Station News

The Connecticut Agricultural Experiment Station
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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

GRANTS RECEIVED MAY 2020

Douglas E. Brackney and **Philip M. Armstrong**, "Implications of Sequential Bloodmeals on Arbovirus Transmission by Mosquitoes." National Institutes of Health National Institute of Allergy and Infectious Diseases; $1.48 million; 05/2020 to 04/2025. (May 2020).

Abstract - *Aedes aegypti* is the primary vector for a number of human pathogens, including dengue virus (DENV; *Flaviviridae*, *Flavivirus*), Zika virus (ZIKV; *Flaviviridae*, *Flavivirus*), chikungunya virus (CHIKV; *Togaviridae*, *Alphavirus*) and yellow fever virus (YFV; *Flaviviridae*, *Flavivirus*), all of which present a continued threat to human health worldwide. Understanding the endemic and epidemic risk of these arthropod-borne (arbo-) viruses is critical to the success of public health preparedness and intervention. One key entomological parameter informing risk estimates is vector competence (how able a mosquito is to become infected and transmit an arbovirus; VC). Quantifying the competency of local vector populations can help inform the risk that any one pathogen poses to a given community. This is often quantified in the laboratory by exposing populations of local mosquitoes to an infectious bloodmeal and harvesting tissues at set time-points post infection. While informative, this approach often fails to consider the biology and behavior of the vector mosquito. For example, it is known that wild *Ae. aegypti* mosquitoes will imbibe several bloodmeals over the course of a traditional laboratory-based vector competence study (e.g., bloodmeal every two to three days). To address these shortcomings, we recently began examining the effects that multiple blood feeding episodes have on the competency of *Ae. aegypti* mosquitoes for ZIKV. Our preliminary findings reveal that providing a second non-infectious bloodmeal to ZIKV infected *Ae. aegypti* mosquitoes enhances viral escape from the midgut and significantly shortens the duration between mosquito acquisition of ZIKV to transmission. In this application, we will examine the effects that multiple blood-feeding episodes have on arbovirus infection of and transmission by vector mosquitoes. Specifically, we will be 1) testing this phenomenon in other virus-vector pairings, 2) evaluating the role of the midgut basal lamina in mediating the double-feed phenotype and 3) determining if similar processes are mediating the ability of arboviruses to infect ovarian tissue and be transmitted vertically.

Dr. Jeffrey S. Ward was awarded a $90,000 grant from USDA Forest Service Eastern Region, State and Private Forestry to become a collaborator in the Forest Ecosystem Monitoring Cooperative (FEMC). FEMC is a regional cooperative of agencies in the six New England states that shares and synthesizes forest ecosystem research and monitoring data, facilitates networking and partnerships, and provides tools to understand and manage forested ecosystems across the region. These funds will enable CAES to enhance and expand our extensive system of permanent plots along with organizing FEMC within Connecticut.

Dr. Quan Zeng (PI) and **Dr. Blaire T. Steven** received an award of $747,602 (CAES) from NIFA for a three-year study on "Functional Characterization of Flower Microbiome in Fruit Development and Resistance to Plant Disease" Notification 2020-67013-31794.

ADMINISTRATION

DR. JASON C. WHITE participated in a Zoom call with collaborators at the Harvard University School of Public Health and Nanyang Technological University in Singapore regarding collaborative projects (May 1, 11, 27); participated in the monthly CT Laboratory Preparedness teleconference call with the Department of Public Health and other state/federal agencies (May 4); participated in a Zoom call with Department of Analytical Chemistry staff and the staff from the Department of Consumer Protection Foods Division regarding FDA projects and surveillance sample collection (May 5); participated in the weekly Center for Sustainable Nanotechnology (CSN) center-wide Zoom call (May 6, 13, 20, 27); gave a

presentation by Zoom entitled "Nanoscale Micronutrients to Enhance Crop Disease Resistance: Unintended Consequences in the Rhizosphere?" as part of the Society of Environmental Toxicology and Chemistry (SETAC) Europe meeting in Dublin, Ireland (85 attendees) (May 6); hosted the CAES J-1 Visa recipients monthly Zoom call (May 8); participated in a Zoom call with Department of Analytical Chemistry staff and the staff from the Department of Agriculture regarding FDA projects and surveillance sample collection (May 8); hosted the CSN monthly Nanochem-Plant working group call (May 12); gave a presentation to the CSN weekly all-center call entitled "Nanochemistry and Plants: Transformative Chemistry-driven Work Within the CSN" (60 attendees) (May 13); served remotely on an NSF CBET MRI grant panel (May 14-15); hosted a Zoom call with Commissioner Bryan Hurlburt of the CT Department of Agriculture and Vice President of the Board of Control Mr. Terry Jones regarding the Valley Laboratory Construction project (May 21); participated by Zoom in meetings for the Editorial Advisory Boards of Environmental Science and Technology (May 26) and Environmental Science and Technology Letters (May 28); and participated in a Zoom call with the Yale School of Public Health on a project using bees as environmental biomonitors (May 28).

ANALYTICAL CHEMISTRY

DR. BRIAN EITZER was a participant in the planning committee phone calls for the Agricultural Feeds Regulatory Program Standards on-line conference (May 7, 21, 28), the North American Chemical Residue Workshop's Organizing Committee call (May 14), the Food Emergency Response Network cCAP call (May 14), a training on the use of the ASTM website (May 19), and the APHL Cannabis Community group phone call (May 28).

MS. KITTY PRAPAYOTIN-RIVEROS participated in the Sample Analysis Data Exchange - IT Implementation Phase Meeting on WebEx to discuss the NFSDX (National Food Safety Data Exchange) phase II Sample Data Elements Mapping File (May 5, 19); and participated in the CT Weekly Office Hours for Teams with Microsoft Customer Success Manager (May 4, 11, 18, 25).

DR. CHRISTINA ROBB participated in meetings for the Eastern Analytical Symposium (EAS) board members (May 15), long range planning (May 31), short courses (May 26); attended the Plant Science Day Planning Committee meeting (May 29).

DR. WALTER KROL submitted a Multistate Hatch Grant entitled "Industrial Hemp Production, Processing, and Marketing in the U.S." to NIFA. It was accepted and approved by NIFA on June 3, 2020.

ENTOMOLOGY

DR. KIRBY C. STAFFORD III was interviewed about tick bite prevention and landscaping as people go outdoors by Taylor Quimby, New Hampshire Public Radio (May 1); recorded an interview/PowerPoint presentation on tick control with Dr. Stephen Rich, University of Massachusetts, for a tick webinar to be aired in June (May 5); participated in the public tick IPM working group conference call (May 13); presented a webinar on tick taxonomy for the NEVBD virtual "boot camp" (17 attendees) (May 19); presented a webinar on the principles for tick control for the NEVBD virtual "boot camp" (17 attendees) (May 20); participated in an NEVBD leadership call (May 22); presented a webinar on integrated tick management for the National Environmental Health Association (295 attendees) (May 28); and presented a webinar on tick management for the Midwest Center of Excellence for Vector Borne Disease (May 29).

DR. MEGAN LINSKE participated in a conference call with collaborators for the Department of Defense project entitled "Novel Evaluation of Control and Prevention Strategies for Ticks and Tick-borne Diseases" (May 20); and attended the Wildlife Society Leadership Institute (LI) Mentor Welcome call and was assigned mentee, Sarah Kramer, from LI class of 2020 (May 21).

DR. GALE E. RIDGE was interviewed about the Giant Asian hornet and the likelihood of its establishment in the Northeast by Lissette Nuñez, FOX 61 News (May 4) and by Kate Sheehy from the New York Post (May 4).

DR. VICTORIA L. SMITH participated in a special meeting of the Yale Biosafety committee, for discussion of COVID-19 proposals, via Zoom (20 participants) (May 7); participated in the regular meeting of the Yale Biosafety committee, via Zoom (21 participants) (May 21); and was interviewed regarding the effects of the ongoing virus pandemic on the CT nursery industry by the CT Examiner (May 26).

DR. KIMBERLY A. STONER presented a talk entitled "Planting a Pollinator Pathway" for the Green Forum of the Interreligious EcoJustice Network via Zoom with 61 people online, and the talk was recorded for posting on the YouTube channel for IREJN (May 18); and presented a webinar entitled "Planting for the Bees' Needs" for the White Memorial Conservation Center via Zoom and streamed on the YouTube channel of Jamie Fischer (research director for WMCC) (May 20). A total of 150 people participated through the two online media. Handouts from the talk are also posted on the WMCC website: https://whitememorialcc.org/special-events/.

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO participated in a conference video meeting with faculty at Villanova University, Pacific Northwest National Laboratory, and Oregon Health and Science University regarding an ongoing research project (May 11); and participated in a Progress Report video workshop for the SERDP grants program (May 20).

DR. PHILIP ARMSTRONG gave an online lecture entitled "Regional Vector-Borne Diseases and Emerging Threats" to participants of the Vector Boot Camp Course, Northeast Regional Center for Vector Borne Diseases (25 attendees) (May 12); and gave an online lecture entitled "EEE Outbreak in Connecticut: Risk Assessment and Response to a Rapidly Evolving Crisis" to attendees of the 11th Annual Northeastern Eastern Equine Encephalitis Conference (50 attendees) (May 27).

MS. ANGELA BRANSFIELD participated in a BioRAFT's EHS Community Connection webinar "Ramp Up & Reopening Checklists – Anticipating Needs" (May 21); and participated in the Federal Select Agent Program's webinar "Directors' Updates and Question and Answer Session" (May 27).

MR. GREGORY BUGBEE gave a presentation entitled "Improving Soil in the Home Garden" via Zoom as part of the adult learning program at the Cora J. Belden Library in Rocky Hill (approx. 12 attendees) (May 2); participated as a panelist in the Northeast Aquatic Nuisance Species Panel spring meeting via conference call (May 6); and was interviewed on "Hydrilla in the Connecticut River" by WSHU radio (May 20).

DR. DOUG BRACKNEY was interviewed about our study examining trends of SARS CoV-2 levels in sewage and how it correlates to hospitalizations and confirmed cases by The New Haven Register (May 27); NPR (May 28); and Connecticut News 12 (May 29).

DR. GOUDARZ MOLAEI was interviewed on "Tick Season--What You're Seeing So Far, and What's Expected as We Enter the Summer" by WTIC-AM/FM (May 28).

DR. SARA NASON presented a poster entitled "Analysis of PFAS contaminated soil from Loring Airforce Base using iterative exclusion and FluoroMatch software" at the virtual SETAC SciCon Meeting (May 3-7); participated in two conference calls for the Benchmarks and Publications for Non-targeted Analysis working group (May 15, 26); participated in a Zoom call with collaborators from Yale, University of Florida, Agilent, and Memorial University of Newfoundland regarding a collaborative project (May 20); and conferred with Jordan Peccia (Department of Chemical and Environmental Engineering, Yale University) regarding a new collaboration (May 27).

MR. JOHN SHEPARD presented "Mosquito Collection Techniques and Specimen Processing" and "Taxonomic Identification of Adult Female Mosquitoes" as part of a Webinar "2020 Boot Camp" for the Northeast Regional Center for Vector Borne Diseases (20 attendees) (May 14, 19); and provided updates about the CT Mosquito Trapping and Arbovirus Surveillance Program on two Northeast Arbovirus Surveillance Situational Awareness calls (39 attendees, May 14) (21 attendees, May 28).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD participated in a conference call with Massachusetts DCR-Division of Water Supply Protection staff to discuss functionality of slash walls (May 8); participated in a Forest Ecosystem Monitoring Cooperative (FEMC) Budget Working group video call (May 11, 15); participated in a Yankee SAF, Forest Management and Carbon Task Force conference call (May 18); spoke on invasive species management for a Connecticut Land Conservation Council web lecture (60 attendees) (May 19); and participated in an FEMC Steering Committee video call (May 26).

DR. ABIGAIL A. MAYNARD was interviewed about home composting by Michelle Acri from Connecticut Magazine (May 4); and participated in a Zoom meeting of the soil health subcommittee of the Council on Soil and Water Conservation (May 6).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE H. ELMER participated in a bi-weekly USDA NIFA zoom conference (May 1, 15, 29) and attended an APS community connection Zoom presentation (May 29).

DR. ROBERT E. MARRA presented a webinar entitled "Updates on Beech Leaf Disease and Oak Wilt" to the UConn "Hot Topics" series (120 attendees) (May 28).

VALLEY LABORATORY

DR. RICHARD COWLES discussed "Resiliency: The Key to Future Success" for Rainbow Tree Care, in a virtual meeting https://www.youtube.com/watch?v=BBioGILIzZg (35 attendees) (May 7).

MS. ROSE HISKES participated in virtual Connecticut Invasive Plant Working Group symposium planning committee meetings (May 19, 22); and participated in webinars on spotted lanternfly (May 21) and spotted wing drosophila (May 28).

DEPARTMENTAL RESEARCH UPDATES MAY 2020

Brackney, Doug E., Maria A. Correa, and **Duncan W. Cozens**. The Impact of Autophagy on Arbovirus Infection of Mosquito Cells. *PLoS Negl. Trop. Dis.* 2020 May 18;14(5):e0007754; doi: 10.1371/journal.pntd.0007754. eCollection (May 2020).

Abstract- Macroautophagy is an evolutionarily conserved cellular process critical for maintaining cellular homeostasis. It can additionally function as an innate immune response to viral infection as has been demonstrated for a number of arthropod-borne (arbo -) viruses. Arboviruses are maintained in a transmission cycle between vertebrate hosts and invertebrate vectors yet the majority of studies assessing autophagy-arbovirus interactions have been limited to the mammalian host. Therefore we evaluated the role of autophagy during arbovirus infection of the invertebrate vector using the tractable Aag2 *Aedes aegypti* mosquito cell culture system. Our data demonstrates that autophagy is significantly induced in mosquito cells upon infection with two divergent arboviruses: dengue virus-2 (DENV-2; *Flaviviridae*, *Flavivirus*) and chikungunya virus (CHIKV; *Togaviridae*, *Alphavirus*). While assessing the role of autophagy during arbovirus infection, we observed a somewhat paradoxical outcome. Both induction and suppression of autophagy via torin-1 and spautin-1, respectively, resulted in increased viral titers for both viruses, yet suppression of autophagy-related genes had no effect. Interestingly, chemical modulators of autophagy had either no effect or opposite effects in another widely used mosquito cell line, C6/36 *Aedes albopictus* cells. Together, our data reveals a limited role for autophagy during arbovirus infection of mosquito cells. Further, our findings suggest that commonly used chemical modulators of autophagy alter mosquito cells in such a way as to promote viral replication; however, it is unclear if this occurs directly through autophagic manipulation or other means.

Eisen, L., and **Kirby C. Stafford III**. 2020. Barriers to effective tick management and tick-bite prevention in the United States (Acari: Ixodidae). J. Med. Entomol. 57 [epub ahead of print 6 May 2020] 10.1093/jme/tjaa079

Abstract- Lyme and other tick-borne diseases are increasing in the United States. Development of tick control tools have focused primarily on the blacklegged tick, *Ixodes scapularis* Say. Application of acaricides or entomopathogenic fungal agents to kill host-seeking ticks or ticks on rodents can suppress *I. scapularis* abundance in residential landscapes, but evidence is lacking for impact on human tick bites or tick-borne disease. Similar studies remain limited for the lone star tick, *Amblyomma americanum* (L.). Other knowledge gaps include how well homeowners and pest control companies perform in the broadcast application of tick-killing products, relative to high efficacy reported in research studies, and the tick-killing potential of natural product formulations exempt from Environmental Protection Agency registration. Area-wide control based on preventing ticks from feeding on their main reproductive host, the white-tailed deer, can suppress populations of both *I. scapularis* and *A. americanum*. Some studies also suggest an impact on Lyme disease cases, but this needs to be further validated in larger-scale intervention studies. The effectiveness, scale, cost, and implementation of various tick management strategies are important considerations in efforts to reduce human tick encounters and tick-borne disease. Additional barriers include weak incentives for industry and academia to develop, test, and register new tick and pathogen control technologies, including vaccines targeting humans, tick reproductive hosts, or wildlife pathogen reservoirs. Solutions will need to be 'two-pronged': improving the tick and pathogen control toolbox and strengthening the public health workforce engaging in tick control at local and state levels.

Hao, Y., **Chuanxin Ma**, **Jason C. White**, M. Adeel, R. Jiang, Z. Zhao, Y. Rao, Y. Rui, and B. Xing. 2020. Carbon-based nanomaterials alter the composition of the fungal endophyte community in rice (*Oryza sativa*). Environ. Sci.: Nano. https://doi.org/10.1039/C9EN01400D.

Abstract- Rice seedlings were exposed to different types of carbon-based nanomaterials (CNMs), including reduced graphene oxide (rGO), multi-walled carbon nanotubes (MWCNTs), and fullerene (C60), at 10-250 mg/L under hydroponic conditions

for 20 days to investigate the impact of CMN exposure on the composition of the rice endophyte community. Physiological results demonstrated that exposure 10 and 50 mg/L MWCNTs and C60 had no overt effect on plant growth; however, at 250 mg/L the fresh biomass was reduced by 17.9-23.7% as compared to the control. Conversely, the addition of 50 and 250 mg/L rGO positively affected rice biomass. The content of three endogenous phytohormones, including indole-3-acetic acid (IAA), zeatin riboside (ZR) and gibberellic acid3 (GA3), were significantly decreased upon exposure to 250 mg/L MWCNTs and C60. A high-throughput sequencing technique was used to analyze the composition of the fungal endophyte community as affected by CNMs exposure. The results show that fungal endophytes in rice were sensitive to CNM exposure; the community composition at different levels (phylum, class, and genus) were significantly altered as compared to the respective control. Taken together, the present work provides new insight on the potential consequences of NM exposure on terrestrial plants. Additionally, it is clear that a systematic evaluation of the risks of CNMs to commensal species such as endophytic fungi is necessary to fully understood the risk these materials pose in the environment.

Iman, A., **Regan B. Huntley,** G. S. Mourad, and **Neil P. Schultes**. Apple Nucleobase cation symporter 1 transports guanine and the *Erwinia amylovora* produced toxic analog 6-thioguanine. Physiol. & Mol. Plant Path. https://doi.org/10.1016/j.pmpp.2020.101492

Abstract- *Erwinia amylovora* causes fire blight, a devastating disease of apples and pears. The antimetabolite 6-thioguanine (6TG) is synthesized and excreted by this bacterium and is involved in pathogenesis. Plants contain numerous nucleobase transporters that readily transport guanine. Studies of the *Malus domestica* nucleobase cation symporter 1 (MdNCS1) by heterologous expression in nucleobase transport deficient *Escherichia coli,* reveals transport of adenine, guanine and 6TG. This is the first report of a plant transporter moving 6-thioguanine, a toxic nucleobase derivative produced by the apple pathogen *Erwinia amylovora*. *MdNCS1* is expressed in both uninfected and *E. amylovora* infected apple flowers (a common route for pathogen entry) and in *E. amylovora* infected immature pear fruitlets.

LaMondia, James A. 2020. Curative Fungicide Activity Against *Calonectria pseudonaviculata*, the Boxwood Blight Pathogen. *Journal of Environmental Horticulture* 38(2):44–49.

Abstract- Azoxystrobin, azoxystrobin plus benzovindiflupyr, kresoxim-methyl, propiconazole, pyraclostrobin, pyraclostrobin plus fluxapyroxad, tebuconazole, tetraconazole, thiophanate-methyl, and triflumizole fungicides were evaluated for curative and anti-sporulant activity against boxwood blight caused by *Calonectria pseudonaviculata* on detached leaves and whole boxwood plants (*Buxus* spp.). Pretreating detached leaves with 30 or 300 ppm a.i. 24 h prior to inoculation reduced disease compared to the untreated control for all fungicides. Fungicides were also applied 24 to 96 h post-inoculation. Only propiconazole reduced diseased leaf incidence to at least half of the control. When leaves were treated post-infection with 300 ppm propiconazole, tetraconazole, tebuconazole, or triflumizole, the pathogen did not sporulate over 2 wks. Propiconazole also reduced the percent of leaf area diseased; lesions were nearly 80% smaller with 300 ppm applied 48 h after inoculation. ‘True Dwarf' boxwood plants treated with 450 ppm thiophanate-methyl, 120 ppm pyraclostrobin or 150 ppm propiconazole 48 h after inoculation demonstrated that only propiconazole reduced the number of diseased leaves, blight lesions and the frequency of pathogen re-isolation. Experiments with ‘Green Mound' and ‘Green Mountain' boxwood cultivars and additional fungicides applied 48 h after inoculation demonstrated that propiconazole at 300 ppm, pyraclostrobin plus fluxapyroxad (150 ppm each) and azoxystrobin (135 ppm) plus benzovindiflupyr (67.5 ppm) reduced disease.

Ma, Chuanxin, H. Liu, G. Chen, Q. Zhao, H. Guo, R. Minocha, S. Long, Y. Tang, E. M. Saad, **Roberto De La Torre Roche**, **Jason C. White**, O. Parkash Dhankher, and B. Xing. 2020. Dual roles of glutathione in silver nanoparticle detoxification and enhancement of nitrogen assimilation in soybean (*Glycine max* L.). Environ. Sci.: Nano. DOI: 10.1039/D0EN00147C.

Abstract- This study focused on investigating the role of glutathione (GSH) in alleviating Ag NP-induced phytotoxicity and boosting soybean (*Glycine max* L.) simultaneously. Exposure to Ag NPs beyond 31.2 mg/kg significantly altered the fresh biomass, nodule formation and total nitrogen of soybean seedlings. Micro X-ray fluorescence (μ-XRF) spectra of Ag NP treated roots and nodules indicate that Ag–GSH was the main component (40.6-88%) other than Ag NPs, highlighting the important role of GSH in alleviating the Ag NP-induced toxicity. The exogenous addition of 0.8 mM GSH not only significantly

increased soybean fresh biomass by 85% in 62.5 mg/kg Ag NP treated soybean, but also decreased Ag accumulation by 24.8-27% in soybean tissues. In addition, the total nitrogen content in soybean co-treated with Ag NP and GSH was more than 5-fold higher than the Ag NP alone treatments, and amino acid profile further confirmed that GSH was utilized as a nitrogen source, resulting in enhanced soybean growth while simultaneously alleviating Ag NPs toxicity. Taken together, these findings have significant relevance for developing future strategies to minimize the crop loss in marginal or contaminated soils, subsequently enhancing global food security.

Noori, A., A. Ngo, P. Gutierrez, S. Theberge, and **Jason C. White**. 2020. Silver nanoparticle detection and accumulation in tomato (Lycopersicon esculentum). J. Nano. Res. 22:131.

Abstract- Recent years have seen significant increases in the use of silver nanoparticles (AgNPs) in areas such as medicine and agriculture. AgNPs released into environment can be accumulated by plants, potentially affecting environmental and human health. In addition, the accumulation of silver in plant tissues can negatively affect plant vascular tissues and membrane transporters that are responsible for the transport of water and essential nutrients. In this study *Lycopersicon esculentum* plants were exposed to 10, 20, or 30 mg/L of silver in bulk (Ag0), nanoparticle (AgNPs), or ionic ($AgNO_3$) form for seven days in Hoagland media. Tissues were then harvested and subjected to elemental, molecular, and microscopic evaluation. The highest and lowest concentration of silver was detected in roots of plants exposed to 10-30 mg/L $AgNO_3$ (432-471 µg/g dw) or AgNPs (40-47 µg/g dw), respectively. Particulate silver was detected in plants exposed to AgNPs. The highest (52700-58400 particles/g) and lowest (6200-13700 particles/g) concentration of particles were detected in roots and leaves, respectively. The membrane transporters H+-ATPase, potassium transporter, and sulfate transporter were upregulated by 23.50%, 52.09%, and 7.6% upon exposure to all forms of silver as compared to the control group. Exposure to all forms of silver resulted in larger xylem cells (14±0.2µm in AgNPs exposed plants) than the control group (9.3µm±0.13). Collectively, the data suggest exposure to AgNPs resulted in the translocation and accumulation of both ionic and particulate forms of silver in tomato plants, affected the structure of vascular tissues, and significantly impacted the expression of membrane transporters. These changes subsequently affect the electrochemical potential of plant cells, the balance of water and nutrient dynamics, and plant growth; all of have implications for sustainable agriculture and ultimately human health. These results also improve our understanding of the fate and effects of nanomaterials in food crops.

Patel, Ravikumar R., and **Lindsay R. Triplett**. 2020. *Xanthomonas vasicola* pv. *vasculorum* (bacterial leaf streak of corn). Factsheet, CABI Invasive Species Compendium. https://www.cabi.org/isc/datasheet/36777909

Williams, Scott C., **Megan A. Linske**, and **Kirby C. Stafford III**. 2020. Humane use of cardiac puncture for non-terminal phlebotomy of wild-caught and released *Peromyscus* spp. Animals 10(5), 826. https://doi.org/10.3390/ani10050826.

Abstract- The cardiac puncture technique for obtaining relatively large volume (50–150 µL) blood samples from sedated rodents has been used in research for nearly a century. Historically, its use to phlebotomize and then release live rodents was more common. However, recently its use in a non-terminal capacity frequently imparts negative connotations in part because exsanguination of sedated animals via cardiac puncture is now an American Veterinary Medical Association-approved euthanasia technique. This association has resulted in ethical concerns by manuscript reviewers and in a few instances, outright refusal by some peer-reviewed journals to publish research that utilized the technique. To counter the perceived negative associations with its non-terminal use, we summarized nearly two decades (2001–2019) of capture and handling data throughout Connecticut, resulting in over 7000 cardiac punctures performed on nearly 5000 sedated, live-captured and released *Peromyscus* spp. We show that our total handling mortality rate (3.7%) was comparable, if not lower, than similar field studies that utilized other phlebotomy techniques. Many public health, integrated tick management, and vector-borne disease ecology studies require samples from individual wild-caught *Peromyscus* spp. over time to determine intervention efficacy and pathogen infection monitoring, and in such field studies, post-operative care is not an option. Proper execution of cardiac puncture does not increase susceptibility of individuals to predation upon release as can potential ocular abnormalities or infections that can occur as the result of use of other techniques. We posit that neither exsanguination nor resulting euthanasia are requirements of cardiac puncture and that its use is entirely appropriate for obtaining blood samples from live-captured and released *Peromyscus* spp. Properly performed cardiac puncture is an excellent technique to obtain blood samples from sedated, individual Peromyscus spp. on multiple appropriately-spaced occasions over single trapping seasons while keeping animal welfare a top priority.

JOURNAL ARTICLES APPROVED MAY 2020

Allan-Perkins, E., K. Maurer, and **James A. LaMondia**. Impact of cultivar, trellis height, and pruning on commercial hop production in Connecticut. *CAES Bulletin*

Bian, J.-Y., Q. Song, Y.-L. Fang, M.-L. Sun, J.-Y. Yang, Y.-W. Ju, **De-Wei Li**, and L. Huang. The fungal endophyte *Epicoccum dendrobii* as a potential biocontrol agent against *Colletotrichum gloeosporioides*. *Phytopathology*

Borges, D. F., G. A. Nogueira, G. A. Cruz, S. G. A. E. Silva, **Washington L. da Silva**, and M. M. Q. Ambrósio. Effects of alternative root rot pathogens control techniques on soil microbial communities. *Revista Brasileira de Ciência do Solo*

Braun, J. C., **Richard S. Cowles**, and **James A. LaMondia**. The use of geostatistics to analyze factors influencing hop (*Humulus lupulus*) yield in Connecticut. *CAES Technical Bulletin*

Cui, W.-L., X.-Q. Lu, J.-Y. Bian, X.-L. Qi, **De-Wei Li**, and L. Huang. *Curvularia spicifera* and *C. muehlenbeckiae* causing leaf blight on *Cunninghamia lanceolata*. *Plant Pathology*

Cui, Zhouqi, **Regan B. Huntley**, **Neil P. Schultes**, **Blaire T. Steven**, and **Quan Zeng**. Manipulation of the apple stigma microbiome reduces the occurrence of fire blight disease. *Phytobiomes Journal*

Hyde, J., M. A. Correa, G. L. Hughes, **Blaire Steven**, and **Doug E. Brackney**. Limited influence of the microbiome on the transcriptional profile of female *Aedes aegypti*. *Scientific Reports*

Little, Eliza A.H., **Kirby C. Stafford III**, and **Goudarz Molaei**. Climatic and environmental determinants of the spatial distribution and abundance of disease vectors, *Ixodes scapularis* and *Amblyomma americanum*. *EcoHealth*

Ma, Q., S. Srivastav, S. Gamez, F. Feitosa-Suntheimer, E. I. Patterson, R. M. Johnson, E. Matson, A. Gold, **Douglas E. Brackney**, J. H. Connor, T. M. Colpitts, G. Hughes, J. L. Rasgon, T. Nolan, O. S. Akbari, and N. C. Lau. An integrated mosquito small RNA genomics resource reveals dynamic evolution and host responses to viruses and transposons. *Genome Research*

Molaei, Goudarz, J. W. Mertins, and **Kirby C. Stafford III**. Enduring challenge of invasive ticks: Introduction of *Amblyomma oblongoguttatum* (Acari: Ixodidae) into the United States on a human traveler returning from Central America. *Journal of Parasitology*

Pagano, L., M. Villani, J. Magnani, A. Zappettini, **Jason C. White**, M. Marmiroli, and N. Marmiroli. Structural maintenance, function and abundance of organelle genetic material in *Arabidopsis thaliana* exposed to engineered nanomaterials. *NanoImpact*

Peccia, J., A. Zulli, **Doug E. Brackney**, N. D. Grubaugh, E. H. Kaplan, A. Casanovas-Massana, A. I. Ko, A. A. Malik, D. Wang, M. Wang, D. M. Weinberger, and S. B. Omer. SARS-CoV-2 RNA concentrations in primary municipal sewage sludge as a leading indicator of COVID-19 outbreak dynamics. *Nature Biotechnology*

Salinas, F., C. E. Astete, J. H. Waldvogel, S. Navarro, **Jason C. White**, **Wade H. Elmer**, J. A. Davis, and C. M. Sabliov. Effects of engineered lignin-graft-PLGA and zein-based nanoparticles on soybean health. *Environmental Science & Technology*

Shidore, Teja, **Nubia Zuverza-Mena**, and **Washington da Silva**. Small RNA profiling analysis of two recombinant strains of potato virus Y in infected tobacco plants. *Virus Research*

Stafford, Kirby C. III, **Gale E. Ridge**, C. Zarb, and P. Bevilacqua. Rabbit bot fly furuncular, tracheopulmonary, and human bot fly infestations in Connecticut (Oestridae: Cuterebrinae). *Journal of Medical Entomology*

Taerum, Stephen J., **Blaire T. Steven**, D. J. Gage, and **Lindsay R. Triplett**. Validation of a PNA clamping method for reducing host DNA amplification and increasing eukaryotic diversity in rhizosphere microbiome studies. *Phytobiomes Journal*

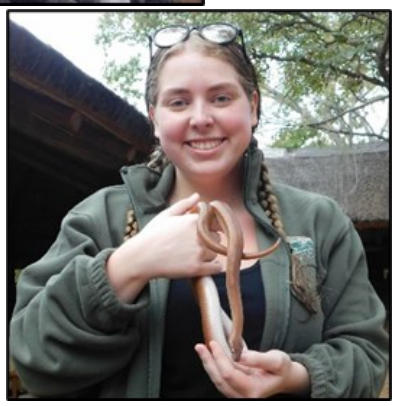
Yang, J., **Joseph J. Pignatello**, K. Yang, L. Zhang, C. Yang, and Z. Dang. The importance

of ring cluster size of carbonaceous sorbents for sorption of aromatic compounds. *Environmental Science & Technology*

Zhang, Z., H. Lin, **Chuanxin Ma**, L. Zhang, J. Zelevinsky, M. Xia, Y. Xu, **Jason C. White**, J. Tyson, and L. He. Integrating the Gutzeit method with X-ray fluorescence spectroscopy for rapid quantification of inorganic arsenic in selected beverages. *Food Control*

NEW STAFF, STUDENTS, AND VOLUNTEERS MAY 2020

ANAIS (ANNIE) BOLDUC, **BENJAMIN GLUCK**, **JAMES DURRELL, ASHLEY MARTONE** (left to right) and **SARA CARSON** (right) return to work with us as seasonal research assistants this summer. Annie and Ben have continued to work for Dr. Kimberly Stoner on her pollinator projects. Sara has continued to work for Dr. Victoria Smith on the CAPS program, while James returns to work with Dr. Victoria Smith and Ms. Gerda Magana on the insect pest surveys. Ashley returned to work with Dr. Claire Rutledge.



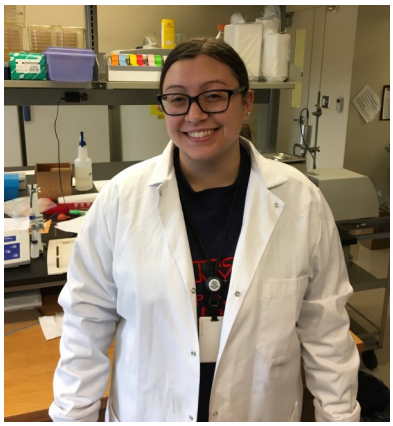
MR. HUNTER BADEY is a sophomore student at Trinity College majoring in biology. He joins the Department of Entomology to work with Drs. Kirby Stafford and Scott Williams on the tick management projects. He has enjoyed working with robotics and has worked as a camp volunteer assisting campers with special needs.

MR. DANIEL DUQUE is student at the University of Connecticut (UConn). He also joins the Department of Entomology to work with Drs. Kirby Stafford and Scott Williams on the tick management projects. At UConn, Daniel has previously worked with Dr. David Wagner on surveying and photographing lepidoptera.

Ms. Anna Welch is a summer seasonal in the Department of Forestry and Horticulture working with Dr. Jeffery Ward collecting data on forest resiliency, growth, and regeneration. She is an undergraduate in the University of Connecticut CAHNR studying Natural Resources and the Environment with a double concentration in Sustainable Forest Resources and Fisheries and Wildlife Conservation. Anna first worked in the woods as a Forestry Technician for the UConn Forest and is happy to expand her familiarity with New England forests through work at CAES.

Ms. Katie Overstrum is a seasonal assistant in the Department of Forestry and Horticulture. She is a recent graduate of Dickinson College, where she studied Environmental Science and Biology. Katie realized her interest in forest health while studying Hemlock Wooly Adelgid presence and hemlock health at hilltop and valley sites in Pennsylvania, and is excited to return home to Connecticut this summer. She will be working with Dr. Jeffery Ward on forest resiliency, growth, and regeneration.

Ms. Renata Martins Pereira is a graduate student from Federales University in Lavras, Brazil. She joined us in May after a two-week social isolation and is working on part of the Ph.D. research with Dr. Wade Elmer on The effect of Cu/Zn nanoparticles on sudden death of soybeans.



Ms. Britney Caso, a graduate in Forensic Biology and Biochemistry at the University of New Haven returned to the laboratory of Dr. Yonghao Li in Plant Pathology and Ecology on May 26, 2020, as a Seasonal Research Assistant. She is a car, music, and dance enthusiast; and loves to talk about all three.

Ms. Cora Ottaviani began working as seasonal employee with Dr. Marra on May 27. She is from Berlin, CT, got her Bachelor's degree at the University of Hartford, and her Master's in Environmental Management at Yale School of Forestry and Environmental Studies. Her work is focused on surveying forested lands for beech leaf disease.

Ms. Alexandra Farah (**Alex**) began working with Dr. Marra as a seasonal employee on May 26 to help with oak wilt diagnostics, as well as other projects in the lab, in particular the population genetics of *Fusarium palustre*, the fungal pathogen of saltmarsh cordgrass associated with Sudden Vegetation Dieback. Alex graduated from the University of New Haven in the Forensic Sciences program.

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