrethroid resistance in fleas. On a related note, squirrels are not efficient hosts for cat fleas, although people often assume that they are. However, a study could be conducted to determine the viability of squirrels as hosts for cat fleas by using fleas from squirrels obtained during the Youth Squirrel Hunt.

A new product is being investigated with the Applied Science Labs that, if left undisturbed, kills fleas, cockroaches, and bed bugs for up to one year. The EPA has specific descriptors that cannot be used when referring to these “natural” or “green” products. For example, even the use of the word “natural” has restrictions. Also, words such as “limited” and “low-risk” may not be used as qualifiers without abiding by the definitions set out by the EPA. Also, it is especially important to refrain from claiming a link between a product and a particular disease entity.

Malaria

Malaria is a major concern in many parts of the world. A current Bill and Melinda Gates Foundation initiative names malaria as the number-one priority. The WHO originally agreed to spray DDT in homes to control malaria but they have since backed off from that stance due to extreme pressure from environmentalist groups. For years, various groups have engaged in extensive research on malaria vaccines but this is a complex problem because of the life cycle of the protozoan. Some success has been claimed from the use of insecticide-impregnated bed nets but some say it actually has a detrimental effect on children because it prevents them from becoming infected when they are young and thereby prevents them from forming a natural immunity. Improved nutrition is fundamental to an individual's ability to fight infection of any kind, including malaria. It has been speculated that global warming will likely bring malaria from the tropics to more subtropical regions, including the United States. The National Science Foundation (NSF) teachers' association will be meeting in Tupelo in 2010 and it was suggested the topic of global warming and malaria be included on the agenda.

Wasps and bees in the urban environment

Africanized or “killer” bees will probably be found in Mississippi within the next 5 years since they are already in Louisiana; in a parish only one removed from the Mississippi River. Introductions are inevitable, for example, through travel, such as into Camp Shelby, Mississippi, a large military training site. Also, yellow jackets might be found in locations, such as in walls that are not their preferred sites. Honey bees are currently in jeopardy. However, if honey bees are found in walls, there does not seem to be a good way to spare them. If a bee-keeper can be alerted, and the bees are in a swarm, they can be collected. However, they are usually just killed. This presents a problem from the subsequent odor in the wall due to rotting bees and honey. This occurs especially in the fall. The cause of beehive collapse syndrome is not known, although it is possibly due to a virus. Others speculate that the widespread use of the insecticide imidacloprid is implicated. The Mississippi Department of Agriculture is encouraging young people to become involved in bee keeping. Clarence Collison (Entomology and Plant Pathology Department) and Harry Fulton (Bureau of Plant and Industry) are among the few currently remaining experts in apiculture in Mississippi.

West Nile Virus (WNV)

The Mississippi department of health tests trapped mosquitoes every year for West Nile virus. Information about the infection status of the mosquitoes is then shared with Roger Nasci at the CDC in Fort Collins, CO. A prevailing theory is that storm drains contribute to the WNV problem. WNV is cyclical, and depends on the bird population. Birds tested in Louisiana are currently negative for WNV, which supports the theory that the infection is cyclical. A testing site in Mississippi in an upscale urban neighborhood recently resulted in the collection of 3,000 *Culex quinquefasciatus* mosquitoes trapped in one night. Home misting systems for mosquitoes are frequently used. One drawback to these systems is that non-certified personnel change the pesticide tanks, rendering the application of the pesticide unregulated. There is also a problem with the concept behind the home misting system in that it does not distinguish between pests and beneficial insects in its killing ability. On the brighter side, the laboratory rat LD₅₀ for a new mosquito control product recently made available is 46,000 mg/kg.

Where to go from here

The following action items were agreed upon by the group. Each one involves collaboration among different people and disciplines. It was agreed by all that the roundtable had exceeded prior expectations and would be the first of subsequent roundtables to be held in association with the annual MEA meeting.

1. John Guyton and Andrea Varela-Stokes: prepare an educational article about the risk of Lyme disease in Mississippi for publication in *Glowworm*.
2. Jeffrey Brown: follow-up with Andrea Varela-Stokes on recommendation to make HE reportable in Mississippi.
3. Carla Huston: provide an organizational chart for the diagnostic lab describing individuals and functions and send it to Kristine Edwards.
4. John Guyton: email Kristine Edwards about the particulars of the youth squirrel hunt.
5. Kristine T. Edwards: prepare the roundtable discussion for publication and contact Chris Peterson to enquire about *Midsouth Entomologist* as a possible venue.

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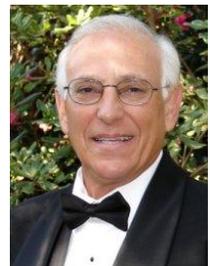
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