GMCA Annual Meeting
Oct 12-14, 2016

Wednesday
Session 1

I. Washington Day Update – Rosmarie Kelly
II. Thermal Fogging and Barrier Sprays – Joe Andrews
    a. Caribbean model
    b. ZIKV outbreak
        i. Backyard spraying may be necessary
        ii. Mosquitoes are daytime biters
        iii. Spray cloud needs to linger and move around obstacles
        iv. Conditions and equipment are key
    c. Inversions
        i. Temperature difference between air and ground
            1. Air near ground cooler
            2. Air 20-30 feet above ground warmer
            3. Can occur in heavily shaded yards
        ii. Thermal fogger
            1. Good penetration
            2. Wider swath width
            3. Lingers longer
            4. Uses more product
        iii. Adulticiding
            1. Smaller droplets/less product
            2. Barriers impede spread
            3. ~300' spray swath
        iv. Keep good records
    d. Barrier spray
        i. Types of companies
            1. One-man company
            2. Franchises
            3. Misting systems
                a. Can be helpful
                b. There are downsides
            4. Barrier sprays
                a. Apply to harborage areas
                b. Perimeter treatments
                c. Lots of different products
                d. 20-30 day residual
                e. Labels are changing – pollinator protection
        ii. Factors to consider
            1. Obstacles
            2. Environmental factors

3. Keep good records

III. The Commercial Applicator's Response to ZIKV – Jeremiah Lewis
   a. Gregory Pest Control
      i. 1972
      ii. 8th largest in coverage area in US
      iii. Extensive experience in mosquito control
      iv. Integrated response
         1. Surveillance
         2. Larvicide focus
         3. Variable depending on situation
   b. ZIKV
      i. Focus on education
      ii. Lots of hype and misinformation out there
      iii. Response
         1. Increase in commercial contracts
         2. Increase in comprehensive services
            a. College
            b. State/county
         3. Only slight increase in residential contracts
         4. Some requests for specific services
            a. Surveillance
            b. Larviciding
            c. Education
               i. ZIKV
               ii. Basic mosquito control
         5. A few contingency contracts
         6. Many chose to do nothing
      iv. Challenges
         1. Tolerance levels for mosquitoes has decreased
         2. Issues
            a. Resident practices
            b. Construction zones
            c. Types of containers
         3. Applicator can't always correct the issues – education needed

IV. Evaluating the Effects of Temperature Variation on Arboviruses – Blanka Tesla
   a. There are some key knowledge gaps in predicting ZIKV transmission potential
      i. Temperature
      ii. Seasonality
      iii. Extrinsic incubation period
   b. Why is dose important
      i. Asymptomatic infections are generally considered dead end infections
         1. Not true in dengue (PNAS 2015: 112)
         2. About 70% of ZIKV infections are asymptomatic
      ii. How does viremia affect ZIKV transmission?

c. Why is temperature important?
    i. Transmission in dengue is temperature dependent
    ii. What about ZIKV?
d. Study
    i. Aims
        1. Characterize vector competence
        2. Extrinsic incubation period
        3. Virus dose – viremia
    ii. Virus dose effect
        1. Varied amount of virus inoculated
        2. Looked at:
            a. Vector competence
                i. Infected – number of positive mosquitoes
                ii. Infectious – number of mosquitoes with positive saliva
            b. Survival
            c. Extrinsic incubation period
            d. Transmission efficacy
                i. Disseminated - # heads positive for virus
                ii. Infectious
        3. Use data to generate a vectorial capacity equation
        4. Results
            a. Significant difference between dose and survival
            b. Dose affects the proportion of infected and infectious mosquitoes
            c. Dose does not affect virus dissemination
            d. Dose does affect transmission efficiency
            e. Dose has an effect on viral dynamics
        5. Conclusions
            a. Variations in viremia cause different pathogen-host dynamics
            b. Changes in temperature can influence:
                i. Extrinsic incubation period
                ii. Vector competence
                iii. Mosquito survival

V. Zika Virus – Daniel Lindsey
a. Virology
    i. Positive sense single stranded RNA virus
    ii. Flaviviridae
    iii. 3 lineages
        1. East African
        2. West African
        3. Asian
b. Transmission

i. Vectors
ii. Sexual
iii. Blood transfusion
iv. Congenital infection of fetus
v. Possibilities
    1. Saliva and other bodily fluids
    2. During child delivery
    3. During breast feeding
    4. Organ transplant

c. Symptoms
    i. Acute
        1. Varied
            a. Fever
            b. Rash
            c. Other
        2. Not all occur every time
    ii. Guillain-Barre Syndrome
    iii. Fetus
        1. Neurological defects
        2. Ocular abnormalities
        3. Joint abnormalities
        4. Termination

d. Diagnosis
    i. Complex
    ii. Evolving
    iii. 2 different avenues
        1. Molecular
        2. Antibody
    iv. Need to rule out other flaviviruses

e. Treatment
    i. Acetaminophen – pain relief
    ii. Do not take aspirin until dengue is ruled out
    iii. Rest
    iv. Hydration

f. Prevention
    i. Primarily vector control
        1. Surveillance is key
        2. Discontinuity across areas is problematic
    ii. Effective control requires a combined approach with community involvement
    iii. Education especially important to deal with alternate transmission routes
    iv. Blood donation testing

g. Future outlook
    i. Vaccine development

1. At least 3 vaccines have entered phase I clinical trials (of three)
2. FDA approval takes from 9 months to 2 years

ii. Funding

1. CDC funds were exhausted in September
2. Funding requested in February – finally approved in Oct

VI. Industry spotlight

a. Central Life Sciences – Zane McCallister
   i. New product coming out soon
   ii. Bti-Altosid mix
b. Clarke – Joe Strickhouser
   i. Natular DT
   ii. Container breeder tablets

VII. Update: Mosquito Surveillance Program in Richmond County, Georgia – Kelsey Laymon

a. Phinizy Center
   i. Working with Richmond County for ~3 years
   ii. 3 routes
   iii. 15 trap sites
b. Collect data for targeted mosquito control
   i. Viral testing
   ii. Plan to identify activity patterns
   iii. Plan to look at environmental factors affecting mosquito populations
c. Wetland is trapped weekly as a control
d. Sites vary in abundances
   i. South route has high abundances
   ii. North route abundances are much lower
e. Activity
   i. April to October
      1. Primary peak: May-June
      2. Secondary peak: Sept-Oct
   ii. Get some mosquitoes every month of the year
   iii. Early winter typically has fewest mosquitoes
f. Diversity
   i. Number of species ranged from 6-25
   ii. Average is 17.8 species per site
   iii. Menhinick Diversity Index - the ratio of the number of taxa to the square root of sample size (http://www.colby.edu/biology/BI131/Lab/Lab09CalcBiodivers.pdf)
   iv. Shannon Wiener Index - counts for both abundance and evenness of the species present (https://www.easycalculation.com/statistics/learn-shannon-wiener-diversity.php)
g. Larval habitats
   i. Grassland pools
   ii. Artificial containers
   iii. Freshwater swamps

iv. Woodland pools

h. Species and abundances can change over time

i. *Uranotaenia lowii*

i. Feeds on frogs and toads

ii. Abundances have increased

iii. Primarily southern and coastal

iv. Most prevalent during the Fall

j. Land use

i. Primarily urban areas

ii. Sites near less developed areas have highest number of species

iii. Jaccard Similarity –

1. http://ag.arizona.edu/classes/rnr555/lecnotes/10.html
2. Looked at least similar and most similar land use types and species found there

VIII. Effects of Latitudinal Variation on *Aedes albopictus* Life History Traits – Kerri Miazgowicz

a. Temperature is an important driver of mosquito-borne disease transmission

i. Affects mosquito traits

ii. Affects pathogen traits

b. Temperature alone does not capture all the variation

c. Models

i. A mechanistic model assumes that a complex system can be understood by examining the workings of its individual parts and the manner in which they are coupled. Mechanistic models typically have a tangible, physical aspect, in that system components are real, solid and visible.

d. Factors affecting mosquito-borne disease transmission

i. Mosquito traits

ii. Pathogen traits

iii. Human traits

iv. Environmental traits

e. Study

i. Objectives

1. Asses variation
2. Look at local adaptation
3. Quantify variability
4. Create a transmission risk map

ii. Mosquito collection sites

1. Southern range
2. Mid-range
3. Northern range

iii. Collected mosquito larvae

1. 9 cities
2. 4 sites in each
3. 5 containers at each site

iv. Reared mosquitoes in a semi-field enclosure

1. Proportion of adults emerging
2. Time to emergence
3. Daily mortality
4. Number of eggs laid
5. Number of females who blood fed

v. Monitored temperature, water temperature, and light
vi. Outcome – local vectorial capacity

f. Data from Georgia
   i. Data loggers
      1. Average daily temperature – 25.2 degrees Celsius
      2. Average humidity – 82%
   ii. Emergence
      1. Northern population had lowest emergence rate
      2. Mid and south were similar
   iii. Bite rate
      1. Northern population had a lower bite rate
      2. Bite rates across all populations were relatively low
   iv. Fecundity
      1. Southern populations had the highest reproduction rates
      2. Northern population laid no eggs during study
   v. Survival was similar over all though southern population had a slightly higher rate
   vi. Wing length (measure of size) showed no overall difference
      1. Fecundity was not predicted by body size in this study
      2. Body size varied more in northern population
g. Conclusion –
   i. Southern population most fit in southern latitude
   ii. Indicator of local adaptation?

IX. Microclimate and Wild Mosquitoes in Athens, GA – Michelle Evans
   a. The geographic distribution of mosquito-borne diseases lines up with disease transmission
      i. Most temperature is taken from satellite data
      ii. There is a scale mismatch which can add to errors in risk determination
      iii. A finer scale is needed to determine disease risk
   b. Temperature and mosquito traits
      i. Unimodal
      ii. Mordecai et al, 2012
   c. Urban microclimate
      i. Does it impact mosquito traits?
      ii. Does it impact disease risk?
   d. Experimental design
      i. 9 sites
      ii. Type – based on amount of impervious surface
         1. Urban

2. Suburban
3. Rural

iii. Reared larvae at sites
1. Brought adults to lab and infected them with dengue virus
2. Looked at dissemination of virus

iv. Logged temperature at each site

e. Results
i. Wing length
1. Urban mosquitoes were larger
2. Rural and suburban mosquitoes were of similar size

ii. Emergence
1. Urban mosquitoes emerged sooner
2. Fewer urban mosquitoes emerged

iii. Infections
1. Urban sites had a lower infection rate
2. No clear trend in infectiousness
3. Between 0-25% infectious by site

f. Broader picture
i. No real clear trend
ii. Urban mosquitoes had
1. Lower emergence rates
2. Higher fecundity rates

g. Still looking at Fall data – temporal effects

Thursday
Session 2

I. UGA Entomology Department Update – Kris Braman
a. Core areas
i. Urban pest management
ii. Systematics and Evolutionary Biology
iii. Insect Host-Pathogen Relationships
iv. Vector Biology and Management
v. IPM/Applied Insect Ecology
vi. Wetland Ecology/Aquatic Entomology

b. Research, Extension, and Education
i. Both undergrad and graduate programs
ii. Strength in research and education

c. Newly designed web page launching before end of year (FACES)
d. Vision for the future
i. Balance between basic and applied
ii. Looking at emerging priorities
1. Agriculture
2. Industry

iii. Rapid response to new challenges

iv. Departmental balance may become an issue
    1. People will be retiring
    2. Need to recruit a new generation of entomologist

e. Strategies
    i. Distance learning options
    ii. Manage program needs and program offerings
    iii. Grow external funding
    iv. Maintain research and education balance
    v. Grow the entomology and applied biotechnology undergrad majors
    vi. Grow graduate programs
    vii. Provide research experience to all students – internships

II. Eprinomectin, Anopheles, and Cattle: Furthering Zooprophylaxis Tactics to Control Malaria – Annie Rich

a. Local malaria vector – *Anopheles quadrimaculatus*
b. History of malaria
    i. 1526 – Spanish colonization brought malaria parasites to the US
    ii. 1820s – drainage to fight malaria
    iii. 1850s – malaria is the principle disease in the US
    iv. 1901 – Laveran & Ross discoveries became commonplace knowledge
    v. 1925 – Paris Green and oils used as larvicide said
    vi. 1939 – DDT
    vii. 1942 – CDC precursor (Malaria Control in War Areas)
    viii. 1947 – National Malaria Eradication Program
c. History of Georgia
    i. 1735 – Georgia founded
    ii. Late 1700s – town of Ebenezer abandoned because of malaria
    iii. 1806 – capitol moved due to malaria
    iv. 1939 – Emory Field Station founded to research malaria
    v. 1946 – CDC founded
d. Study
    i. Current control measures
        1. Prophylactic drugs
        2. Bed nets
        3. Mosquito control
    ii. New measure – zooprophylaxis
        1. Non insecticidal
            a. Provide alternative host
            b. Draw vector away
        2. Insecticidal
            a. Working on a long range treatment
            b. Eprinomectin
                i. Injectable wormer
                ii. 150 days of control of parasites
                    1. Internal parasites

2. Live
iii. Used as a rotation option
c. Objective
i. Does it kill mosquitoes when they feed?
ii. How long
iii. Sub lethal effects
iii. Mortality study
1. Procedure
a. Draw cattle blood
b. Mix with drug
c. Feed to mosquitoes
2. Total mortality at 48 hours at all dose levels
iv. Field study (ongoing)
1. Inject cattle with drug
2. Attach mosquito feeding stations to cows
3. Draw blood to determine tiger of drug

III. CDC: VBD Regional Centers for Excellence Proposal Status – Elmer Gray
a. FOA released in early August
i. Estimated number of awards – 5
ii. Estimated total program funding - $50,000,000
1. $10,000,000 per center
2. Spread over 5 years
3. University overhead taken from this
b. Purpose
i. Build collaboration
ii. Provide training
iii. Conduct research
c. Sept 12
i. Final RFA
ii. Due date 10/13
iii. Got an extension of a week due to the hurricane
d. Known partners
i. Regional participants
1. Georgia
a. Chatham County
b. DeKalb County
c. Valdosta State
d. Georgia Southern
e. GDPH
2. South Carolina - DHEC
3. Alabama
a. Vector Management Society
b. City of Huntsville
c. City of Mobile

        d. Baldwin County
        e. Alabama DPH
    4. Florida - Vero Beach Med Ent Lab
    5. Puerto Rico
  ii. Extension Services
    1. GA
    2. FL
    3. AL
    4. SC
    5. PR
  iii. Many more
- e. Specific aims
  i. Region-wide best practices
    1. Training
    2. Education
  ii. Develop a strong cadre of vector control specialists
  iii. Promote best management practices (IMM)
    1. http://www.mosquito.org/assets/Resources/PRTools/Resources/bmpsformosquitomanagement.pdf
    2. http://floridamosquito.org/App_Docs/Products/FMCA_BMPs.pdf
  iv. Surveillance at local, state, and regional levels
    1. Vector surveillance
      a. Vector abundance and distribution
      b. Pathogen prevalence
    2. Insecticide resistance
    3. Web platform development to improve data collection and analytics
    4. Trap evaluation
  v. Support research
  vi. Training
    1. Multilayer approach
      a. Fundamental training for mosquito control
      b. Train the trainer
      c. Specialty training
      d. Continued education
    2. Public education and relations – focus on school programs
    3. Graduate and post-doctoral training for specialists
  vii. Novel approaches
    1. Entomophagous fungi
    2. Ovitraps
    3. Region wide arbovirus surveillance
- f. Summary
  i. Generate knowledge
  ii. Enhance training, surveillance, and control

iii. Generate data for risk assessment and intervention decisions

IV. ZIKV Epidemiology – Amanda Feldpausch
   a. This is an evolving response
   b. History
      i. Large outbreak started in 2015 in Brazil
      ii. Large outbreak in Singapore staring in Aug 2016
      iii. Nationally
         1. 105 locally acquired reported to CDC as of Oct 5
         2. Travel associated cases reported – 3712
         3. Lab acquired case – 1
         4. 30 sexually transmitted
      iv. Florida
         1. Local transmission began in mid-June 2016
            a. Wynwood area of Miami
            b. Miami Beach
         2. Zones
            a. Transmission occurring - red
            b. Cautionary travel guidance still in place – yellow (no new case in 45 days)
   c. Pregnancy registry
      i. 837 women enrolled
      ii. Tracks adverse outcomes up to 12 months of age
      iii. Results to date
         1. 22 live born infants with birth defects
         2. 5 pregnancy losses
   d. Transmission
      i. Mosquito
         1. Viremia period is first 7-10 days of illness
         2. Extrinsic incubation period is 7-10 days
      ii. Intrauterine
      iii. Sexual transmission
         1. Mostly male to female
         2. Some male to male
         3. Some female to male
      iv. Lab exposure
      v. Blood transfusion – possible but not confirmed
      vi. Breast milk or organ donation has not been confirmed
   e. Clinical picture
      i. Incubation period is 3 days to 2 weeks
      ii. 1 in 5 people infected become ill
      iii. Symptoms
         1. Rash ~85% of time
         2. Fever
         3. Joint pain

4. Conjunctivitis

iv. Tends to be a mild, self-limiting disease in most adults

v. Severe outcomes

1. Guillain-Barre Syndrome (GBS)
    a. Less than one percent of cases
    b. Link is not yet definitive
2. Neuropathic issues
3. Pregnancy outcomes
    a. Microcephaly – link is confirmed
    b. Other severe pregnancy outcomes have been documented but not confirmed

f. Surveillance goals

i. At risk population – pregnant women

ii. Document travel-associated cases to monitor spread

iii. Roles

1. Facilitate lab testing
2. Follow up on suspected cases
3. Education on mosquito avoidance

iv. Testing

1. RT-PCR: symptomatic
2. PRNT – done after IgM positive
3. Understanding results
    a. IgM just tells you that you were infected with a flavivirus
    b. ~50% of IgM positives in Georgia are not ZIKV

g. Epidemiology definition - http://dph.georgia.gov/zika

i. Testing

1. Symptomatic
    a. Joint pain
    b. Conjunctivitis
    c. Maculopapular rash
2. Priority for testing – pregnant women with symptoms or exposure
3. Also need to evaluate for CHIK and DEN
4. Where sexual transmission is a possibility, both partners are tested

ii. Everything evaluated on a case by case testing

iii. Follow up for vector surveillance

h. Local transmission

i. Symptomatic

ii. No travel history

iii. Absence of more likely diagnosis

iv. No chance of sexual transmission

i. Data

i. Triaged

1. 1700 clinical calls

2. 4000 general inquiries
ii. Testing – over 1100 persons
iii. Documented 90 travel-related cases
1. 65% in metro Atlanta
2. This is likely a case of surveillance bias is
iv. Education
1. Tip and toss
2. Sexual transmission – 6 months
3. Avoid mosquitoes for 3 weeks after possible exposure

j. ZAMS
i. ZIKV active monitoring system
ii. Through SENDSS

k. Community campaign
i. Travel – airport
ii. Tip and toss

l. Take home message
i. Reduce risk to pregnant women
ii. Reduce risk of local cases
iii. Still lots of unknowns

V. Industry spotlight

a. Bayer - Gordon Morrison
i. Business
1. Manufacturing
2. R&D
3. Sales
ii. Looking to acquire Monsanto
iii. Latest new products
1. DeltaGuard EW
a. Deltamethrin
b. Type 2 pyrethroid
c. Wide area mosquito control
d. Reduced risk product
i. No PBO
ii. Water based
2. Formulation – emulsion in water (EW)
a. Droplet integrity
b. Good coverage
iv. Videos – link on website

b. Curtis Dyna-Fog – Claude Thomas
i. Bought B&G
ii. Equipment
1. Thermal fogger
a. Various sizes
b. Also a water-based fogger

2. ULV units of various sizes

Third session

I. College of Agricultural and Environmental Sciences Update – Dean Sam Pardue
    a. Start with Why – Simon Sinek
        i. The golden circle
        ii. Need to understand why you do things
    b. Why does agriculture matter
        i. By 2050, the human population is projected to exceed 9 billion
        ii. A 50% increase in food production will be needed by 2030
        iii. Issues
            1. Projected water scarcity in 2025
            2. Roughly 1/3 of world's population
            3. Agriculture uses 70% of all water consumption
    c. Crisis driven funding
        i. A crisis creates funding
        ii. Food crises
            1. Obesity
            2. Diabetes
            3. Food insecurity

II. Pollinator Update – Gordon Morrison
    a. Pesticide issues
        i. CNIs and bee kills
            1. Seed treatments with neonictinoids
                a. Originally was a very dusty product
                b. Currently products bind much better to the seeds
            2. Use less pesticide when crops are growing
        ii. Bee kills and mosquito control
            1. ULV sprays can kill bees
            2. Puts mosquito control in a negative light
            3. Also puts pesticide companies in a negative light
    b. Bee Care Center
        i. Research Triangle Park, NC
        ii. Look into problems causing mortality in bees
    c. LSU Study
        i. Methods
            1. Caged studies
            2. Bees of different ages
            3. Several different pesticides tested
        ii. Results
            1. Did not see high mortality in bees
            2. Saw no difference in adverse health outcomes in bees
    d. Trends across the continents
        i. The Americas are at about steady state for bee hives

ii. Winter loss rates haven't changed
iii. Annual loss is problematic

e. Why are bees dying?
i. Varroa mites
ii. Tracheal mites
iii. Hive beetles
iv. Disease
v. Nutrition
vi. Bee keeping practices
1. Professionals
2. Hobbyists
vii. Pesticides
viii. Genetic weakness

f. Actions to promote pollinator protection
i. 2015 order
ii. Reduce honey bee losses to 15% or less
iii. Increase monarch butterfly populations
iv. Restore pollinator habitat
v. Key EPA actions to protect pollinators
vi. Draft ecological risk assessment to be released Oct 2016
vii. Looking at organophosphate and pyrethroids

g. State Managed Pollinator Protection Plans

h. Bee helpful
i. Communicate real problem
ii. Prepare a fact sheet
iii. Establish a relationship with local apiary specialist
iv. Seek out local beekeepers
v. Develop a list of bee colonies
vi. Notify beekeepers of treatments

i. What's next
i. Honest discussions
ii. Continue to plan and develop Vector Control BMPs
iii. Regulations need to be based on science

III. Safety First When Applying Pesticides – Mickey Taylor

a. Why are pesticides dangerous?
i. They are all poisons
ii. Advantages
1. Fast
2. Easy to use
3. Effective
iii. Disadvantages
1. Can cause harm to non-targets
2. Can harm the environment

b. Responsibilities

i. Protect yourself and others
ii. Protect the environment
iii. Follow the label
iv. Keep a spill kit where you mix or handle pesticides

c. IMM
    i. Using multiple tactics in an overall plan to control mosquitoes
    ii. Includes:
        1. Surveillance and ID
            a. Knowing the problem helps determine the best control means
            b. Set an action threshold
                i. Trap data
                ii. Complaints
                iii. Arboviral testing
            c. Action thresholds vary by species, site, weather, public tolerance, and season
        2. Habitat modification
        3. Vegetation management
        4. Biological control
        5. Mechanical barriers
        6. Chemical control
        7. Public education
        8. Arboviral testing
    iii. Goals
        1. Prevention
        2. Suppression or reduction
        3. Eradication or elimination

d. Using pesticides
    i. Identify target
    ii. Identify susceptible life stage
    iii. Use the lowest rate that kills the mosquitoes
    iv. Rotate modes of action frequently
        1. Systemic
        2. Contact
        3. Selectivity
            a. Broad spectrum
            b. Target only certain species
            c. Residual

e. Resistance
    i. More likely to develop is population is high
    ii. Switch modes of action frequently – more often that once a year
    iii. Rotate between larvicide and adulticides
    iv. Pesticides
        1. *Bacillus sphaericus*

a. Resistance has developed
b. Mix with anti to reduce resistance

2. Bti
    a. No resistance
    b. Works best in clean water
3. Spinosad
4. Methoprene
    a. Resistance has developed
    b. Combine with Bti to regain some susceptibility

f. Pesticide safety
    i. Read the label
        1. These are laws, not guidelines
        2. Do not burn or bury the container
        3. Triple rinse
    ii. Store correctly
        1. No unauthorized access
        2. Secure during all phases of work
        3. Use sturdy plastic or metal shelves
        4. Store heavy materials and liquids below, dry products above
    iii. Handle correctly
        1. Clearly mark containers
        2. Use accurate measuring devices
        3. Stay upwind
        4. Pour below eye level
    iv. PPE
        1. Determined by toxicity, formulation, and activity
        2. Listed on label
        3. Wear nonabsorbent materials
    v. Protecting water supply
        1. Keep water pipe or hose well above pesticide
        2. Use a 100' setback

IV. GovPilot – Sandy Lyna
    a. https://govpilot.com
    b. Mosquito control application
        i. Crowd sourcing to determine mosquito issues
            1. Mobile app - GovAlert
                a. Geolocator
                b. Can also take a picture and add a description
            2. Online form
        ii. Creates an order sent to mosquito control
            1. Email sent to reporter
            2. Email sent to person responsible to follow up
    c. GovPilot
    d. Opens to a map of area of concern

i. Message center – each record
    1. Form
        a. Treatment used
        b. Action taken
        c. Notes
        d. Other – this is flexible
    2. Assessor info
    3. Other complaints from site
ii. Automated work flow
iii. Interactive mapping
iv. Can tie into other agencies
v. Can send record to other people or agencies to be dealt with

V. Environmental Health Strike Teams – Chris Kumnick
- a. EHS workforce
    i. 20 State employees
    ii. 18 EH Directors
    iii. 386 county EHS
- b. Public Health Entomology
    i. Entomologist
    ii. New vector surveillance staff
        1. May 16, 2016 start date
        2. 2 weeks of training
        3. Out to regions June 1, 2016
    iii. Responsibilities
        1. Collecting baseline data
        2. Education
- c. ZIKV ConOp
    i. Multi-level approach
    ii. Multi agency
- d. Strike Teams
    i. Number of EHS has dropped as population has grown
    ii. Need 125 more EHS just to meet current needs
    iii. Staff is aging
    iv. Disaster management
        1. Function within the Incident Command System
        2. Fall under ESF8 in the National Incident Management System
        3. Disaster cycle
            a. Preparation
            b. Response
            c. Recovery
            d. Mitigation
        4. EHS response
            a. Mass feeding facilities
            b. Mass shelter facilities

c. Water interruptions
d. Portable sanitation
e. Solid waste management
f. Vector and rodent control
g. Situational awareness

5. Mass fatality coordination – EHS works with State coroner
6. EHS Strike Teams
    a. Help in situations where EH is understaffed
    b. Listed as a resource for the ICS
    c. Regional team coordination – 5 regions
    d. Yearly training
    e. EHS
        i. Trained and credentialed
            1. Registered environmentalist
            2. EHS and EPR standard training
            3. EHTER and EHTER Ops
            4. FEMA NIMS/ICS
            5. Shelter inspection
            6. Outbreak/Epi investigation assistance
        ii. Additional training
            1. WebEOC
            2. FEMA training through EMI
            3. Radiation training
        iii. Prepared to deploy
            1. Report to Incident command post
                a. Check in
                b. Report to team leader
            2. Perform assigned tasks

e. Issues
    i. Potable water
    ii. Waste water
        1. Public sewers
        2. Septic tanks
    iii. Portable sanitation systems
    iv. Refuse and pest control
        1. Flies
        2. Mosquitoes
        3. Rats
    v. Shelters
        1. Waste disposal
        2. Food and mass feeding locations
f. ZIKV response
    i. Levels
        1. Pre-Incident

a. Preparedness
b. Mosquito season
2. Suspected/confirmed incident
3. Incident/response

ii. ConOp (Conception of Operation) plan
1. Incident command – Epidemiology
2. VSC and EH Emergency Strike Teams
3. Contingency contracts
4. Work with local partners in focused area
5. Scalable response

VI. Industry Spotlight
a. Target Specialty Products – Vima Saenz
b. UNIVAR – Julie Fogg/Jason Conrad
c. AllPro – Joe Andrews/David Sykes

VII. So What Else Happened in 2016? – Rosmarie Kelly

Friday
Session 4

I. A Termite Researcher's Opinion on Surveillance and Management of *Aedes albopictus* in the Georgia Piedmont – Brian Forschler
a. Tiffany Nguyen's research
b. First study – adult sampling
i. Sampling methods
1. CDC light trap
a. No dry ice
b. Dry ice
2. Net
3. Gravid trap
4. Vacuum

ii. Sampling on campus at a courtyard
1. Garbage can
2. Clogged drain – got fixed last year of study
3. Ash trays
4. Old trees

iii. Species
1. 7 different species
2. 90% albopictus
3. Changes in 3 years
a. Drop in species probably breeding in clogged drain
b. Species that flew in stayed fairly consistent
4. Seasonality

iv. Traps
1. Varied by trap used
2. Varied by species

3. Varied by year

c. Second study – residential mosquito control
    i. Shadowed to pest control companies
    ii. Methods
        1. Pyrethroids
        2. 30 total houses treated
        3. 23/24 control houses
        4. Treated once a month
        5. Sampled twice a month with vacuum
        6. July – Oct
        7. 2014-2015
    iii. Mosquito habitats
        1. Plant saucers – biggest problem
        2. Random stuff in yards
        3. Storm drains
    iv. Results
        1. 2014
            a. Treated – 2
                i. Technician issue
                ii. That technician left after 2015
            b. Control – 8
        2. 2015
            a. Treated – 0
            b. Control – 5
    v. Survey
        1. All houses filled out survey
        2. Most interesting response had to do with tolerance
            a. Treated houses had no mosquito tolerance at all
            b. Control houses had lots of tolerance for mosquitoes or did not want their yards sprayed

d. Efficacy study
    i. Methods
        1. Houses around campus
        2. 2014 – 9 houses treated
        3. 2015 – 15 houses treated
        4. Products
            a. 2014 – pyrethroids
            b. 2015 – added natural 25b products
    ii. Results
        1. 2014
            a. Only 30% of houses had any mosquitoes
            b. Numbers were low
        2. 2015
            a. Very few mosquitoes

b. Natural products didn't appear to work

e. Results
    i. Backpack mister treatments were effective as long as larviciding was also part of the regime
    ii. 25b products did not really work at all
    iii. Vacuum device was a useful tool for mosquito sampling on vegetation
    iv. Residuals
        1. Plant type
        2. Applicator
f. Comment (Gordon Morrison) – mosquitoes appear to be found primarily in shaded areas, so applying barrier spray only in these areas could reduce amount of pesticide being used

II. Identification of Semiochemicals Attractive to *Simulium vittatum* (IS -7) – Gui Verocai
a. Background
    i. Important nuisance pest
    ii. Economic impact
    iii. Vectors
        1. Viruses
        2. Parasites
            a. Onchocera – filariasis worm
                i. Species in North America found in:
                    1. Cattle
                    2. Dogs and cats
                    3. Wild ungulates
                ii. Human disease in tropical areas
            b. http://www.cdc.gov/parasites/onchocerciasis/disease.html
b. Objective – search for compounds attractive to black fly
c. Methods
    i. Use host seeking females
        1. Reared at UGA
        2. Allowed to lay first batch of eggs
    ii. Visually attracted to certain colors and shapes
    iii. Organic volatile compounds (58)
        1. Different chemical classes
        2. Attractive to hematophagous dipterans
        3. Isolated from potential mammalian hosts
            a. Breathe
            b. Hair
            c. Skin
            d. Sweat
    iv. Electroantennography
        1. Measured electric response to stimuli
        2. 11 groups of 5-7 compounds

v. Statistical analysis
    1. EAG responses normalized to octanol
    2. One-way ANOVA

d. Results
    i. 7 out of 58 compounds were attractive
    ii. Followed up with a behavioral assay using a Y-tube olfactometer
        1. 6 groups of 20 black fly
        2. Dilutions of the 7 compounds
        3. Dark environmental room
        4. Stimulus and control chambers
        5. Light and air source at end
        6. Results
            a. 5 compounds were attractive
            b. Mostly at lower concentrations

e. Conclusions
    i. Few simuliids tested for attraction of compounds
    ii. Future studies
        1. Need to test compounds in the field
            a. Encephalitis Virus Surveillance (EVS) trap
            b. Esperanza Window Trap (EWT)
        2. Select most attractive compounds/blends
            a. Population suppression
            b. Surveillance of pathogens
        3. Paper will be out soon

III. A New Approach to Stormwater Management – Fred Koehle

a. Background
    i. Stormwater fee/tax passed
    ii. Stormwater issues have not been addressed for many years
    iii. Mosquito issues and stormwater issues go hand in hand

b. Richmond County detention ponds
    i. County & school board
        1. 300
        2. Inspected every 5 years
        3. Maintained by county
    ii. Private
        1. 600
        2. Inspected every year
        3. Maintained by property owner
    iii. Both under same NPDES permit
    iv. Inspection form
        1. County and EPD forms
        2. Issue with inspecting private ponds

c. Opportunity
    i. MC put together a team to inspect private ponds

ii. Use the chance to also inspect for other mosquito issues
iii. Equipment needed
    1. Truck
    2. ULV sprayer
    3. Thermal fogger
    4. Backpack sprayer
    5. Trailer and utility vehicle
    6. PPE
    7. Flashlight, tape measure, etc
    8. Chemicals
iv. Budgets
    1. Capital
    2. ??
v. Personnel
    1. Extra employees - 4
    2. Training – county engineer

d. The process
    i. Ponds vary in upkeep
    ii. Notices will be sent out
        1. 60 days
        2. Cut back vegetation
        3. Haul off debris
        4. Cover overflow unit
    iii. Penalties
        1. Fines
        2. Jail time
        3. Community service
e. Inspections
    i. Find overflow
        1. Is it working
        2. Can water get to it
    ii. Cut back vegetation
    iii. Designed to empty themselves within 72 hours
f. Results
    i. Fill out county paperwork
    ii. Fill out EPD paperwork
    iii. List of approved contractors to deal with issues
g. Still using goats
h. Why is MC doing this?
    i. Opportunity to get out into the public
    ii. Educational opportunity
    iii. Funding increase
    iv. Finding new problems that can be controlled
i. Future projects

i. Determine mosquito productivity
ii. Get stormwater working again

IV. Mosquito Gut Microbiota Project Objectives – Bret Boyd
   a. Mosquitoes and bacteria
      i. Wolbachia – vertically transmitted
      ii. Gut microbiota
         1. Diverse
         2. Essential for development
            a. Molting
            b. Adult health and reproduction
            c. Vector qualities
         3. Acquired from environment
         4. Some persist into the adult stage
   b. Why are microbiota variable?
      i. Site by site variation
      ii. Mosquito limits colonization
      iii. Work has been focused on *Aedes* and *Culex* spp
      iv. Clear out microbiota when they molt
   c. What about less global species?
      i. Site
         1. Does species matter?
         2. Is environmental variance more important?
      ii. Host
         1. Physiology
         2. Behavior
      iii. Habitat
         1. Varies by species
         2. Why
   d. Sampling
      i. Compare gut microbiota between species types
      ii. Focus on a clade of mosquitoes
         1. Aedini
         2. Outgroup – *Orthopodomyia*
      iii. Different genera
      iv. Different habitat choice
   e. Methods
      i. Collect mosquito larvae
      ii. Extract bacterial DNA
      iii. Use next generation sequencing to describe microbial diversity
      iv. Use statistical analysis to look for similarities
      v. Tree will vary depending on driving factors for microbial diversity
   f. Rationale
      i. Resource and habitat usage
      ii. Vector competency

iii. Identify novel bacteria species for control

g. Samples needed
    i. Live Aedini mosquito larvae
        1. Fourth instar
        2. >20 per site
        3. Water from site
    ii. Please contact either Bret or Elmer

V. West Nile Surveillance in Wild Birds 2014-2016 – Joseph McMillan
a. Background
    i. Wildlife disease of birds
    ii. Spread by Culex
b. Methods
    i. Mist nets
    ii. ID birds to species
    iii. Band birds
    iv. Blood sample – not all birds are sampled
c. Sampling sites
    i. Areas in Atlanta
    ii. Mosquitoes also sampled in areas
d. Results
    i. 25 of 51 Atlanta species captured and bled
        1. 5 most commonly caught
            a. American robin
                i. ~25%
                ii. >50% positive
            b. Northern cardinal
            c. Grey catbird
            d. Mockingbird
            e. Brown thrasher
        2. Other birds
            a. ~50% for virus
            b. Migrants are also found with antibody
    ii. 429 samples
    iii. 2015-2016
    iv. Virus
        1. >50% show antibodies to virus
        2. Varies across time
e. WNV enzootic activity
    i. 2014
        1. Acquire virus from exposure
        2. Virus seroconversion increases over time
        3. Infection seen in hatch year birds, which indicates transmission is occurring
        4. Grant Park was a hot spot

ii. 2015
    1. Similar trend
    2. Somewhat fewer birds were positive
    3. Infection in hatch year birds
iii. 2016
    1. WNV detected in all 4 parks
    2. Hatch year birds found positive

f. Future projects
    i. The effect of mosquito control
        1. Larviciding occurred in 2015 and 2016
        2. Need to analyze data
    ii. The effect of weather

VI. Revisiting Dadd's Mosquito Theory – Donald Beasley
a. Reginald Dadd
    i. Agricultural pests
    ii. Mosquito nutrition
b. Composition of synthetic mosquito larvae diets
c. Theories – mosquito larvae diet
    i. Fatty acids
        1. Protozoa
        2. Non animal sources
    ii. Maximum stage of development dependent on food type
    iii. Can mosquitoes synthesize needed fatty acids?
d. http://poorjavad.iut.ac.ir/sites/poorjavad.iut.ac.ir/files//files_course/the_insects_structure_and_function4.pdf. (See nutrition chapter)
e. So what? Why do we care about diet?
    i. In search of unique characteristics
        1. Most mosquito larvae are omnivores
        2. It seems unlikely any class of food organism has key nutritional value
        3. Rex Dadd's work is being overlooked
    ii. Ecology
    iii. Autogeny
        1. Nutrient rich larval environments
        2. Predaceous larvae
    iv. Eicosanoids
        1. Signaling lipids
        2. http://study.com/academy/lesson/eicosanoids-definition-function-types-effects.html
        3. Made and used up at site
        4. Mediate cellular immune reactions
    v. Genome mapping
    vi. Chemical ecology – need for better understanding of the biochemistry
    vii. Lab rearing

1. More consistency
2. Create mosquitoes in the lab that are closer to wild mosquitoes

Business Session

- New members
    - 3-year board member – Laura Peaty
    - Industry rep – Zane McAllister
- 2016-2017 Board
    - President – Kenna Graham
    - VP – Joey Bland
    - Directors
        - 1-year: Steve Pavlovich
        - 2-year: Allen Hillman
        - 3-year: Laura Peaty
    - Industry Member – Zane McCallister
    - Secretary-Treasurer: David Touwsma
    - Past President – Jeff Heusel
    - GA Cooperative Extension Rep – Elmer Gray
    - GA Public Health Rep – Rosmarie Kelly
- Next annual meeting will be Oct 18-20, 2017