Station News

The Connecticut Agricultural Experiment Station
Volume 6 Issue 2 February 2016

The mission of The Connecticut Agricultural Experiment Station is to develop, advance, and disseminate scientific knowledge, improve agricultural productivity and environmental quality, protect plants, and enhance human health and well-being through research for the benefit of Connecticut residents and the nation. Seeking solutions across a variety of disciplines for the benefit of urban, suburban, and rural communities, Station scientists remain committed to "Putting Science to Work for Society", a motto as relevant today as it was at our founding in 1875.

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

DR. THEODORE ANDREADIS presided over a quarterly meeting of the Station's Board of Control held in Hartford (January 20); presented an update on Experiment Station activities at a meeting of the Experiment Station Associates Board of Directors (January 20); presented an overview of the Experiment Station and its various research, regulatory and public service programs the Annual Meeting of the Connecticut Tree Protective Association held in Plantsville (700 attendees) (January 21); met with Senator Ted Kennedy Jr., Representative James Albis and other members of the Environment Committee to discuss the impact of pesticides on pollinator health in Connecticut with **DR. KIMBERLY STONER** and **DR. RICHARD COWLES** (January 26); attended a Council Meeting of the Connecticut Academy of Science and Engineering held in Wethersfield (January 27); and with **DR. JASON WHITE** attended a meeting with Dr. Cameron Faustman, and Dr. Michael O'Neil of the University of Connecticut's College of Agriculture and Natural Resources to discuss the 2015 Accomplishment Report and 2016 Plan of Work for the Experiment Station (January 29).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE met with Professor Saion Sinha of the Department of Physics at the University of New Haven to discuss future collaborative research on engineered nanoparticle toxicity (January 11); along with **DR. BRIAN EITZER, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, DR. WALTER KROL, MR. CRAIG MUSANTE, DR. CHRISTINA ROBB AND MS. TERRI ARSENAULT** participated in the monthly FDA FERN cCAP teleconference call (January 14); met with Professor Yangchao Luo the Department of Nutritional Sciences at the University of Connecticut to discuss Station research programs and potential collaborative research (January 14); participated in the Association of Public Health Laboratories (APHL) Agricultural Chemistry teleconference call (January 15); gave an invited lecture at the Duke University Center for the Environmental Implications of Nanotechnology (CEINT) entitled "Nanomaterial interactions with agricultural crops" (40 attendees) (January 18); was invited by the Eastern Analytical Symposium and Exposition (EAS) to organize and chair the Young Investigator Award Session at the November 2016 Conference in Somerset NJ (January 21); spoke by phone with Dr. Anil Patri of the US Food and Drug Administration (FDA) National Center for Toxicological Research NCTR-ORA Nanotechnology Core Facility regarding collaborative research projects (January 25); spoke with Professor Greg Lowry of Carnegie Mellon University regarding a joint grant proposal submission to the NSF INFEWS Program (January 25); along with **DR. BRIAN EITZER, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, MR. CRAIG MUSANTE, DR. CHRISTINA ROBB, MS. KITTIPATH P.-RIVEROS, DR. ALIA SERVIN, DR. ROBERTO DE LA TORRE ROCHE, AND MS. TERRI ARSENAULT** participated in the quarterly FDA ISO AFRPS teleconference call (January 26); and along with **DR. THEODORE ANDREADIS** met with representatives from the University of Connecticut regarding joint preparation of the USDA Research Accomplishments Report and Plan of Work (January 29).

DR. BRIAN EITZER attended the American Bee Research Conference and was a participant in the PI meeting of the multi state hatch grant entitled "Sustainable Solutions to Problems Affecting Bee Health" in Ponte Vedra, FL (January 8-9); and along with **MR. JOSEPH HAWTHORNE** and **DR. SANGHAMITRA MAJUMDAR** attended a seminar on the use of mass spectrometry in forensics at the State of Connecticut Department of Emergency Services & Public Protection Laboratory in Meriden CT (January 20).

ENTOMOLOGY

DR. KIRBY C. STAFFORD III presented a talk titled "The Birth of an Idea: A History of the First Agricultural Experiment Station" at the Station seminar series in Jones Auditorium (January 13); presented a talk titled "Tick Management in 2016" at National Pest Management Association Eastern Conference in Pocono Manor, PA (approximately 60 attendees) (January 14); participated in conference calls with U.S. Biologic, Inc. on the testing of the rodent-targeted Lyme vaccine trial (January 15); participated in an EAB outreach meeting at the CTPA Headquarters in Wallingford, CT (January 19).

MS. KATHERINE DUGAS staffed a CAPS and Forest Pest booth at the CT Nursery and Landscape Association Winter Meeting in Watertown, CT (January 14-15); staffed a CAPS and Forest Pest booth CT Tree Protective Association Winter Meeting in Watertown (January 21); participated in an EAB Outreach meeting at the CTPA office in Wallingford (January 19); and staffed a Forest Pest/Don't Move Firewood Table at the Northeast RV and Camping Show in Hartford, CT (January 22 & 24).

DR. CHRIS T. MAIER displayed longhorned beetles commonly found in firewood while attending the annual meeting of the Connecticut Tree Protective Association in Plantsville (January 21); and presented a display on the invasive spotted lanternfly at a meeting of the Connecticut Entomological Society at Yale University, New Haven (January 22).

DR. GALE E. RIDGE spoke to the Connecticut transfer station attendant and health department officials on how to screen and manage for bed bugs as mattresses enter the recycling stream in Gale's Ferry (40 attendees) (January 6); was quoted in the New Haven Register in their article, "Bed bug battle a constant in state," and the online C-hit news outlet in an article titled, "Bed Bugs: Our Creepy, Pervasive and Expensive Problem" (January 11); spoke at the Vocational Rehabilitation Center, River Valley Services in Middletown about bed bugs (60 attendees) (January 14); trained Gilead Community Services staff, based in Middletown, about bed bug management and self-protection via phone conferencing (January 15); was interviewed about bed bugs on the Larry Rifkin live radio show WATR, Waterbury (January 25); was interviewed by Lewis Carta from WIHS radio, Wallingford (January 27); attended a conference on cross cultural communication sponsored by the department of consumer protection in Hartford (January 28); and presented a talk about bed bugs to staff at the Western Connecticut Mental Health Network in Waterbury (45 attendees) (January 29). The EPA renewed Dr. Ridge's membership for three years as a member of their FIFRA scientific advisory panel.

DR. CLAIRE E. RUTLEDGE presented the talk 'Emerald Ash Borer in Connecticut' in the IDEP symposium at the Eastern Branch of the Entomological Society's annual meeting in Philadelphia, PA (60 attendees) (January 4); presented the talk 'Emerald Ash Borer in Sprague' to town meeting in Sprague, CT (14 attendees) (January 12); presented the talk 'Emerald Ash Borer in Connecticut' to Joshua's Trust in Mansfield, CT (40 attendees) (January 14); presented the talk 'Something old, Something new: Emerald ash borer and Southern pine beetle' at the Connecticut Nursery and Landscape Association's annual meeting in Southington, CT (30 attendees) (January 15); participated in a meeting of the Emerald Ash Borer Outreach group in Wallingford CT (15 adults) (January 19); and participated at the annual meeting of the Connecticut Tree Protective Association in Southington, CT (January 21).

DR. VICTORIA L. SMITH attended the CT Nursery and Landscape Association Winter Symposium, held at Aqua Turf in Southington (200 attendees) (January 14); participated in an emerald ash borer municipal strategy meeting, held at CT Tree Protective Association headquarters in Wallingford, CT (10 participants) (January 19); participated in a meeting of the Yale University Biosafety Committee, held at 135 College St., New Haven (20 participants) (January 21); and participated in a meeting of the National Plant Board Systems Approach to Nursery Certification Working Group, as part of the Pilot Nurseries Committee, held at the Holiday Inn Orlando Airport, in Orlando Florida (100 participants) (January 26-28).

DR. KIMBERLY A. STONER interviewed by Susan Haigh of the state capitol office of the Associated Press about pollinator health and actions that might be taken by the state legislature to support pollinators (January 21); with **DR. RICHARD COWLES** and **DR. THEODORE ANDREADIS**, met with the Environment Committee of the state legislature about pollinator health and what action might be taken to protect and support pollinators (January 26); and toured the Hartford Landfill with the Landfill Legacy Work Group as preparation for planning pollinator plantings and other beneficial uses of the Hartford Landfill (January 28).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO met with Prof. Baoshan Xing at the University of Massachusetts in Amherst to discuss ongoing collaborative research (January 27).

DR. GOUDARZ MOLAEI hosted Dr. Mahmood Iranpour, from the National Microbiology Laboratory, Public Health Agency of Canada, and trained him on mosquito blood meal analyses (January 18-22).

DR. PHILIP ARMSTRONG gave a lecture titled "An Overview and Survey of Arboviral Diseases" for the course, Biology of Disease Vectors in the Yale School of Public Health (January 28).

MR. GREGORY BUGBEE with **MS. JENNIFER FANZUTTI** gave two Workshops on invasive aquatic plants for the Connecticut Envirothon at Goodwin College, East Hartford (approximately 85 attendees) (January 16).

DRS. JOSEPH PIGNATELLO, DOUG BRACKNEY, BLAIRE STEVEN, PHILLIP ARMSTRONG, and GOUDARZ MOLAEI presented introductions to their research interests to the first year medical students at Quinnipiac University at a special session of the Capstone Mentor Fair (approximately 30 attendees) (January 7).

FORESTRY AND HORTICULTURE

DR. JEFFREY WARD spoke on "Como sembrar árboles" at the Connecticut Nursery & Landscape Association Winter symposium & Expo in Plantsville, CT (31 attendees) (January 15); and participated in a New England Society of American Foresters planning meeting (January 26).

DR. ADRIANA ARANGO VELEZ gave a presentation "Uses of biochar for urban tree health", at the Massachusetts Tree Warden 103rd annual conference in Sturbridge, MA (300 attendees) (January 12); spoke on "Plant defenses against biotic and abiotic stresses" and "Defensas de árboles a estreses bióticos y abióticos" at the Connecticut Nursery & Landscape Association Winter symposium & Expo in Plantsville, CT (60 attendees) (January 15); and visited Dr. Chakraborty at Central Connecticut State University to discuss research collaboration (January 25).

DR. ABIGAIL MAYNARD spoke to AP Biology class about New Crops program and agricultural research at Hamden Hall Country Day School (1 teacher, 15 students) (January 7); attended the Connecticut Vegetable and Fruit Growers Conference in South Windsor (January 11); visited Hindinger's farm in Hamden and discussed the New Crops Program (January 14); reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation in Windsor (January 20); and represented the Station at a meeting of the State Technical Committee in Tolland (January 27).

DR. SCOTT WILLIAMS along with **DR. JEFFREY WARD**, **MR. MICHAEL SHORT**, and **MS. MEGAN LINSKE**, met with the wildlife biology class from Lyman Hall High School about careers in the natural resources field (January 12); along with **MR. MICHAEL SHORT** and **MS. MEGAN LINSKE**, met with Guilford Health Director Dennis Johnson about participating in a potential tick management research project (January 14); and hosted the quarterly meeting of the Executive Board of the Connecticut Urban Forest Council in New Haven (January 22).

MR. JOSEPH P. BARSKY participated in the quarterly executive committee meeting of the New England Society of American Foresters in Sturbridge, MA (January 14); and attended the Connecticut Tree Protective Association Annual Winter Meeting in Southington (January 21).

PLANT PATHOLOGY AND ECOLOGY

DR. SANDRA ANAGNOSTAKIS served as a judge for over 500 Nut entries from many species of tree nuts at the Nut Exhibit at the Pennsylvania Farm Show in Harrisburg, PA (Jan 8 -10). The Best of Show was from a seedling heartnut (*Juglans ailantifolia* var. *cordiformis*) grown by Tucker Hiller from Etters, PA.

DR. WADE H. ELMER attended the annual meeting of the Northeastern Division of the American Phytopathological Society meeting in Philadelphia, PA and presented the talk on "Effect of CuO nanoparticles on Fusarium wilt of watermelon" (32 adults) (Jan 4-7); and attended the Special Crop Research Initiative planning meeting for "Biocontrol Products in the Greenhouse" at Ohio State University, Columbus, OH and Co-presented the presentation "Biocontrol products for Disease management" (44 attending) (Jan 12-15).

DR. FRANCIS FERRANDINO presented "Spore transport in a vineyard" at the Northeastern Division of the American Phytopathological Society meeting in Philadelphia, PA (Jan 3-7) held in Philadelphia PA as part of the Northeastern Plant Pest and Soils Conference (NEPPSC) and presided over the business meeting as the Division President.

DR. YONGHAO LI presented a talk titled 'Ornamental Disease Update in Connecticut' at the Northeast Plant, Pest, and Soil Conference – Industry/Extension Session, Philadelphia, PA (26 adults) (Jan 4); presented a presentation titled 'Effects of Fungicides on Spore Germination and Colony Development of *Erysiphe pulchra*, the Causal Agent of Powdery Mildew of Flowering Dogwood' at the Northeast Plant, Pest, and Soil Conference, Philadelphia, PA (50 adults) (Jan 6); gave a talk titled as 'Important and Common Disease Problems in the Industry' at the CNLA Winter Symposium & Expo, Plantsville, CT (100 adults) (Jan 14); was interviewed by Mr. Sam Kantrow at News 8 (WTNH) about possible impacts of lack of snow on trees and shrubs (Jan 15); and gave a talk about 'Backyard Small Fruits 101– Easy and Quick Yielding Delectables' for the Sustainable Backyard Series at the Scoville Memorial Library in Salisbury, CT (16 adults) (Jan 30).

DR. ROBERT MARRA presented a talk titled "Assessing internal decay in trees nondestructively with tomography" at the Annual meeting of the Northeast Division of the American Phytopathological Society, held jointly this year with the Northeastern Plant, Pest and Soils Conference, in Philadelphia, PA (Jan 6); and was elected Secretary-Treasurer for the Northeastern Division of the American Phytopathological Society.

DR. TEJA SHIDORE presented a poster "Protein moonlighting in plant disease: Characterization of the dual function of a bacterial type III secreted virulence effector and chaperone as a toxin-antitoxin system" at the Annual meeting of the Northeast Division of the American Phytopathological Society, held jointly this year with the Northeastern Plant, Pest and Soils Conference, in Philadelphia, PA (Jan 6).

DR. LINDSAY TRIPLETT presented to the Quinnipiac Medical Students about possible internships (Jan 7); and judged the Worthington Hooker Science Fair (Jan 29).

VALLEY LABORATORY

DR. JATINDER AULAKH attended the Northeastern Plant, Pest, and Soils Conference in Philadelphia, PA, presented a research poster and interacted with weed scientists in the Northeast for research collaborations (60 attendees) (January 4 to 7); attended the IR-4 meeting at Philadelphia, PA, to discuss ornamental plant safety trials for 2016 (January 5); presented a talk on "Research Perspectives on the Management of Invasive Plants and Weeds in Ornamental Nurseries and Christmas Trees" at Plantsville, CT (January 14); and attended the Connecticut Invasive Plant Working Group meeting at the Valley Lab, (January 19).

DR. CAROLE CHEAH was interviewed by Tim Palmer, renowned photographer and author, about hemlock woolly adelgid and biological control, for an upcoming book, (January 29).

DR. RICHARD COWLES presented "Making the right choices," about insecticide physical characteristics and how that influences their suitability to be used to target particular groups of pests, to the New York Turf and Landscape Association in Yonkers, NY (109 attendees) (January 13); had a phone conference with researchers and extension specialists in North Carolina regarding soil acidification to protect Christmas trees from root rot infection (5 participants) (January 21); presented "The annual bluegrass weevil paradox" to golf course superintendents for the Hart Seed Co. educational seminars in Taunton, MA, (100 participants) (January 26) and in Cromwell, (70 participants)(January 27); provided a two-hour presentation on "Neonic update and nursery IPM principles" to staff at Pride's Corner Nursery (50 attendees) (January 28); and was invited with Drs. Andreadis and Stoner to discuss neonicotinoids and bee health with the leadership of the Environment Committee of the CT State Legislature, Hartford (8 attendees)(January 26).

MS. ROSE HISKES participated in the Pesticide Resistance Management Education Webinars put on by the Northeastern Integrated Pest Management Center (December 3, 7, 10, 14); participated in the Connecticut Invasive Plant Working Group Symposium Planning Committee meeting in Windsor (December 8); and met with the Friends of Bolton Lakes Association board to discuss educational materials for waterfront property owners in Connecticut (December 16).

DR. JAMES LAMONDIA attended the Northeast Plant Pest and Soils Conference held in Philadelphia PA and presented 'Curative fungicidal activity against *Calonectria pseudonaviculata*, causal agent of boxwood blight' (60 attendees)(January 4 – 7); moderated the afternoon session of the Connecticut Vegetable and Small Fruit growers conference held in South Windsor, CT (January 11); discussed the Connecticut Century Farm Award program with Emily Smith, legislative aide for US Senator Chris Murphy (January 19); and participated in a meeting of the Connecticut Agricultural Information Council at the Valley Lab (January 27).

DR. DEWEI LI made a presentation "Indoor molds and human health' to medical students at the School of Medicine, Quinnipiac University on (January 7); and attended the Connecticut Tree Protective Association (CTPA) annual meeting at the Aqua Turf Club in Plantsville, CT (January 21).

DR. KATJA MAURER attended the Northeast Plant Pest and Soils Conference held in Philadelphia PA and presented 'Fungicide Sensitivity in the Boxwood Blight Pathogen *Calonectria pseudonaviculata*' (60 attendees)(January 4 – 7);

DEPARTMENTAL RESEARCH UPDATES JANUARY 2015

Gent, M.P.N., W.H. Elmer, K. Macherla, R.J. McAvoy. 2015. Effects of salinity and irrigation management on poinsettia. *Acta Horticulturae* 1104:41-47.

ABSTRACT: Two cultivars of *Euphorbia pulcherrima* were grown under partial or full saturation irrigation using a standard fertilizer solution, with or without the addition of sodium chloride. At UCONN, the gravimetric water content averaged 250 and 330 g L-1 prior to irrigation, and 500 and 670 g L-1 following irrigation, for partial or full saturation regimes, respectively. At crop maturity, the electrical conductivity of the potting medium averaged 7.7 and 4.2 S m-1, for plants exposed to salinity or not, respectively. Plants had lower dry weight with partial than full saturation. 'Peterstar Red' had greater dry mass and larger total laminar area than 'Prestige Red'. Sodium concentrations in stem tissue were highest ($P \leq 0.05$) in plants exposed to salinity and these plants accumulated less Na under partial saturation. In a second study with or without salinity and drip or partial saturation irrigation, 'Peterstar Red' had greater height and width than 'Prestige Red' but dry matter content and tissue contents of K, P and Na were greater for 'Prestige Red'. For both cultivars, added salinity resulted in lower K and increased P concentrations in stems. This study demonstrates that partial saturation can be used as an effective water management option when control of plant height and overall crop growth are desirable, and has the added benefit of limiting the toxic accumulation of Na when raw water contains elevated salinity.

Servin, A.D.; White, J.C. 2016. Nanotechnology and agriculture: Next steps for understanding the balance between applications and implications. *NanoImpact* http://dx.doi.org/10.1016/j.impact.2015.12.002.

ABSTRACT:- The potential uses and benefits of nanotechnology in agriculture are significant, including producing greater quantities of food with lower cost, energy, and waste. However, many questions regarding the risk of these approaches in food production remain unanswered. A robust literature assessing the toxicity of engineered nanomaterials to terrestrial\agricultural plant species has begun to develop. However, much of this literature has focused on short term, high dose exposure scenarios often conducted in model media. Although important to determining inherent nanomaterial hazard, these studies are inadequate for assessing the actual risk posed to agricultural systems, including for sensitive receptors such as humans. Although the existing literature is somewhat contradictory, it is notable that the overall findings seem to suggest low to moderate toxicity to terrestrial plant species. However, what is now needed is a systems-level approach investigating more subtle yet potentially more significant impacts of nanomaterial exposure in agricultural systems, including the use of a range of more sensitive endpoints that can mechanistically characterize toxicity. This article will identify these and other key knowledge gaps and also highlight critical next steps for understanding the balance between nanotechnology applications and implications in agriculture and food production.

Mukherjee, A.; Majumdar, S.; Servin, A.; Pagano, L.; Parkash-Dhanker, O.; **White, J.C.** 2016. Carbon nanomaterials in agriculture: A critical review. *Front. Plant Sci*. http://dx.doi.org/10.3389/fpls.2016.00172.

Abstract- There has been great interest in the use of carbon nano-materials (CNMs) in agriculture. However, the existing literature reveals mixed effects from CNM exposure on plants, ranging from enhanced crop yield to acute cytotoxicity and genetic alteration. These seemingly inconsistent research-outcomes, taken with the current technological limitations for in situ CNM detection, present significant hurdles to the wide scale use of CNMs in agriculture. The objective of this review is to evaluate the current literature, including studies with both positive and negative effects of different CNMs (e.g., carbon nano-tubes, fullerenes, carbon nanoparticles, and carbon nano-horns, among others) on terrestrial plants and associated soil-dwelling microbes. The effects of CNMs on the uptake of various co-contaminants will also be discussed. Last, we highlight critical knowledge gaps, including the need for more soil-based investigations under environmentally relevant conditions. In addition, efforts need to be focused on better understanding of the underlying mechanism of CNM-plant interactions.

Bing Yang, **Joseph J. Pignatello**,* Dong Qu,* and Baoshan Xing. Activation of Hydrogen Peroxide and Solid Peroxide Reagents by Phosphate Ion in Alkaline Solution, *Environmental Engineering Science*, online January 16, 2016; DOI: 10.1089/ees.2015.0460.

Abstract: Hydrogen peroxide and its derivatives can serve as useful bulk oxidants for soil and water treatment provided activation is supplied. Solutions of a model compound methylene blue (MB) were treated with hydrogen peroxide (HP), urea hydrogen peroxide (UHP), sodium perborate (SPB), sodium percarbonate (SPC), or calcium peroxide (CP). In unbuffered systems, addition of HP or UHP was ineffective in decolorizing MB, whereas addition of SPB or SPC was moderately effective due to the known ability of borate and carbonate ions, respectively, to activate H_2O_2. Addition of CP caused moderate decolorization as well, but base hydrolysis contributed due to the high pH (~12). Decolorization of MB in HP, UHP, SPB, and SPC systems was greatly accelerated when mixtures were buffered at pH 10 with phosphate (25 mM) compared to mixtures where pH was unadjusted, NaOH-adjusted, or carbonate-adjusted. Decolorization correlated strongly with decomposition of active peroxide (AP), implying a shared pathway. Decolorization was highly inefficient relative to AP decomposition, however. This study represents the first example, to our knowledge, demonstrating activation of H_2O_2 by phosphate towards oxidation of organic compounds. It is suggested that the reactive oxidant species responsible for decolorization and AP loss in the presence of phosphate is, or is derived from, HPO_5^{2-}.

Wang F, Kaplan JL, Gold BD, Bhasin MK, Ward NL, Kellermayer R, Kirschner BS, Heyman MB, Dowd SE, Cox SB, Dogan H, **Steven B**, Ferry GD, Cohen SA, Baldassano R, Moran CJ, Garnett EA, Drake L, Otu HH, Mirny LA, Libermann TA, Winter HS, Korolov K. (2016) Detecting microbial dysbiosis associated with pediatric Chrohn's disease despite the high variability of the gut microbiota. *Cell Reports* 14, 1–11.

Abstract: The relationship between the host and its microbiota is challenging to understand because both microbial communities and their environments are highly variable. We have developed a set of techniques based on population dynamics and information theory to address this challenge. These methods identify additional bacterial taxa associated with pediatric Crohn disease and can detect significant changes in microbial communities with fewer samples than previous statistical approaches required. We have also substantially improved the accuracy of the diagnosis based on the microbiota from stool samples, and we found that the ecological niche of a microbe predicts its role in Crohn disease. Bacteria typically residing in the lumen of healthy individuals decrease in disease, whereas bacteria typically residing on the mucosa of healthy individuals increase in disease. Our results also show that the associations with Crohn disease are evolutionarily conserved and provide a mutual information-based method to depict dysbiosis.

Goudarz Molaei, **Michael Thomas**, Tim Muller, Jan Medlock, **John Shepard**, **Philip Armstrong**, and **Theodore Andreadis**. Vector-Host Interactions in Avian Communities in Four Eastern Equine Encephalitis Virus Foci in the Northeastern U.S.. *PLOS Neglected Tropical Diseases*, January 11, 2016, DOI: 10.1371/journal.pntd.0004347.

ABSTRACT:

Background. Eastern equine encephalitis (EEE) virus (*Togaviridae, Alphavirus*) is a highly pathogenic mosquito-borne zoonosis that is responsible for occasional outbreaks of severe disease in humans and equines, resulting in high mortality and neurological impairment in most survivors. In the past, human disease outbreaks in the northeastern U.S. have occurred intermittently with no apparent pattern; however, during the last decade we have witnessed recurring annual emergence where EEE virus activity had been historically rare, and expansion into northern New England where the virus had been previously unknown. In the northeastern U.S., EEE virus is maintained in an enzootic cycle involving the ornithophagic mosquito, *Culiseta melanura*, and wild passerine (perching) birds in freshwater hardwood swamps. However, the identity of key avian species that serve as principal virus reservoir and amplification hosts has not been established. The efficiency with which pathogen transmission occurs within an avian community is largely determined by the relative reservoir competence of each species and by ecological factors that influence contact rates between these avian hosts and mosquito vectors.

Methodology and Principle Findings. Contacts between vector mosquitoes and potential avian hosts may be directly quantified by analyzing the blood meal contents of field-collected specimens. We used PCR-based molecular methods and direct sequencing of the mitochondrial cytochrome b gene for profiling of blood meals in *Cs. melanura*, in an effort to quantify its feeding behavior on specific vertebrate hosts, and to infer epidemiologic implications in four historic EEE virus foci in the northeastern U.S. Avian point count surveys were conducted to determine spatiotemporal host community composition. Of 1,127 blood meals successfully identified to species level, >99% of blood meals were from 65 avian hosts in 27 families and 11 orders, and only seven were from mammalian hosts representing three species. We developed an empirically informed mathematical model for EEE virus transmission using *Cs. melanura* abundance and preferred and non-preferred avian hosts. To our knowledge this is the first mathematical model for EEE virus, a pathogen with many potential hosts, in the northeastern U.S. We measured strong feeding preferences for a number of avian species based on the proportion of mosquito blood meals identified from these bird species in relation to their observed frequencies. These included: American Robin, Tufted Titmouse, Common Grackle, Wood Thrush, Chipping Sparrow, Black-capped Chickadee, Northern Cardinal, and Warbling Vireo. We found that these bird species, most notably Wood Thrush, play a dominant role in supporting EEE virus amplification. It is also noteworthy that the competence of some of the aforementioned avian species for EEE virus has not been established. Our findings indicate that heterogeneity induced by mosquito host preference, is a key mediator of the epizootic transmission of vector-borne pathogens. **Conclusion and significance.** Detailed knowledge of the vector-host interactions of mosquito populations in nature is essential for evaluating their vectorial capacity and for assessing the role of individual vertebrates as reservoir hosts involved in the maintenance and amplification of zoonotic agents of human diseases. Our study clarifies the host associations of *Cs. melanura* in four EEE virus foci in the northeastern U.S., identifies vector host preferences as the most important transmission parameter, and quantifies the contribution of preference-induced contact heterogeneity to enzootic transmission. Our study identifies Wood Thrush, American Robin and a few avian species that may serve as superspreaders of EEE virus. Our study elucidates spatiotemporal host species utilization by *Cs. melanu-*

ra in relation to avian host community. This research provides a basis to better understand the involvement of *Cs. melanura* and avian hosts in the transmission and ecology of EEE virus and the risk of human infection in virus foci.

Elmer, W. H. 2016. Pathogenic microfungi associated with *Spartina* in salt marshes, In: *Biology of Microfungi* , ed., D. Li Springer Publishing Co. ISBN : 978-3-319-29135-2.

Diebacks associated with disease in salt marshes are not as frequently observed as in terrestrial systems. However, when they do occur, the ecological costs to the marsh system can vary from devastation, in the case of Sudden Vegetation Dieback, to a minor cost, as in the case of Spartina rust outbreaks. All major diebacks of *Spartina alterniflora* have occurred along its native range in the western Atlantic and Gulf Coast. Fungi, herbivores, and abiotic stressors are frequently associated with the dieback. Many dieback/disease events have occurred as a result of fungal pathogens being introduced on invasive *S. alterniflora*. The dieback of the native common reed grass *Phragmites australis* in Shanghai, China, was found to be associated with *F. palustre* being vectored on *S. alterniflora* where it spread onto *Phr. australis*. Another example was when *S. alterniflora* presumably introduced the Spartina strain of ergot (*Claviceps purpurea*) to Europe where it increased on *Spartina anglica*. Although ergot was already present on the native *Spartina foliosa* in the eastern Pacific Coast marshes, the more resistant and robust hybrids that resulted between the invasive *S. alterniflora* and native *S. foliosa* were selectively favored over the native *S. foliosa,* thus advancing the dominance of the hybrids in these marshes. The incidence of Spartina rust incited by *Puccinia spartinioidis* is frequently seen in the marsh, but the rust is not considered to have a significant ecological cost to the marsh. The main economic concern is the disfigurement it can cause to its alternate host, ash (*Fraxinus* spp.). The last fungus discussed (*Phaeosphaeria spartinicola*) did not incite disease, but was highlighted due to its important function as a saprobe and in its facultative, mutualistic relationship with the herbivorous periwinkle snail. During periods of drought, these two organisms interacted in a way that led to massive dieback. Given the resilience of *Spartina* spp., it is surprising when these fungi cause significant damage. Most disease problems, however, tend to be associated with global spread of *S. alterniflora* into nonnative habitats.

JOURNAL ARTICLES APPROVED JANUARY 2016

Aulakh, J. S. Woody vines – Identification and control. *CAES Fact Sheet*

Benton, E., J. F. Grant, J. Webster, **R. S. Cowles,** A. Lagalante, R. Nichols, and C. Coots. Hemlock woolly adelgid and hemlock canopy health numerous years after imidacloprid basal drench treatments: implications for management programs. *Journal of Economic Entomology*

Covey, K., C. Bueno de Mesquita, B. Oberle, D. Maynard, C. Bettigole, T. Crowther, M. Duguid, **Blaire Steven,** A. Zanne, M. Lapin, M. Ashton, O. Chadwick, L. Xuhui, and M. Bradford. Trace gases in deadwood. *New Phytologist*

Ding, X-L, J-R Ye, S-X Lin, X-Q Wu, **De-Wei Li,** and B. Nian. Deciphering the molecular variations of pine wood nematode *Bursaphelenchus xylophilus* with different virulence. *PloS One*

Ferrandino, Francis J. Grape anthracnose. *CAES Fact Sheet*

Ferrandino, Francis J. Grape downy mildew. *CAES Fact Sheet*

Ferrandino, Francis J. Grape powdery mildew. *CAES Fact Sheet*

Li, Yonghao, Margaret T. Mmbaga, Boru Zhou, Jacqueline Joshua, Emily Rotich, and Lipi Parikh. Hydrangea diseases (Book Chapter). In: *Handbook of Florists' Crop Diseases*. Robert J. McGovern and Wade H. Elmer (Editors). Springer

Peterson, Richard B., Neil P. Schultes, Neil A. McHale, and **Israel Zelitch.** Evidence for a role for NAD(P)H dehydrogenase in concentration of CO_2 in the bundle sheath cell of *Zea mays*. *Plant Physiology*

Sheele, J. M., and **Gale E. Ridge.** Toxicity and potential utility of ivermectin and moxidectin as xenointoxicants against the common bed bug, *Cimex lectularius* L. *Journal of Medical Entomology*

ARTICLES OF INTEREST JANUARY 2016

CCABB with a grant from DEEP launched a second electronic billboard bed bug informational display on I95 southbound in Bridgeport and I91 northbound in Hartford. It will run until February 16th 2016.

Quan Zeng's baby girl Lianne Marie Zeng was born on Saturday (1/30/16) around noon at Yale New Haven Children's Hospital. She is 7 pounds 7 ounces and 20.75" at birth. Both mom and baby are healthy. Quan and his wife Lindsay are very thankful for all the wishes and kindness from the station colleagues and friends.

CAES

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The Connecticut Agricultural Experiment Station

Main Laboratories
123 Huntington Street
New Haven, CT 06511-2016
Phone: 203-974-8500

Lockwood Farm
890 Evergreen Avenue
Hamden, CT 06518-2361
Phone: 203-974-8618

Griswold Research Center
190 Sheldon Road
Griswold, CT 06351-3627

Valley Laboratory
153 Cook Hill Road
Windsor, CT 06095-0248
Phone: 860-683-4977

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Station News was prepared and edited by Dr. Theodore G. Andreadis, Mrs. Vickie Bomba-Lewandoski, and Ms. Rebecca Carlone.

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