GMCA Annual Meeting
Oct 18-20, 2017

Day 1 – Oct 18

A. Opening remarks & Washington Day Update – Fred Koehle & Rosmarie Kelly
B. Control of *Aedes aegypti* and *Ae albopictus* in the Real World – Chris Lesser
    a. Background
        i. Most mosquito control districts were established to deal with saltmarsh mosquitoes
            1. Fairly straightforward control
            2. Large synchronous broods
        ii. Historically, efforts against *Aedes aegypti* and *Ae albopictus* have been focused on:
            1. Public education
            2. Focal premise sanitation
            3. Some ULV truck spraying, more for PR than real control
            4. Control
                a. Much more difficult
                b. Asynchronous breeding
                c. Daytime feeder
        iii. Issues
            1. Little authority to enter backyards
            2. Code enforcement laws generally do not include mosquito breeding containers
            3. Strong privacy rights
            4. Resistance to pyrethroids in *Ae aegypti* populations
        iv. Disease issues
            1. Dengue was eliminated in Florida in the 1940s, largely through premise sanitation
            2. Dengue re-emerged in FL in 2009
            3. Chikungunya emerged in FL in 2013
            4. Zika emerged in 2016
        v. This has led to a re-evaluation of mosquito control methods for dealing with daytime biting mosquitoes
    b. What we know
        i. Premise sanitation works
        ii. Problems
            1. Large acreage
            2. High cost
            3. Not time effective
        iii. Re-evaluation
            1. County
                a. 750 sq miles
                b. 50+ sq mile urban core with 350,000 residents
                c. 10 field inspectors
            2. Considerations
                a. Cost effective
                b. Rapid control

        c. Wide area control
c. Evaluations
    i. Small droplet larviciding from truck mounted ULV equipment
        1. 5% altosid with 50-75 droplet size
        2. Trial – good coverage
        3. Neighborhood – no reduction seen
        4. Why?
            a. Too many cryptic sites
            b. No wind to move product into backyard
    ii. Ground ULV adulticiding
        1. Fyfanon ULV at maximum label rate with 15 micron droplet size
        2. Weekly spray events
        3. Sprayed
            a. Daytime – 68% reduction
            b. Dusk – 76% reduction
        4. Problems
            a. Slow
            b. Relies on ambient wind to carry product to backyards
            c. Complaints about spraying
    iii. Small droplet aerial larviciding (helicopter)
        1. For saltmarsh species
            a. Large droplet liquid formulations of larvicide
            b. Daytime application
        2. How does this translate to spraying for spraying for container breeders
            a. Flight at 150 feet above ground level
            b. Fly at night
            c. Droplets of 100-150 microns (altosid)
        3. Results
            a. Drop in population seen by week one
            b. 73% reduction in treatment area
            c. 3% increase in non-treatment area
    iv. Aerial adulticiding (helicopter)
        1. Malathion
        2. Daytime spray
        3. Saw an immediate reduction in landing counts after spray
        4. Average mortality was 89.7%
d. What next
    i. Aerial spray for container breeders at night – will it work
        1. More acceptable to residents
        2. Decrease risk for non target effects
        3. More area can be spray
    ii. It works! Average 91.2% reduction
    iii. Used malathion – causes hyper-excitability
    iv. Have used dibrom
        1. Reduction seen
        2. Malathion works somewhat better
e. Would this be enough to stop a dengue, Chikungunya, or Zika outbreak?
    i. IPM for domestic mosquitoes

ii. Area of treatment was a very focused urban center of about 150 acres
    1. Used malathion and altosid
    2. Used surveillance to dictate spraying
    3. Started in late June
    4. This approach crashed the population by August
    5. Population stayed low the 2 following years, without additional control being done
        a. 90% reduction in year 1
        b. 86% reduction in year 2
iii. Area of treatment on Anna Maria Island – very urbanized 1500 acre island
    1. Same approach as with earlier trial
    2. Saw same results

C. After Matthew Came Irma: Mosquitoes and Storms – Laura Peaty
    a. Major factors contributing to mosquito issues
        i. Rain
        ii. Tides
        iii. Dredging operations & spoil deposition
    b. Extensive hurricane response plan
    c. 3 evacuation zones
    d. Post hurricane response - Matthew
        i. Chose not to larvicide
            1. Larvae already in 4th instar
            2. Pupae present
            3. County-wide rain event
            4. Would have had to adulticides anyway
        ii. Inspected trap sites and equipment
        iii. Cleared trails of debris
        iv. New issues
            1. New larval breeding sites were created by tree falls
            2. Debris piles become potential breeding sites for quincs
        v. Service calls increased rapidly
            1. Nuisance species of concern
                a. Saltmarsh species – techs were finding mosquitoes in places they had never been seen before
                b. Floodwater species
                c. Container breeders – populations were already reducing
            2. Vector species of concern
                a. *Culiseta melanura* - big increase in numbers the following year
                b. *Culex quinquefasciatus*
                    i. Initial decrease
                    ii. Organic materials in water increased populations
    e. Other considerations
        i. Automated notification system
        ii. Increase in adulticiding following Matthew
        iii. Coastal flooding brought fish into ponded areas
    f. Then came Irma
        i. 2 waves of mosquito problems
            1. Significant tidal surges

2. Heavy rainfall in western part of county led to an emergence of Psorophora spp

ii. Response

1. Got helicopters out more quickly
2. Took multiple spray events to reduce mosquito populations

g. Lessons learned

i. Not all storm systems are the same
ii. No power leads to more human-mosquito exposure
iii. Keep essential supplies in inventory
iv. Know your role
v. Document everything

D. Urban Microclimate and Mosquito Dynamics – Michelle Evans

a. Factors affecting mosquito populations

i. Heterogeneity in urban microclimates affects mosquito populations
ii. Mosquito habitat differs across urban areas

b. Hypotheses

i. Increase in number of containers with more urbanization
ii. Urban heat island effects

c. Study

i. June 2016 - May 2017
ii. 3 rural, 3 suburban, 3 urban sites
iii. Grid survey – 100 m radius
iv. Data

1. Mosquito habitat
    a. Surface area
    b. Depth
    c. Canopy cover
    d. Type
    e. Turbidity
    f. Temperature
    g. Other aquatics
2. Larval survey

v. Results

1. 5 genera, 11 species
2. Most common – *Aedes albopictus*
3. Species presence varied across land class
4. Urbanization is homogenizing the mosquito populations
5. About 1/3 of habitats were larval positive
6. Artificial containers are the most common habitat used by most species
7. Temperature
    a. Species were found across a similar range of temperature
    b. Artificial containers were all in that 25 degree optimal range
    c. Treehole temperature was affected by land class

d. Conclusions

i. Endemic species may be more vulnerable to urban microclimate
ii. Need to look at other factors

E. *Aedes aegypti* Control: Indoor Residual Spraying and the Impact of Insecticide Resistance – Gonzalo Vasquez-Prokopec

a. Background
    i. History of success – http://history.amedd.army.mil
    ii. Currently, there are more people living in urban areas and urban areas are bigger
b. Methods to control *Ae aegypti* can be quantified as far as a reduction of mosquito numbers, but there is limited epidemiological data to show a decrease in disease issues
    i. Vector control works if done correctly and thoroughly
    ii. More info is needed to show how reducing mosquitoes reduces disease
c. Study 1 – targeted indoor residual spraying (TIRS)
    i. *Aedes aegypti* resting sites (regional)
        1. Indoors
        2. Low on the walls
        3. Under furniture
        4. In dark corners and closets
    ii. Indoor residual sprays reduce mosquito numbers and human cases
        1. Effectiveness – 86-96% reduction in cases
        2. Resistance is a problem
d. Study 2 - resistance
    i. 3 treatment types
        1. No treatment
        2. Deltamethrin
        3. Bendiocarb
    ii. Intensity bottle bioassay
    iii. Bendiocarb reduced mosquito numbers by 60%
    iv. No difference between no treatment and deltamethrin
    v. Resistance will lead to treatment failure
e. Scaling up interventions
    i. TIRS needs to be part of an IPM control program
    ii. Inside residual spraying can be done 3 months prior to start of dengue season to further reduce transmission

F. The Influence of Temperature on Mosquito Life History and Implications for Transmission – Kerri Miazgowicz
a. Current control methods
    i. Indoor residual spraying
    ii. Bed nets
    iii. Larval source reduction
    iv. GMO mosquitoes
b. Issues
    i. Lack of public health infrastructure
    ii. Limited funding
    iii. Insecticide resistance
c. Predictive models ($R_0(T)$)
    i. Only as good as the data
    ii. Many factors influence vector-borne diseases and influence the model
    iii. Temperature is a major factor in the transmission of VBDs
        1. Affects where diseases are found
        2. Affects mosquito behavior, development, and vector competence
        3. Mordecai et al. 2012. Ecology Letters

d. Study - thermal functions in MBDs
    i. Looked at a single species
    ii. Life table study
    iii. 6 different temperatures (16-36 degrees C)
    iv. Measurements
        1. Egg laying
            a. Lifetime production
            b. Eggs per day
        2. Life expectancy
        3. Probability of biting
        4. Number of gonotrophic cycles
        5. Gonotrophic cycle duration
    v. All these thermal responses are different than one another and integrate in a complex manner
        1. Mortality increases with temperature and changes with age
        2. Biting rates decrease with age only at higher temperatures
        3. Fecundity varies with age in relation to temperature
    vi. How does this affect transmission?
        1. Temperature strongly influences life history traits
        2. The effect on transmission is complex
        3. Individual mosquitoes vary in their response to temperature
        4. Mosquito population age structures can modify trait performance across temperature, which can affect transmission dynamics

G. Estimating the Effect of Viral Dose and Temperature on Zika Transmission Potential in *Aedes aegypti* – Blanka Tesla
    a. Key knowledge gaps
        i. Most Zika hosts are asymptotic
        ii. Relationship between viremia and transmission is unclear
        iii. Environmental parameters affecting transmission are unknown
    b. Objective 1 - viremia
        i. Can cause different pathogen-host dynamics
        ii. Can influence mosquito traits
        iii. Results
            1. Viremia affects number of mosquitoes that get infected
            2. Viremia affects dissemination
            3. Viremia affects number of mosquitoes becoming infectious
            4. Viremia also affects the rate at which these things happen
        iv. Zika dose does not affect mosquito survival
        v. Transmission risk increases with viremia
    c. Objective 2 – temperature effect
        i. Used 8 different temperatures ranging from 16 – 38 degrees
        ii. At the lowest temperatures, virus dissemination and transmission was suppressed
        iii. Temperature affects proportion and rate of dissemination and transmission
        iv. Temperature affects mosquito survival – optimum temp is 24-28 degrees

Day 2 – Oct 19
Session 1

A. UGA Entomology Department Update – Kris Braman
    a. Signature areas
        i. Urban pest management
        ii. Vector biology and management
        iii. Wetland ecology
    b. Department has received recognition and awards of excellence
        i. National and international
        ii. Teaching and research
        iii. Student and faculty
    c. One of 14 Entomology undergraduate programs in the country
    d. Program is strong and growing
    e. New faculty
        i. Insect-microbe interactions
        ii. Turf and ornamentals pests
    f. Vision for the future
        i. Current and emerging priorities
            1. Emerging invasive pests
            2. Rapid response
        ii. Agriculture, urban, and industry
        iii. Land Grant mission
    g. Newsletter on website
B. AMCA Board of Directors Update and Mosquito Control in the United States: Challenges and Opportunities – Joe Conlon
    a. Mosquito Control
        a. A role for PMPs and Mosquito Control Districts
        b. What are the mosquito control capabilities in the US?
            i. There are some large gaps
            ii. Need to work with PMPs and the National Pest Management Association
        c. What constitutes a mosquito control district?
            i. 947 government mosquito control entities as defined by the CDC
            ii. Funding varies and is dictated by local conditions
            iii. Costs vary widely
        d. Funding
            i. Supplemental funding
                1. VBD Centers of Excellent
                2. SMASH Act
                3. HR 3354: Make America Secure and Prosperous Appropriations Act
            ii. Federal funding - CDC
                a. ELC
                b. National Center for Emerging and Infectious Disease
                c. Emergency funding
        e. PMPs
            i. Residual Barrier Treatments
                1. Nontarget impacts
                2. Possibility for resistance
            ii. Results vary

f. Mosquito Control Districts
    i. Strengths
        1. Low cost
        2. Extensive coverage
        3. Historical surveillance data
        4. Communication
        5. Wide range of control options
    ii. Weaknesses
        1. High profile – target for the ignorant
        2. Government regulation
        3. Resource volatility
        4. Travel restrictions
        5. No spray zones
g. PMPs
    i. Strengths
        1. Motivation to please customers
        2. Available in places that MCDs are absent
        3. Familiarity with insect behavior and pesticide applications
        4. Better pay
    ii. Weaknesses
        1. Customer based
            a. Precludes wide area control
            b. Precludes some larval control options
        2. Time constraints on control/survey
        3. Misting systems
        4. Profit-driven paradigm
h. Cooperation is critical
    i. Communicate
    ii. Attend specialized trainings
    iii. Membership in mosquito control associations
    iv. Attend each other's conferences and present
i. Public misconceptions
    i. Pesticides
        1. Naled
        2. Pyriproxifen
        3. GMO
    ii. Control tool availability is decreasing
        1. Registrations
        2. New surveillance technologies
        3. New control technologies
    iii. Regulatory reform – NPDES
j. Travel and disease transmission
    i. Volume, speed, and reach are unprecedented
        1. Travel
        2. Refugees
    ii. Demographics
    iii. Economic land use
    iv. Microbial/ Viral adaptations

k. What's next?
    i. Rift Valley – *Aedes vexans*
    ii. About 20 others that we are aware of
b. AMCA
    i. Publications
    ii. Webinars
    iii. Training and Certificate Programs for Mosquito Surveillance and Control – with CDC
        1. Track 1: E-modules (4)
            a. Basic principals
            b. Http://Training.mosquito.org
        2. Train the Trainer workshops
            a. Case studies
            b. Working in teams
        3. Strategic Planning and Organizational Development
            a. Plan for program goals and needs
            b. Public health and mosquito control
    iv. Updated Best Practices Manual (2017)

C. Larviciding in Chatham County – Doug Nelson
    a. Larval inspections are conducted after rain events
        i. Info given to Entomologist
        ii. Entomologist and Director determine the course of action
        iii. Treatment spreadsheet is given to applicators
    b. Aerial control
        i. Helicopter and air tractor
            1. Loading issue with air tractor
                a. Too much time
                b. Too much money
            2. Fixed problem
                a. Mixing
                    i. Sand silo
                    ii. Mixer – sand and altosid
                    iii. Pilot calls in for reloading about 15 minutes before landing so product can be mixed and ready
                b. Loading
                    i. Conveyor
                    ii. Load aircraft in 10-15 minutes
                    iii. Also have a sand hog
        ii. Large areas needing control

D. Urban Pest Management Training and Education Programs at UGA – Dan Suiter
    a. Training Center at Griffin Campus
        i. Georgia Structural Pest Control
            1. Started as a termite training program
            2. Strong GDA input
        ii. Workshops
            1. Termite
            2. Bed bugs
            3. Commercial IPM

4. School IPM
5. Home IPM

iii. Gabugs.uga.edu

b. Do we need a new training model?
   i. Is current training enough?
   ii. Do we teach the most appropriate information?
      1. Problem solving
      2. Logical thinking
   iii. Should non-technical info be part of training
   iv. Distance education
   v. Social media

E. Industry spotlight
   a. UNIVAR – Jason Conrad
      i. In2Care Unit
         1. Targets ovipositing container breeders
         2. Active ingredients attach to mosquito
            a. Fungus slowly kill mosquitoes
               i. Makes mosquito less active
               ii. Retards the development of dengue virus
            b. Larvicide kills larvae at other oviposition sites
         3. Larvicide in water in trap kills pupae at emergence
         4. Mosquito breeding in and around the trap is controlled

F. Safety Concerns and Personal Protection Relative to Application Method and Product – Mickey Taylor
   a. PPE
      i. Follow all label instructions
         1. Handlers
         2. Applicators
         3. Maintenance and cleanup
      ii. Minimum requirements are given
         1. Most pesticide poisoning is through dermal exposure
            a. Chemical resistant clothing
            b. Gloves provide a great deal of protection
            c. Unlined rubber boots with pant legs outside
            d. Liquid-proof wide brimmed hat
            e. Eyewear of a variety of types
         2. Respirators, to prevent inhalation exposure
         3. Protective clothing can be hot, so it is important to take breaks and drink plenty of water to avoid heat stress
      iii. Need to be aware of your surroundings
   b. Other issues
      i. Misinformation about pesticides
      ii. Outright lies
      iii. Public perception
      iv. Poor practices

Session 2

A. Implementing an Arboviral Surveillance Program – Marah Clark

a. City of Jacksonville entomologist
b. Viral Surveillance
    i. Why
        1. Vector-borne diseases
        2. Many vector species prefer birds
        3. New viruses
        4. Reemerging viruses
    ii. Mechanisms
        1. People
        2. Horses
        3. Mosquitoes
        4. Avian
    iii. Variety of tests of varying specificity
c. Mosquito Surveillance
    i. Traps
        1. CDC
        2. Gravid
        3. BGS
    ii. Trap-specific baits
    iii. Chill table or anesthetizing agent
    iv. Stereoscope with light
    v. Someone who can identify
    vi. Testing capabilities
        1. RAMP
        2. VectorTest
        3. Lab
d. Bird surveillance
    i. Dead birds
        1. Typical target corvids
        2. Bird needs to be fresh
        3. Will people participate
        4. Handling birds can be risky
        5. Storage and shipping
    ii. Wild birds
        1. Set mist nets
        2. Trap and release
        3. Lots of time
        4. No control over type of birds caught
    iii. Sentinel chickens
        1. Consistent testing
        2. Short viremic period
        3. Low viremia
        4. Need shelter, food, water, and protection
e. Starting a sentinel chicken program
    i. Chicks or pullets
    ii. Individual capable of drawing blood
    iii. Locations of known activity and landowners willing to participate
    iv. Placement is key

v. Need good equipment

f. Mosquito Surveillance
    i. Can set traps near sentinel chicken sites
    ii. Timing is important

g. Pros and Cons
    i. Pros
        1. Goal of preventing human exposure
        2. Knowledge base
        3. Learn more about your vectors
    ii. Cons
        1. Cost for tests
        2. Timeline can be skewed
        3. Employee availability
        4. Potential for incorrect test results

B. Virus-Like Particle-Based Vaccine Approaches Against Emerging and Reemerging Arboviruses – Maria Arevalo
    a. Clinical features
        i. Symptomatic
            1. 18% - ZIKV
            2. 25% - dengue
            3. Most – Chikungunya
        ii. Very similar symptoms
    b. Virus characteristics
        i. http://www.flashcardbook.com/v7/d3qd2dv7.html
        ii. Viral family
            1. Flaviviridae
                a. Dengue
                b. ZIKV
            2. Togaviridae - chikungunya
        iii. All three are enveloped viruses
        iv. All transmitted by *Aedes aegypti* and *Ae albopictus*
    c. Making vaccines
        i. Making subviral particles
            1. Consist of membrane and e-protein
            2. Made naturally when a virus infects a host
        ii. Making virus-like particles
            1. Virus is made of replication machinery and structural proteins
            2. Virus-like particles are just the structural proteins
            3. Dengue has four serotypes, so it requires region-specific vaccines and is a more complicated process
    d. Testing vaccines
        i. Inject into test host (mice) and check for antibodies
        ii. Check to see if mouse sera neutralize the virus

C. Zika Virus: The Orange County (Florida) Experience – Kelly Deutsch
    a. ZIKV Cases
        i. 2016
            1. 296 locally-acquired cases
            2. 1122 travel-related cases

3. 49 undetermined cases

ii. 2017

1. 1 locally acquired case
2. 13 travel-related cases
3. No undetermined cases

b. Process

i. Person being tested

1. Receive block number of person being tested from Dept of Health
2. Go into neighborhood and do a site assessment

ii. Once case is confirmed

1. Surveillance
2. Treatment

iii. Challenges

1. Can be very difficult to get access to private property
2. May only be able to treat a third of the houses in the neighborhood

c. Preparedness

i. Raising gambusia
ii. Looking into new treatment modalities
iii. Proactive media communication

1. Will need to call on other county departments to help in case of a locally-acquired case
2. Put together training modules for these people

iv. Outreach to community
v. Outreach to other agencies and organizations
vi. Outreach to PMPs
vii. Coordinate with State and local public health
viii. School education programs

d. Work with emergency management in case of a locally acquired case
e. Issues outside the norm

i. Positive cases with long-lasting viremia
ii. People coming in from viremic areas due to natural disasters

D. Operational Larvicide Applications – Zane McCallister

a. Elements of a larviciding program

i. Preemptive action
ii. Requires boots on the ground
iii. Good reporting
iv. Water knowledge

b. Pros and cons of a larvicide program

i. Pros

1. Public perception
2. Efficiency
3. Effectiveness
4. Environmental impact

ii. Cons

1. Public perception
2. Cost
3. Need institutional knowledge
4. Water

5. Pesticides

c. What was done
    i. Public perception
        1. People don't think you are doing mosquito control if they don't see a truck
            a. Geared public health message towards larviciding
            b. Went everywhere to provide education
        2. A focused message turned public opinion
    ii. Cost
        1. Small district, small money
            a. People were willing to vote for mosquito control
            b. Needed to expand district to increase revenue
        2. Increased from 8 square miles to 148 square miles between 1998 and 2012
        3. Revenue increased from $45000 to $2400000
    iii. Water
        1. Issues
            a. Access
                i. Property right issues
                ii. Code enforcement doesn't always extend to mosquito-related sanitation issues
                iii. "Killed them" with kindness
            b. Unpredictability
                i. Water in the West changes channels due to flash floods
                ii. Irrigation
                iii. Partnered with other agencies involved in water
            c. Nontargets
                i. Endangered fish species
                ii. Choice of pesticide is important
    iv. Institutional knowledge
        1. Limited resources mean a few people need to know everything
        2. GIS became a useful tool for capturing knowledge and passing it on
    v. Pesticides
        1. Started out adulticiding the bluff area until it became controversial
            a. Went to backpack larviciding with Bti
            b. Worked well in the small residential area
        2. When the control area became larger and moved into agricultural areas, switched to methoprene
            a. Campaigned to pretreat irrigation areas
            b. Got ~50% buy in
            c. Once the kinks were worked out, control was incredible
        3. Products
            a. Permanent water – Bti
            b. Irrigation and floodwater – methoprene

d. Conclusions for creating a larvicide program
    i. Public education
    ii. Managing costs
    iii. Understanding water

iv. Data collection and mapping
v. Selecting the proper larvicide

E. ZIKV Epidemiology – Skyler Brennan
    a. April 2016 – link confirmed between ZIKV and microcephaly
    b. Georgia Response
        i. Testing
            1. Initially
                a. Facilitated testing at GPHL for ~2000 persons
                b. Primarily pregnant women
            2. Currently, more people are being tested at commercial labs
        ii. Testing recommendations
            1. There are a whole bunch of qualifiers for testing at the GPHL lab
            2. There are a variety of testing regimes broken down by pregnant VS non-pregnant
        iii. Epidemiological response
            1. Triaged 2880 clinical calls since Jan 2016
            2. Dealt with 7100 general inquiry calls
        iv. ZIKV monitoring system – ZAMS
            1. Demographic info
            2. Symptoms
            3. Travel history
            4. Provider info
            5. Tests ordered
            6. Tests results
            7. Notes
        v. ZIKV case counts
            1. 120 travel-related cases as of Oct 18, 2017
            2. Most in metro Atlanta area
        vi. ZIKV Education and Infection Prevention
            1. Travel advisories
            2. Mosquito avoidance
            3. Sexual transmission prevention
            4. Tip-n-toss

F. Industry spotlight
    a. Clarke – Joe Strickhouser

G. Department of Public Health: In House Training – Fred Koehle
    a. Pre-training test
    b. Designing and implementing the training
        i. Basic principles
        ii. When to control
            1. Larviciding
            2. Adulticiding
        iii. Breeding sites
        iv. Disease issues
        v. How can mosquito-borne diseases affect you
    c. Post-training survey
    d. Future programs
        i. Any answers below 90% were adjusted to become more clear

ii. New group was trained with updated questions, just waiting on results

H. Killer Cows: Zooprophylaxis and Endectocide Use in Mosquito Control
    a. Malaria in rural agriculture areas is difficult to control
    b. How can mosquitoes be controlled
        i. Zooprophylaxis via livestock
            1. Passive – mosquito prefers to feed on the larger animal
            2. Active – add an insecticide to the cow
                a. Most products are short acting
                b. Looked at eprinomectin as a long-acting solution
        ii. Endectocide
            1. One injection
            2. 5 months of control for ectoparasites
            3. What about mosquitoes?
    c. Study
        i. Looked at amount of product in cow blood VS mosquito LC50
        ii. Field study
            1. Control
            2. Single dose
            3. Double dose
        iii. Mosquitoes placed in cups on back of cow and allowed to feed
        iv. Mosquitoes observed
            1. Mortality
            2. Fertility
            3. Fecundity
        v. Results
            1. Mortality rates were low
            2. Not enough eprinomectin was getting into the mosquitoes
    d. Next step
        i. Testing tech grade eprinomectin
        ii. Need combined tactics to control malaria

Banquet speaker – Mark Newberg, Dealing With the Media

Day 3 – Oct 20
Session 1

A. Environmental Health Strike Teams – Byron Lobsinger
    a. Environmental Health disaster response (ESF8)
        i. Shelter
        ii. Food
        iii. Water
        iv. Sanitation
        v. Vector surveillance
        vi. Indoor air quality
        vii. Other
    b. EH Strike Team helps deal with surge of needs after a disaster
        i. State broken into 5 regions
        ii. 2 Teams per region –

1. 6 person teams including the leader
2. 84 rostered members

iii. EHS

1. Trained
    a. General EH training
    b. Specialized disaster response training
        i. Vector response
            1. Surveillance and control training
            2. 10 vector surveillance trailers deployed around the State
        ii. Vector Surveillance Coordinators and entomologists are available to be deployed as well
2. Credentialed
3. Prepared to deploy

iv. Deployment

1. After a disaster, everything needs to get back to working condition
2. EH works with restaurants to help get them back open
3. Where there is need, EH Strike Team is deployed to assist
4. Request procedure
    a. Check County
    b. Check adjacent counties
    c. Ask State office
    d. EH Strike Team deployed
5. Deployment is usually accomplished within 24 hours
6. Requesting county provides
    a. Lodging
    b. Meals
    c. Supplies

c. After deployment

i. Reports sent on a daily basis
ii. Teams may be rotated in and out based on need
iii. Additional teams are on standby

d. Other resources

i. Mass calling system
ii. Requests for resources come through
    1. Local EMA
    2. GEMA
    3. FEMA
iii. Documentation is essential

B. An Assessment of Governmental Mosquito Control Services in Georgia – Chris Rustin

a. Mosquito control in Georgia

i. First assessment done in 2007
ii. Revisited in 2009

b. Assessment lacked detail and was outdated
c. Benefits of updating assessment

i. Provides a list of resources for Public Health
ii. Provides good information to mosquito control programs throughout the State
    1. Collaboration

2. Mutual aid
3. Emergency response

d. Questions asked
    i. Equipment
    ii. Staffing
    iii. Extent of program
    iv. Awareness of GMCA
e. Methods and timeline
    i. Jan- Feb
        1. Developed survey tool – 3 page survey
        2. Established contacts
            a. All counties
            b. Cities
                i. County seat
                ii. Greater than 20,000 people
                iii. Listed in original GMCA document
    ii. Feb-March
        1. Hired students
        2. Provided training and did mock calls
        3. Divided up the contacts
    iii. March-June
        1. Started calling
        2. All responses reviewed for quality control
        3. Follow-up calls made to deal with inconsistencies
        4. Final document reviewed
f. Survey document
    i. Do you do mosquito control?
        1. If no, do you work with the local health department to deal with mosquito issues
        2. If yes, got detailed contact info
    ii. Asked about types of activities
        1. Education
        2. Clean up programs
        3. Complaint response
        4. Media
        5. Source reduction
            a. Basic
            b. Enhanced
                i. Work with code enforcement
                ii. Do inspections
        6. Larviciding
            a. Do it
            b. Offer larvicide to public
            c. Biological control
        7. Adulticiding
        8. Chemicals used and where purchased
        9. Equipment
            a. What type

b. Are they calibrated
10. Surveillance
    a. Complaints
    b. Trapping
    c. Larval Surveillance
    d. Other monitoring
11. Mapping
12. Dedicated staff
    a. Licensed
    b. NPDES

g. Types of program
    i. 0 – no program (215)
    ii. 1 – basic (37)
    iii. 1/2 – a bit better than basic but not quite at level 2 (26)
    iv. 2 – some additional response (45)
    v. 3 – comprehensive (18)
h. Snapshot
    i. 342 counties/cities identified
    ii. 98% response rate
        1. 7 Programs did not respond
        2. All listed having programs on their web site
    iii. Number of programs identified – 126
        1. 96 city programs
        2. 30 county programs
i. Challenges
    i. Funding
    ii. Public complacency
    iii. CDC focus
    iv. Fear of chemicals
    v. Loss of programs

C. A Survey of the Mosquito Population in North Georgia – Amy Grice
    a. North Georgia Health District
        i. 6 counties
        ii. Good mix of urban and rural
        iii. Good mix of terrain types
    b. EH is response for mosquito surveillance at need
    c. Study
        i. Purpose – look at mosquito distribution in District 1-2
        ii. Descriptive study
        iii. 2 data sets
            1. Historic data
            2. Data collected for the study
        iv. Traps
            1. CDC light trap
            2. Gravid trap
        v. Methods
            1. Collected mosquitoes and identified them
            2. Classified as risk or non-risk to humans

3. Analyses
    a. Diversity
    b. Distribution

vi. Results
1. 31 species identified
2. No difference between risk and non-risk species
3. Focus of surveillance plays a role in which species are found

d. Discussion
i. Results somewhat biased
1. Trapping focus
2. Trap types
3. Weather conditions
ii. Improved baseline knowledge about mosquitoes
iii. Improved surveillance logistics
iv. Contributed to statewide preparedness for arboviral diseases

e. Future research
i. Compare species diversity in different settings
ii. Establish standardized surveillance
iii. Look at species of risk for other animals

D. The Resurgence of WNV in Chatham County – Bobby Moulis
a. History
i. 2001 – 5 WNV+ dead birds detected
ii. Initially, positive mosquito pools were found in metro Savannah
1. Associated with catch basins
    a. Catch basin control program started
    b. Went to a 30 day product
2. Virus began spreading throughout much of the county in 2003
iii. Amount of virus found in Chatham County mosquitoes varied from year to year
1. Disappeared in 2005 and 2006
2. Re-emerged in 2007, then dropped off the radar again
3. Virus changed
4. Re-emerged in 2011
5. Disappeared in 2016
6. 2017 has been a bumper year

b. County WNV distribution since 2002
i. 600 positive pools
ii. 50 sites
iii. Most mosquitoes collected in core “hot zone”

c. Vector
i. *Culex quinquefasciatus*
ii. *Culex* spp (too worn to ID)
iii. *Cx nigripalpus*
iv. *Aedes albopictus*
v. *Ochlerotatus taeniorhynchus*

d. Ratio of positive pools to total pools is generally low
e. Data used to initiate control efforts

E. *Wolbachia* Infection Among Mosquito Species in the Atlanta Metro Area – James Russell
a. http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.2002780

b. Cytoplasmic incompatibility
    i. Gene drive
    ii. May lead to speciation
c. Wolbachia and mosquito-borne diseases
    i. Can prevent disease transmission
    ii. Has been shown to enhance WNV transmission
d. Mitochondria
    i. Diversity varies between species
    ii. Selective sweep in *Aedes albopictus* population
    iii. Something is going on with the *Culex quinquefasciatus* population that is of yet unexplained
    iv. How are the Wolbachia getting between mosquito genera? Water mites?

F. An Operational Overview of the South Walton County Mosquito Control District – Ben Brewer
a. Independent program
    i. Board of Commissioners
    ii. 12 staff
    iii. Director
b. Issues
    i. Low lying
    ii. No overall development plan and lots of development
    iii. Protected lands
    iv. Wetlands
    v. Tourism
    vi. Retirement communities
c. Programs
    i. Maintain mosquito control ditches
    ii. County does not maintain roadside ditches
    iii. Source reduction
        1. Maintain big dumpsters
        2. Reduces dumping in ditches
    iv. Sentinel chicken coops
        1. 16 sites
        2. Paired with a New Jersey trap
    v. Adulticiding
        1. ULV truck mounted spraying
            a. 13 spray routes
            b. Tracking system to collect data
        2. Do some thermal fogging
        3. Based on number of mosquitoes
    vi. Larviciding
        1. 7000+ Storm drains
        2. Hand application and backpacks
    vii. School education program
d. Other issues/benefits
    i. Yellow flies
        1. Black balls
        2. Hand out to people with instructions
    ii. Education program

iii. Bottle bioassay
    1. Lots of resistance
    2. Lab insectary set up to support the program
iv. Involved in a lot of research

Business Session

2017-2018 Board Members

1. President – Joey Bland
2. VP – Steve Pavlovich
3. Directors
    a. 1 year – Allen Holoman
    b. 2 year – Laura Peaty
    c. 3 year – Tiffany Nguyen
4. Sect/Treas – Karen Farris
5. Sustaining member – Zane McCallister
6. Past President – Fred Koehle
7. Representatives
    a. Elmer Gray – Extension
    b. Rosmarie Kelly – Public Health

Next meeting is Oct 17-19, 2018