HIGHLIGHTS

Research and the Storrs Agricultural Experiment Station · 2020

College of Agriculture, Health and Natural Resources • University of Connecticut

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VISION

The College of Agriculture, Health and Natural Resources will provide for a global sustainable future through scientific discovery, innovation, and community engagement. Our accomplishments will result in safe, sustainable, and secure plant and animal production systems; healthier individuals and communities; greater protection and conservation of our environment and natural resources; balanced growth of the economy; and resilient local and global communities.

MISSION

Our research mission is to develop knowledge and disseminate it through the three academic functions of teaching, research, and outreach education. This mission is based on historic federal legislation that led to the modern day land-grant university, including the Morrill, Hatch, Smith-Lever, McIntire-Stennis, and Animal Health acts, and enabling state statutes.

Indrajeet Chaubey
Dean and Director
College of Agriculture,
Health and Natural Resources

MESSAGE FROM THE DEAN

It is a pleasure to present highlights of our research conducted through the Storrs Agricultural Experiment Station for the Governor's Office and the Connecticut General Assembly (per State Statute Ch. 426, Sec. 22-102). As Connecticut's land-grant institution, we have a federally charged responsibility to educate the next generation of students; conduct fundamental and translational research to address the needs of Connecticut's $4 billion agricultural economy, be stewards of the state's natural resources, and improve human health; and provide outreach and training to Connecticut's citizens through the Cooperative Extension System. Our research continues to be fully integrated with our academic programs, and our students are directly engaged with faculty in research as we train the next generation of scientists and leaders. Likewise, our research discoveries are delivered directly to citizens of Connecticut in each of 169 cities and towns through our Cooperative Extension System.

INTRODUCTION

The University of Connecticut's College of Agriculture, Health and Natural Resources (CAHNR) is committed to research that solves problems and investigates new areas relevant to agriculture, food, forestry, and environmental and human health. The Office of Research and Graduate Education is responsible for facilitating CAHNR's research environment, which is supported by capacity and competitive funds. Capacity research funding is provided through the federal-state partnership managed by the Storrs Agricultural Experiment Station (SAES). Competitive funds are obtained from a variety of federal and non-federal sources through the independent initiative of CAHNR's faculty and staff. We encourage fundamental research to gain knowledge in relevant fields, and multidisciplinary collaborations between institutions, agencies, and fields of study to advance national goals established by the United States Department of Agriculture National Institute of Food and Agriculture (USDA-NIFA). We value applied research approaches and the application of results from all research endeavors.

The College of Agriculture, Health and Natural Resources hosts nine departments that are home to 168 faculty members and 110 staff. These individuals all contribute to the discovery of new knowledge and its communication to the broader population of the state, region, and nation. An essential component of the CAHNR research mission is to provide opportunities for graduate student and postdoctoral scientist training, ensuring that the next generation of scientists is prepared for addressing the state's, region's, and nation's challenges.

The Storrs Agricultural Experiment Station and Research

The Storrs Agricultural Experiment Station (SAES) receives capacity funding from the USDA each year and a 1:1 state match is provided through the University's block grant from the state legislature. For FY 2020, funding in the amount of $4.2 million was received to support independent investigator and multistate research in the broad fields of agricultural science, environmental science, forestry, and human and animal health. The allocation of those funds is indicated in Figure 1. Ninety-four percent of the budget was used to fund personnel (i.e., graduate students and faculty/staff) who contributed to research associated with USDA-approved capacity projects.

The investment provided by the federal-state SAES partnership is leveraged considerably by the creative and scholarly efforts of CAHNR's faculty and staff. This is done primarily through the pursuit of competitive extramural funding in the form of single- or multi-year grant awards. In FY 2020, CAHNR faculty and staff members were engaged in over fifty research projects supported directly by the USDA capacity funds.

Table 1. Proposals to Federal Agencies by Lead Agency

Agency	Request	%
Department of Commerce (DOC)	$1,140,815	1.23
Department of Defense (DOD)	$1,101,744	1.19
National Aeronautics and Space Agency (NASA)	$1,865,410	2.01
National Institutes of Health (NIH)	$41,273,254	44.41
National Science Foundation (NSF)	$5,836,095	6.28
U.S. Department of Agriculture (USDA)	$37,448,967	40.3
Other federal agencies	$4,260,589	4.58
Total	**$92,926,874**	

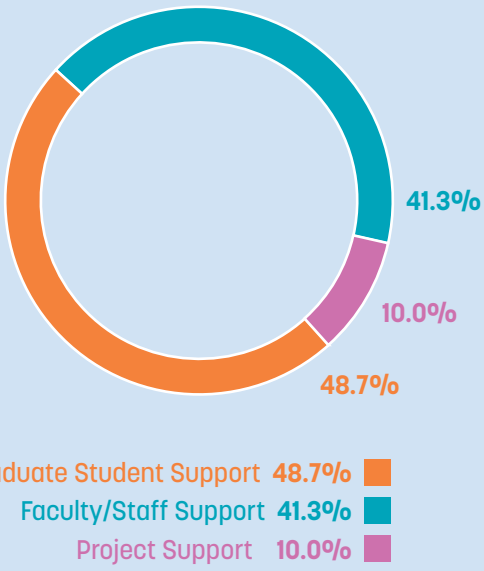
Table 2. Grant Awards by Federal Agency

Agency	Request	%
Department of Commerce	$2,490,874	8.31
Department of Defense	$972,212	3.24
Department of Energy	$164,903	.55
National Institutes of Health	$3,370,142	11.25
National Science Foundation	$1,012,637	3.38
US Department of Agriculture	$20,332,496	67.85
Other federal agencies	$1,747,775	5.42
Total	**$16,731,833**	

Allocation of Storrs Agricultural Experiment Station Funds, FY 2020

Source: Office of Vice President for Research

Figure 1



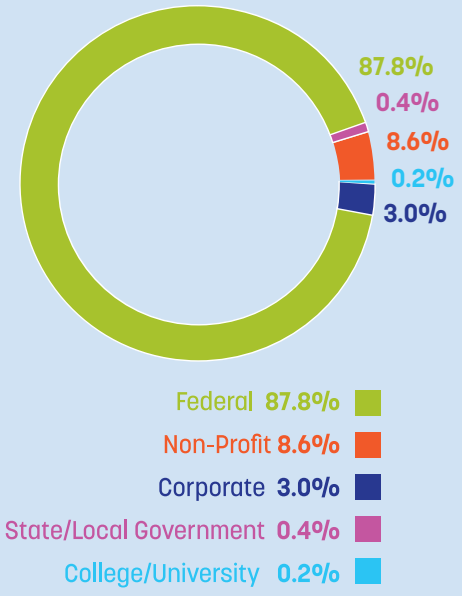
In FY 2020, CAHNR researchers applied for a total of approximately $105.8 million in extramural grant funding (Figure 2). Proposals were submitted to a variety of federal and non-federal sources. Based on the quantity of requested funds, federal agencies were approximately 86 percent of the destinations for grant submissions. The majority of these were targeted to NIH, NSF, and the USDA (Table 1).

In FY 2020, $34.79 million in extramural grant funding was received by CAHNR researchers. The majority of funding awards was from federal agencies and amounted to $29.96 million. Approximately 67 percent of all funding awards were received from USDA (Table 2).

Proportion of Funding Requests by Sponsor, FY 2020

Source: Office of Vice President for Research

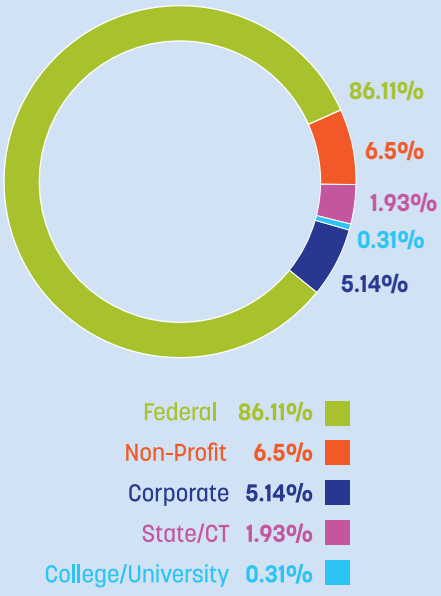
Figure 2

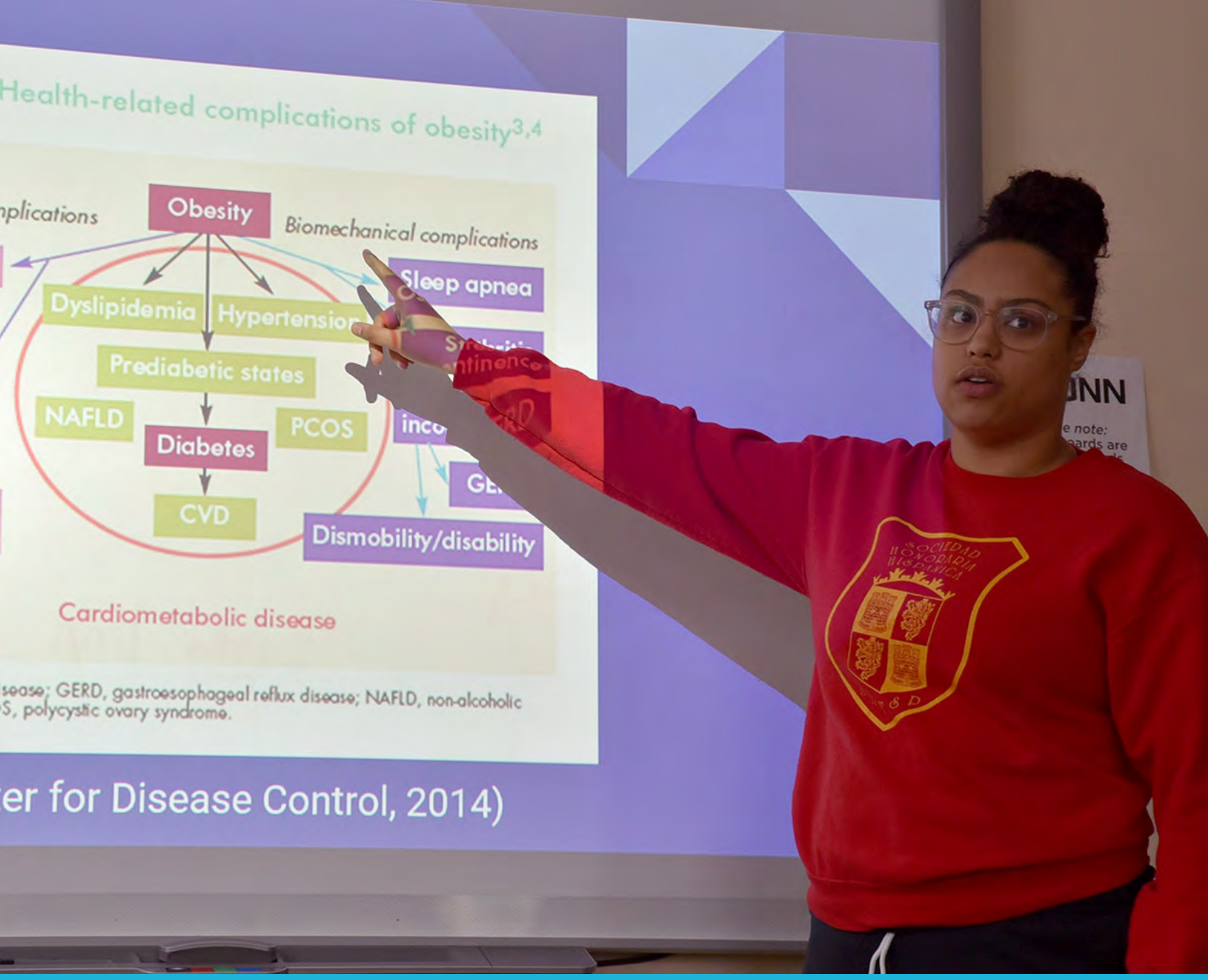


Proportion of Funding Awards by Sponsor, FY 2020

Source: Office of Vice President for Research

Figure 3





Scholarly Productivity

The application for and acquisition of funding is a common metric used to gauge research activity. While it communicates the value of a research idea/mission as judged by qualified peer scientists and agencies, it represents only the input side. The outputs from research funding are measured in terms of scholarship and the number of scientists (i.e., MS and Ph.D. students; postdoctoral fellows) trained.

Scholarly Product/Indicator	Number
Peer-reviewed journal articles	233
Books authored	2
Book chapters	11
Published conference proceedings	192
Technical reports and manuals	31
Patents	5
Editorships of major journals	20
Associate editorships/editorial board memberships	182
Member of federal peer review committees	31
Member of other national/international peer review committees	78
Member of state or regional peer review committees	32
Ad hoc reviews for granting agencies	665

Training the Next Generation of research scientists

Human Capacity Development in the Agricultural, Health, and Environmental Sciences

Human capacity development in the agricultural, health, and environmental sciences is necessary for our state and nation to remain competitive in the global marketplace. An essential element of the CAHNR research mission is the training of master's, doctoral, and postdoctoral scientists for the purpose of meeting this need. The US Department of Labor Bureau of Labor Statistics recently noted that research scientists will continue to be in high demand with doctoral graduates enjoying the greatest opportunities.

Fiscal Year 2020

28 **Ph.D.** degrees awarded

44 **MS** degrees awarded

36 **DPT** (Doctor of Physical Therapy) degrees awarded

Ph.D. Degrees Conferred in 2020

Student	Advisor	Dept	Doctoral Dissertation Title
Courteney Benjamin	Douglas J. Casa	KINS	The Impact of Heat Acclimatization Induction and Intermittent Exercise-Heat Exposures on Physiological Adaptations
Jessica Ann Canter	Steven J. Geary	PVS	Investigating the Role of Neuraminidase Activity in the Co-pathogenesis of *Mycoplasma gallisepticum* and Low Pathogenic Avian Influenza A Virus
Yoon Young Choi	Farhed Shah	ARE	Essays in Economics of Climate Change, Land Use, and Public Health
Kelly Ann Coleman	Stephanie M. Mazerolle	KINS	Secondary School Athletic Trainers: Examining Leadership Development
Mahesh Dahal	Nathan Fiala	ARE	Essays in Applied Microeconomics
Guanlong Fu	Stephen K. Swallow	ARE	Theories and Applications of the Baseflow Supply Capability Credits Trading Mechanism and Economics of Compliance with the National Primary Drinking Water Regulations
Gabrielle Elam Williams Giersch	Douglas J. Casa	KINS	The Impact of Menstrual Cycle Phase and Sex on Outcomes Related to Hydration Interventions
Xi He	Rigoberto Lopez	ARE	Agriculture, Food, and Health: Changes in Industry Structure and Consumer Behavior
Emily Howard	Nancy R. Rodriguez	NUSC	Integrated Role of Intramuscular Inflammation, Dietary Protein, and Testosterone Supplementation in the Regulation of Skeletal Muscle Mass during Muscle Wasting Conditions
Qiaobin Hu	Yangchao Luo	NUSC	Biocompatible Polymeric Nanoparticles with Innovative Structural Design for Oral Delivery of Lipophilic Bioactives
Devi Jaganathan	Kristen Govoni	ANSC	Host-pathogen Interaction In Bovine Mastitis And Effects Of Plant Derived Compounds In Staphylococcus Aureus Infection
Lindsay Marie Jasperse	Paulo H. Verardi	PVS	Development and Testing of Zika Virus Vaccine Candidates: Application of a Novel Platform for Rapid Generation of Recombinant Vaccinia Viruses
Brittany Anne Jasperse	Sylvain Deguise	PVS	The Effects of Deepwater Horizon Oil, Dispersants, and Environmental Stressors on the Health of Two Important Gulf of Mexico Species, Eastern Oysters and Sheepshead Minnows
Jeremy Leeming Jelliffe	Boris E. Bravo-Ureta	ARE	An Economic Analysis of Smallholder Groundnut Production in Selected African Countries
Jacques C Julien	Boris E. Bravo-Ureta	ARE	Essays on Farm Productivity: Econometric Evidence from Malawi, Tanzania and Uganda
Rachel Kay Katch	Douglas J. Casa	KINS	Influence of Physical Characteristics and Chronic Statin Therapy on Thermoregulation and Cardiovascular Responses in Runners
Danielle Kloster	Anita Morzillo	NRE	Human Dimensions of Roadside Forest Management to Reduce Utility Infrastructure Vulnerability
Thomas Krumel	Nathan Fiala	ARE	Three Essays on Welfare and Experimental Economics
Diana Li	Alison Kohan	NUSC	Determining the Role of Intestinal Basolateral Lipid Substrate Transport (BLST) in Modulating Chylomicron Secretion
Melissa Moser Melough	Ock K. Chun	NUSC	Relationship between Dietary Furocoumarins and Melanoma Risk
Courtney Lynn Millar	Christopher N. Blesso	NUSC	The Effect of Plant-, Animal-, and Microbe-derived Bioactive Compounds on Atherosclerosis
Sarah Myers	Stephanie M. Mazerolle	KINS	Identifying Developmentally Effective Experiences and Self-Authorship Among Professional Masters Athletic Training Students
Yuan Niu	Farhed Shah	ARE	The Economics of Climate Change Adaptation and Water Resources: An Application to Dams
Caitlin Marie O'Connell	Paulo H. Verardi	PVS	Replication-Inducible Vaccinia Virus Vectors for Vaccines and Therapeutics with Single or Double Safety Features
Nastassja Rochelle Ortega	Mazhar I. Khan	PVS	The Role of VP1 and VP2 in the Humoral Immunity Against Chicken Parvovirus-Induced Enteric Disease
Gregory Panza	Linda Pescatello	KINS	The Effects of an Acute Exposure to Weight Stigma on Cardiovascular Reactivity among Women with Obesity and High or Normal Blood Pressure
Cayla Rodia	Alison Kohan	NUSC	The Role of Apolipoprotein C-III in Regulatory T cell Metabolism and Impact on Inflammatory Disease
Yasuki Sekiguchi	Douglas J. Casa	KINS	The Practical Application of Heat Acclimatization Induction and Intermittent Exercise-Heat Exposures in Endurance Athletes
David Tongjoo Suh	Charles Towe	ARE	Three Essays on Fisheries Economics
Giulia Tiboldo	Farhed Shah	ARE	Three Essays on Food Policy, Retailer Strategic Behavior, and Consumer Welfare
Taoran Wang	Yangchao Luo	NUSC	Development of Solid Lipid-polymer Hybrid Nanoparticles as Potential Oral Delivery Systems for Lipophilic Bioactive Compounds

ARE: Agricultural and Resource Economics; ANSC: Animal Science; KINS: Kinesiology; NRE: Natural Resources and the Environment; NUSC: Nutritional Sciences; PSLA: Plant Sience and Landscape Architecture; PVS: Pathobiology and Veterinary Science

Doctor of Physical Therapy Degrees Conferred in 2020
Department of Kinesiology

Ethan Aresta	Thomas Galanos	Joseph Marini	Allison NG
Caitlyn Ayotte	Marie Hall	Megan McCollum	Colin Sauter
Jillian Chongruk	Emma Hart	Grace McCormick	Jack Sullivan
Jacob Chwiedz	Sydney Houseworth	Evan Menze	Yarden Tepper
John Deleo	Christina Joerg	Nicholas Metaxas	Kathryn Tirrell
Amy Demers	Sara Jose	Sarina Moghadam	Brittany Toscano
Matthew Edwards	Kaitlin Keeley	Haunz Murdoch	Kevin Tucker
Laura Frechette	Matthew MacDonald	Kaitlyn Murray	Marcus Vesprini
Nicole Furman	Thomas Mango	Kathryn Newton	Jacqueline Wolff

Nutritional scientist studies blackcurrant health benefits and obesity-related disease prevention

By Jason M. Sheldon

YOOJIN LEE

Graduate Student
Department of Nutritional Sciences

Yoojin Lee studied food science and engineering in South Korea. A growing interest in how nutrients affect the body led her to the Department of Nutritional Sciences in the College of Agriculture, Health and Natural Resources, where her research focused on the relationship between obesity-associated diseases and foods that might have protective effects and other positive health benefits.

Obesity, a state caused by an imbalance between energy intake and expenditure, is an established risk factor for non-alcoholic fatty liver disease (NAFLD). NAFLD refers to a range of conditions concerning the accumulation of excess fat in the liver of people who drink little or no alcohol. There is an increasing prevalence of NAFLD. It is estimated to be the most common liver disease in the world and affects 80 to 100 million in the US alone. With the obesity rate of US adults recently found to be 42 percent, the impacts on health are far-reaching.

"NAFLD is an obesity-associated disease and globally affects about 25 percent of adults," says Lee. "There is no single FDA-approved drug to treat the disease. As of now, only lifestyle changes and dietary means are recommended. As a nutritional scientist, I believe part of my work is to identify dietary factors to prevent disease."

One of the foods Lee chose to study was blackcurrant (*Ribes nigrum*), a small berry with a strong, tart flavor and an abundance of antioxidants. Antioxidants have been found to produce anti-inflammatory effects, convincing her that blackcurrant could be a part of suggested dietary changes to prevent obesity or help those with obesity-associated diseases. While blackcurrant's uses are diverse, including jams, juices, and syrups, and it is popular in many parts of the world, it is quite likely many Americans are less familiar with the berry.

The commercial growth of blackcurrant was banned by the United States Department of Agriculture from 1911 to 1966. Blackcurrant was found to be responsible for spreading a fungus (*Cronartium ribicola*). The fungus causes white pine blister rust, a tree-killing disease which affected the country's timber industry. Even after the federal ban ended, many states continued to prohibit cultivating blackcurrant, including Connecticut until 1983. Research into fungicides and varieties of pine with immunity from the disease, in addition to research that found blackcurrant could safely be grown with enough distance from white pines, all led to relaxed restrictions by most states in the early 2000s.

This fascinating history intrigued Lee. She saw a potential opportunity to reintroduce an unfamiliar berry and flavor as a healthy food into American diets.

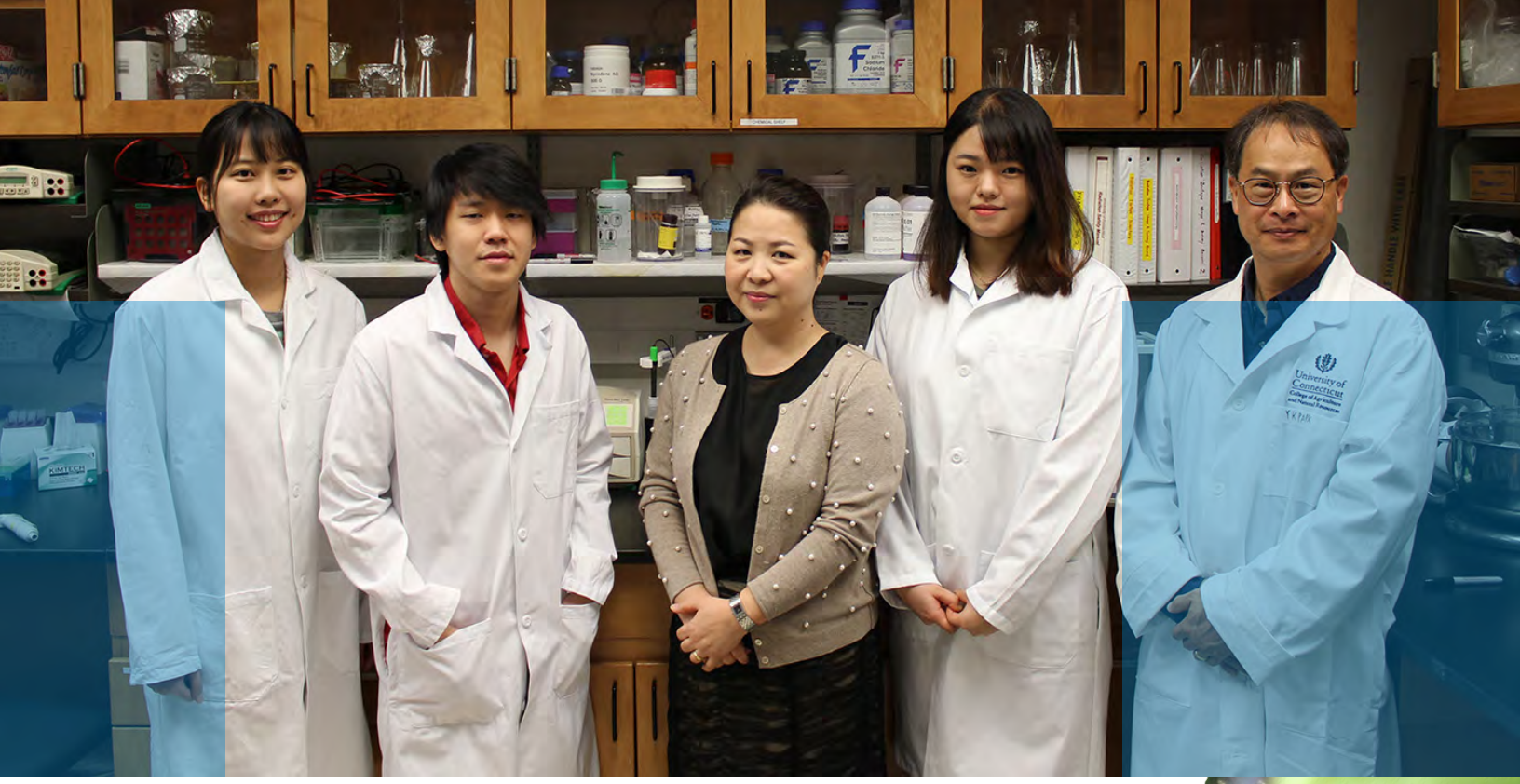
The study examined the effects of blackcurrant consumption on macrophage phenotypes, white blood cells that adapt to different tissue environments. M1-type macrophages are common in inflamed tissue and their presence exacerbates inflammation. Lee compared mice on a lean diet and a high-fat/high-sugar diet with both consuming blackcurrant. While the mice on a lean diet showed no changes in the M1 macrophage when eating blackcurrant, the mice on the obesogenic diet were found to have reduced expression of pro-inflammatory genes. The study even further suggested that while blackcurrant might not alter macrophage phenotypes, it may inhibit many factors of obesity-associated inflammation beyond macrophages.

"Blackcurrant is rich in polyphenols, a common type of antioxidant found in plants. It led me to study more about other types of polyphenols and understand their roles in NAFLD," says Lee.

Polyphenols are common in plant-based foods and drinks. The role of polyphenols has been extensively studied in preventing various diseases, so Lee began to learn more about them to build a concept of how they may offer protective qualities in NAFLD. Her research and growing expertise in polyphenols led to her authoring a chapter in a book on dietary interventions and liver disease.

"It was a great opportunity to learn about different types of polyphenols. I read the research and reviewed the literature and summarized a concept of how obesity is affected by polyphenols and how they protect against disease. I started writing it early in my Ph.D. program. It really helped me with my writing and learning to keep revising and to work closely with my advisor, Professor Ji-Young Lee. The experience helped me to think about ways to look at the same data from different angles."

One of those new directions was to examine the role of histone deacetylase 4 (HDAC4), an enzyme that removes acetyl groups from histone proteins, altering DNA accessibility for gene expression. Obesity causes many changes in gene expression, the process that instructs DNA to assemble



a product, most often a protein, in our bodies. Lee was curious how HDAC4 contributed to the development of obesity-associated diseases.

"The experiment was about epigenetic regulation, gene expression that is modulated, while the DNA remains unchanged. If we know how HDAC4 behaves in obesity, then we can learn more about how it contributes to the development of obesity-associated diseases," says Lee.

Lee is continuing to study the mechanisms of disease development as a postdoctoral research fellow at Harvard Medical School and Massachusetts General Hospital.

"During my time at UConn, I was finding and providing scientific evidence to the nutritional community. That work is directly connected to the public through the sharing of information and knowledge to improve health. I was happy to find and provide scientific evidence for why blackcurrant could be used as a dietary means to prevent disease. I'm carrying on the research questions from UConn and searching for ways to reduce the incidence of NAFLD."

Research described in this article was funded by USDA AFRI #2015-05512, USDA Hatch #CONS00972, and USDA Multi-State Hatch #CONS00916.

Research Features

The research enterprise of any entity is only as good as its scientists.

Our focus has always been on hiring talented researchers to help advance the College's research mission and solve real-world problems. The following articles provide brief summaries of the research activities of selected faculty and staff.

Landscape architect studies health and community benefits of outdoor recreational spaces

By Kim Colavito Markesich

SOHYUN
PARK

Assistant Professor
Department of Plant Science and Landscape Architecture

Sohyun Park is involved in a multi-state project to evaluate the health and community benefits of outdoor recreational spaces. Park is an assistant professor of landscape architecture in the College of Agriculture, Health and Natural Resources' Department of Plant Science and Landscape Architecture.

The project is a collaboration with community partners such as the Connecticut Trail Census Program, with a team that includes Sungmin Lee of Texas A&M University's Department of Landscape Architecture and Urban Planning; Anita Morzillo, associate professor in CAHNR's Department of Natural Resources and the Environment; Laura Brown, associate extension educator in UConn Extension; Caitlin Lombardi, assistant professor in UConn's Department of Human Development and Family Sciences; and Kimberly Bradley, program coordinator for the Connecticut Trail Census.

"We are reviewing the relationship between the natural recreation activities in parks and trails with family and community resilience," says Park. "We plan to employ quantitative methods, including spatial pattern analysis and multimodal survey, to inform our understanding of the role of outdoor recreational amenities."

Aside from human health risks from physical inactivity such as the increase in obesity among children and adults, outdoor activity improves mental health and a sense of community.

The project focuses on two areas: the Naugatuck River Greenway, which encompasses eleven communities along forty-four miles from Torrington to Derby, and the Farmington Canal Heritage Trail, which covers fifty-eight miles between New Haven and the Massachusetts border.

"There are many factors that hinder outdoor physical activities, but poorly built ecospaces combined with social barriers can provide little motivation for the enjoyment of outdoor recreational services," Park explains. "When you have high-quality trails, open spaces, and good parks within walking distance, they have the capacity to make family and communities healthier. People feel happy and engaged with the community."

The team will evaluate trail areas, then survey residents living within a half-mile radius of the trailheads, as well as those frequenting trail sites. They will also engage with community groups and trail management organizations to develop educational seminars and workshops to raise awareness and improve community engagement. Additionally, the project will serve as a training ground for two graduate students and multiple undergraduate students.

"Connecticut residents are fortunate that we have numerous trails and state parks available for recreation, but many people are not aware of these outdoor spaces," Park notes. "The project may shed light on this factor. For whatever reason, people do not always take advantage of these recreational areas."

Toward the end of the three-year project, the team will make recommendations to communities surrounding the trails. For instance, there may be urban areas that need to improve connectivity from local open space to the trails. "There are scattered efforts around the state to create and improve trails and open spaces," says Park. "We have these large green corridors, but at the neighborhood level, these spaces are piecemeal in their efforts. I'd like to promote these types of spaces in every community. It's important for land-use officials to understand the benefits to having high-quality recreational spaces. Having safe, enjoyable trails affects the economy, health, and well-being of a community."

She continues, "I hope the outcome of this project will create changes in terms of family health. I'd like to also promote different types of trails that include a diversity of landscape, color, flora, and fauna."

In a different project, Park recently concluded a collaborative study with Texas Tech University examining the relationship between urban green spaces and fine particulate matter. Park says that connected green spaces are important in combatting increasing particulate matter in cities where population is growing while the negative effects of climate change are increasing.

In addition, Park recently published a paper in the *Journal of Urban Design* entitled "Rethinking Design Studios as an Integrative Multi-Layered Collaborative Environment," which highlights peer-to-peer learning, student collaboration, and other strategies to improve student learning.

The greenway project is supported by USDA Hatch Project #CONS01040.

Physical therapist develops assistive technologies for developmentally disabled young adults

By Kim Colavito Markesich

Sudha SRINIVASAN

Assistant Professor
Department of Kinesiology

Trained as a pediatric physical therapist, Sudha Srinivasan focuses on assisting children and adults with developmental disabilities. She joined the Department of Kinesiology as assistant professor in January 2019.

While she was a Ph.D. student at UConn, Srinivasan's research centered on two main projects—early detection of autism spectrum disorder (ASD) during the first two years of life and development of engaging multi-system interventions for school age children with ASD. Her dissertation project, funded through the National Institutes of Health, compared the effects of short-term (eight weeks) music-based interventions, robotic interventions, and standard-of-care interventions in four-to-twelve-year-old children with ASD.

"The idea was that children with ASD have motor difficulties that increase their social interaction struggles," Srinivasan says. "The way you navigate your physical and social environment depends greatly on your motor skills. If you have early motor impairments, it is going to affect the way you can play with your peers and learn from your caregivers through imitation, as well as your ability to communicate with them verbally or through nonverbal gestures. We believe that creative play and movement-based games serve as a great way to engage the child in meaningful and enjoyable contexts that can ultimately target the very skills impaired in children with ASD."

Srinivasan began her postdoctoral work at the University of Delaware (UD), assessing the needs of young adults with autism, by working with the Center for Disabilities Studies at UD. She then pursued a second postdoc at the Indian Institute of Technology Bombay in Mumbai, India, where she was involved primarily in a three-year UNICEF-funded multi-disciplinary project working with a group of engineers, graphic designers, and animators to develop an open-source augmentative and alternative communication (AAC) tool, called Jellow Communicator, for children with communication difficulties.

"This is a user-friendly tool available in multiple formats, including as an app, designed for nonverbal and minimally verbal children with disabilities, including ASD and cerebral palsy," she explains. "It's a pictorial tool that makes sentences for the child when they click on a couple of icons in the app. For instance, if the child clicks on the banana icon and the want icon, the app will automatically speak a sentence aloud, 'I want a banana.'" Jellow Communicator won the 2018 National Award for the best applied research/innovation or product aimed at improving the life of persons with disabilities, granted by India's Ministry of Social Justice and Empowerment.

Srinivasan shares her passion for this work with her students, encouraging them to accomplish their career goals while making a difference in the lives of their clients.

"It's so rewarding to see your efforts pay off when a child succeeds. It's an amazing feeling. I want to inspire my students to feel that. One quality I would like to encourage in my students is perseverance. Particularly while working with neurological populations, you need great patience and cannot give up."

Srinivasan's current work at UConn is funded through UConn's InCHIP and is a continuation of the work she started at the University of Delaware, expanding her research to young adults with disabilities that include ASD, cerebral palsy, and Down syndrome.

"We are trying to understand the physical activity and fitness levels of this population and determine how they relate to their ability to meaningfully participate in the community," Srinivasan says. "We hope to eventually secure a larger grant to expand this research. There is a lot of work done with children with developmental disabilities, but once they reach adulthood, it is almost as if they fall off a cliff in terms of services received and research on interventions and outcomes. Young adults with developmental disabilities are an underserved and understudied population."

"I want to help these individuals improve their functional levels and their participation in the community. We would like to develop physical activity programs to help improve their physical health, well-being, and physical fitness. I want to ensure that my work is truly translational. Therefore, I will be involving caregivers, teachers, and therapists of young adults with disabilities in this project to get their perspectives on health and well-being of their children/students so that the work goes beyond the study into the community and becomes self-sustaining."

Srinivasan works with community programs such as S.T.A.A.R., a collaboration between E.O. Smith High School and UConn for young students with disabilities. She says, "I will draw from the several years of expertise of teachers and therapists in these organizations and try to integrate that into my research in order to make a meaningful change in the lives of these individuals."

In a different multi-site collaborative project with the University of Delaware that is an extension of her doctoral work, Srinivasan is conducting a randomized controlled trial to assess the effects of two types of creative movement-based intervention compared to a standard-of-care table-top

intervention on motor, social communication, and behavioral skills of school-age children with ASD. For this work, Srinivasan is funded through UConn's Research Excellence Program.

The project started as a face-to-face intervention program where Srinivasan and her students provided training activities in children's homes twice a week for eight weeks. However, with the onset of COVID-19, the team shifted to delivering the interventions online using a telehealth model. Says Srinivasan, "Parents and caregivers are desperately looking for ways to provide meaningful learning experiences to their children with special needs. We found that with school closures, parents frequently reported that their kids were not receiving anywhere close to the amount of specialized support services they would receive when physically at school. Parents really wanted ways they could engage their child throughout the day."

The team took the opportunity to adapt the program for virtual delivery. The intervention is still provided twice a week, with Srinivasan and her students using a secure video-conferencing platform to reach the child and parent. Says Srinivasan, "It actually turned out to be a pretty great experience for the families we have seen so far! It definitely required a lot of commitment from the parents to dedicate the required amount of time twice a week for eight weeks. But the experience allowed them to bond in newer ways with their child. In fact, by being part of the intervention delivery process and by engaging in activities collectively with their child, caregivers learn ways to engage their child more effectively and become well equipped to continue activities with their child even after the intervention is completed."

Srinivasan will continue this work with her collaborators and students over the next year. She believes the telehealth-based approach has offered the opportunity to expand her research beyond the local community to families with children with ASD across the country.

Srinivasan earned her BS and MS degrees in physiotherapy from the Maharashtra University of Health Sciences in Nasik, India. Following her postdoctoral work, she was appointed as assistant professor at UConn and moved to Storrs with her husband, a civil engineer. They met before both enrolled in graduate school at UConn.

"I am so happy to be back," says Srinivasan. "UConn is my alma mater, and I am very comfortable here. I am working with my mentors, which is a great feeling. The department and University are very supportive of research, and there are so many accomplished people at the College, it inspires me to do better every single day."

The dissertation research was funded by NIH grants #5R21MH089441-02 and #4R33MH089441-03.

Microbiologist develops improved technology for poultry food safety

By Kim Colavito Markesich

Abhi UPADHYAY

Assistant Professor
Department of Animal Science

One Friday evening in the spring of 2019, Abhi Upadhyay, assistant professor of food microbiology and safety in the Department of Animal Science, found himself watching a video showing microbubbles for pet care and grooming. He started thinking about using this technology for food safety and spent the weekend researching its potential, current state of the field, and appropriate grant opportunities.

In spring of 2020, Upadhyay received a $148,874 grant from Northeast Sustainable Agriculture Research and Education to conduct a three-year collaborative study on the use of ultra-fine ozone bubbles as a novel antimicrobial wash against food pathogens on eggs and fresh produce. His team includes Assistant Extension Educator Shuresh Ghimire and Assistant Extension Educator Indu Upadhyaya, both in UConn Extension in the College of Agriculture, Health and Natural Resources.

Ultra-fine bubbles are small, spherical, gas-filled cavities within liquids with a diameter of less than 100 nanometers. They have very peculiar characteristics (for example, high surface charge, high gas pressure, taut inflexible surfaces with high tension, increased surface area, prolonged survival in liquid) that can be used in many fields such as wastewater treatment, soil remediation, and aquaculture. Many of these applications depend on the choice of gas for the bubbles. Ozone is an antimicrobial gas widely used for sterilization, deodorization, and organic matter decomposition. It has a short half-life and readily decomposes to oxygen without leaving any harmful residues, which makes it ideal for food washing applications. Upadhyay is testing the efficacy of ultra-fine ozone (UFO) bubbles for food washing, a process that involves dipping produce in water containing UFO bubbles for five to ten minutes. The ozone poses no threat to either the applicator or end user as the ozone in water dissipates in about twenty minutes.

"Our aim is to increase the antimicrobial efficacy of ozone by converting it into these ultra-fine bubbles that can stay in the solution for an extended duration to kill pathogens," says Upadhyay. "Because of the small size of the bubbles, which are not visible to the naked eye but observable through diffraction technologies, we are able to have a higher concentration of ozone in the water."

Upadhyay will be testing the most dangerous pathogens that lead to food poisoning, including *Salmonella*, *Escherichia coli* 0157 and *Listeria monocytogenes*, on eggs as well as spinach, lettuce, cucumber, and cantaloupes. The team will also be evaluating the effect of treatment on color, quality, and shelf life of products. In addition to laboratory research, the project includes field demonstrations and outreach to both extension personnel and vegetable growers and egg producers in the Northeast.

In a larger collaborative project studying ultra-fine bubbles, Upadhyay is working with Ghimire; Michael Darre, professor emeritus of animal science; Nathan Fiala, associate professor agricultural and resource economics; Ann Donoghue of the USDA Agricultural Research Service; Komala Arsi of the University of Arkansas; Anne Fanatico of Appalachian State University; and Ondieki Gekara of CalPoly, Pomona, funded by a four-year, $500,000 grant from USDA.

"We are aiming to control *Salmonella* and *Campylobacter*, which are the two major foodborne pathogens transmitted through chicken meat," Upadhyay says. "These two pathogens infect more than two million people with gastrointestinal disease every year."

As a postdoctoral fellow at the University of Arkansas, Upadhyay worked with veterans to assist them in starting small and medium-sized poultry farms. When he came to CANHR, he realized that many veterans in the Northeast were seeking similar business opportunities. Although the work initially focused on farmers who are military veterans, after a review, the team decided to open the research and training opportunity to all small and medium-sized poultry farms where the farmers were interested in the technology.

"One of the challenges they faced was finding a way to produce chicken meat that was microbiologically safe," says Upadhyay. Ultra-fine bubble technology could provide an affordable way for small farmers to produce safer chicken as it is portable, so several farmers could share one equipment system.

In addition to his work with ultra-fine bubble technology, Upadhyay is involved in the recently announced $10 million research and outreach project headed by Kumar Venkitanarayanan, professor of animal science and associate dean for CAHNR's research and graduate studies. The project is designed to improve the sustainability and food safety of the production of antibiotic-restricted broiler chickens. Upadhyay will be investigating the potential of plant-based nanoemulsions for reducing *Salmonella* colonization in broiler chickens. These essential oils are derivatives of common herbs such as cinnamon and cloves.

"We need to find antibiotic substitutes that can provide health benefits to birds while reducing the pathogen load in the gut," explains Updadhyay. "We need to do this to create safer chicken that will contribute to the sustainability of the poultry industry in the years to come."

"I am looking forward to this research," Upadhyay says. "I'm fortunate to be involved in these studies that address both the pre-harvest (animal health) and post-harvest (chicken, fresh produce, eggs) sides of the equation to enhance food safety."

The research related to ultra-fine bubble technology is funded by USDA project #CONS2019-05760 and NE-SARE project #LNE20-412R. The nanoemulsion research is funded by USDA NIFA project #CONS2019-08297.

Epidemiologist leverages social media to support healthy lifestyles for new moms

By Kim Colavito Markesich and Molly Waring

Molly
WARING

Associate Professor
Department of Allied Health Sciences

Associate Professor of Allied Health Sciences (AHS) Molly Waring focuses her research on leveraging social media health promotion among childbearing women, particularly for weight management. Says Waring, "My early research focused on patterns of weight gain during middle age and cardiovascular disease in later life, which got me thinking about preventing weight gain later in life. My research led me back to prenatal exposures and maternal health during pregnancy, and as I learned more about the childbearing years, the more this exciting phase of life resonated with me. Pregnant and postpartum women are often motivated to make healthy lifestyle changes but face multiple demands on their time and energy that can get in the way of making changes. It's a challenging time to intervene for health promotion, but it's a rewarding time."

Waring and her team have developed a postpartum weight loss intervention based on the Diabetes Prevention Program Lifestyle Intervention, and in a three-year project funded through the NIH National Heart, Lung, and Blood Institute are comparing two versions of the weight loss intervention—one version delivered via in-person group sessions and the other via a private Facebook group.

Many women want to lose weight after childbirth, but time constraints and other responsibilities often make it difficult to attend sessions. Waring is interested in providing remote evidence-based lifestyle interventions that new mothers can participate in from home.

"We tailor the intervention to suit new mothers' needs by creating a healthier version of their normal diet," Waring says. "We're helping them make changes that they can maintain long term."

The current study involving sixty-two women will determine the feasibility of a larger trial to test whether the Facebook version of the program leads to as much weight loss as the version in which women meet in person each week. Each wave of the study includes an in-person group and a remote group. The in-person group meets for a weekly ninety-minute session with a counselor, discussing diet, nutrition, physical activity, and behavioral strategies to overcome challenges. The other group interacts via a private Facebook group, open only to the counselor and participants, and covers the same topics. The counselor posts twice a day, with the women responding with group discussions.

Waring and her team are completing data collection on this project at the time of this writing, but Waring reports that women in both groups enjoyed the supportive environment, and six-month weight losses seem promising for both groups.

In addition to Waring, the interdisciplinary research team includes Sherry Pagoto, professor in AHS and director of UConn's Center for mHealth & Social Media; Tiffany Moore Simas, chair of the Department of Obstetrics and Gynecology at the UMass Medical School; and Justin Wang, assistant professor at the Community College of Rhode Island.

Waring is also working with Pagoto and Moore Simas on a second project, developing an Instagram-delivered gestational weight gain intervention. Says Waring, "I'm excited to contribute to or lead research that helps us tackle some of these health problems in new and innovative ways."

The statistics on excessive gestational weight gain show mothers with higher rates of gestational diabetes, high blood pressure during pregnancy, and increased risk for difficult deliveries including higher incidence of cesarean delivery. Additionally, some studies have shown that women who gain more during pregnancy are more likely to have a child that is overweight by age three.

"There's been research on prenatal programing and child health," Waring notes. "It's exciting to see that there is more research across the translational spectrum in this area."

Several years ago, Waring led a project to develop a program addressing gestational weight gain that was offered via an interactive website. However, the website was difficult to navigate. Since then, Waring has been investigating different platforms that might be more user friendly.

"We found that many moms with new babies love sharing photos, so we thought Instagram might serve as an attractive platform," Waring explains.

The project has begun with the examination of some 1,600 public Instagram posts related to diet, physical activity, or weight gain during pregnancy, to explore how women share their pregnancies experiences on this social media platform. Next, the team is conducting a survey of 200 pregnant women, sharing a description of the intervention and assessing interest and concerns about the proposed program. "We want get women's feedback early in development—a process that's called user-centered design," Waring says. "Next, we will ask a small group of pregnant women to engage with our posts and tell us what they think of the program."

Finally, with a three-year grant from USDA, Waring and her team are investigating how mothers evaluate information about child nutrition on social media. The team working on this project includes Waring, Pagoto, and Professor Valerie Duffy and Assistant Professor Ran Xu, both in AHS.

In the first phase of the study, Waring and her team surveyed both clinicians who work with children and researchers studying child nutrition, to determine the most common online misconceptions concerning childhood nutrition. An example might be deciding a safe age to introduce certain foods to babies or toddlers. They then surveyed mothers of children from newborn to age twelve, asking which social media platforms and sites they frequent and where else they might find information on childhood nutrition, including their pediatrician, family, friends, and magazines, and how credible they find these sources. Finally, Waring and her team will examine public tweets on a popular misconception about child nutrition and examine to how misinformation spreads across social media.

"We're focused on how we can help people enhance their life using social media productively to support healthy lifestyles," says Waring. "We want to help people find good health information and weed out information that isn't helpful or is even harmful. Improving our understanding of how evidence-based information and misinformation spread on social media has implications beyond child nutrition."

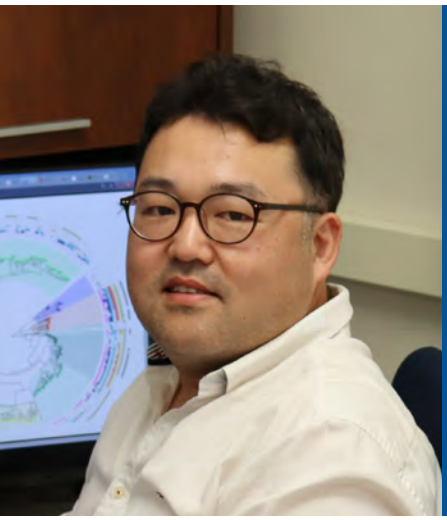
Both graduate and undergraduate students are involved in Waring's research projects. Waring mentors graduate students in the MS and Ph.D. programs in health promotion and is accepting students for fall 2021. Waring also supervises undergraduate students receiving academic credit in AHS, mentors students completing their Honors theses or conducting independent research supported by grants by the Office of Undergraduate Research such as the IDEA grant program, and employs students through the Office of Undergraduate Research Work-Study Research Assistant Program. Waring says, "I really enjoy having students actively engaged in our projects. It's great experiential learning for students to be involved in grant-funded research—students learn about the scientific process, gain skills, and feel empowered to be contributing to research with the intention of making a positive impact on individual and population health."

When asked how the COVD-19 pandemic has affected her research, Waring replies, "We're fortunate in that many of our research activities can be done remotely. We've had to adjust some of our data collection procedures—for example, holding a group discussion (focus group) via WebEx versus in-person—but our team has adapted very well to working together without meeting in person. The pandemic has reinforced my commitment to developing effective behavioral interventions that can be delivered remotely, such as via social media platforms, and understanding how online platforms and activities can contribute to health through the spread of information."

The post-partum weight loss study is funded by NIH/NHLBI grant #R34HL136979. The gestational weight gain study is funded by InCHIP Faculty/Researcher Seed Grant #1020701,project number CONS01015).

Molecular epidemiologist tracks virus with genome sequencing and comparative phylogenetic analysis

By Kim Colavito Markesich



Dong-Hun LEE

Assistant Professor
Department of Pathobiology and Veterinary Science

Avian influenza (AI) affects both the poultry industry and public health, as it can cross species and infect livestock, pets, marine mammals, and humans. Dong-Hun Lee, assistant professor in the College of Agriculture, Health and Natural Resources' Department of Pathobiology and Veterinary Science, has studied this virus for the past thirteen years, using genome sequencing and comparative phylogenetic analysis to examine evolutionary changes that highlight the role of wild birds in the spread of these viruses.

"Migratory birds play important roles in the geographic spread of avian influenza virus," says Lee. "Migratory wild birds, particularly those belonging to the orders Anseriformes (such as ducks, geese, and swans) have long been recognized as natural hosts and reservoirs for avian influenza viruses." Lee says that as long-distance seasonal migrants, these birds serve as perfects hosts for AI. The viruses have been isolated in more than one hundred bird species, with global distribution of AI in free-living waterfowl populations.

He continues, "The birds encounter migratory birds from other flyways and aggregate in large numbers at stopover sites during migration, which can facilitate infections as the virus can be more rapidly transmitted between individuals that occur in high density. This explains why this virus disperses over long distances so fast."

The H5Nx highly pathogenic avian influenza (HPAI) virus emerged in 1996 in Guangdong, China, and has since caused outbreaks in poultry, infections in wild birds, and often fatal clinical cases in humans in more than eighty countries. HPAI emerged in North America in 2014, affecting more than fifty million poultry birds in the United States before it was eradicated in June 2015, at a cost of $850 million to the US government, and an estimated $700 million to $1 billion for poultry industries.

Lee explains, "To better understand the emergence and transmission history of this outbreak, we investigated the underlying ecologic and epidemiologic processes associated with this viral spread by performing a comparative genomic study using virus genome sequences and data from outbreak investigations."

Lee says that the data showed that the HPAI virus was introduced into North America through Alaska via intercontinental movement of migratory waterfowl and circulated in wild birds along the Pacific flyway before several spillover events transmitted the virus to poultry farms. Subsequently, multiple virus introductions into Midwestern states occurred during the spring of 2015. Once established in poultry farms in the Midwest, the virus rapidly spread between turkey and chicken farms in neighboring states. This was the largest and most expensive avian influenza outbreak in the United States, with an economic impact of $3.3 billion.

To further understand and trace these global viral transmissions, Lee is involved in several international collaborations with universities and government researchers in Bangladesh, Cambodia, Canada, Dominican Republic, Iran, Jordan, Korea, Laos, Mexico, Mongolia, Pakistan, Russia, Taiwan, the United Kingdom, and Tunisia. These studies are supported through the USDA, UConn, and the Konkuk University Industrial Corporation Foundation of South Korea.

In his research, Lee uses interdisciplinary combinations of genome sequencing and computational biology tools to rapidly identify unknown or unexpected pathogens, allowing his team to identify the origins of an outbreak and track patterns of disease transmission.

"Recent advances in molecular biology and bioinformatics allow complete genome sequencing of pathogens that can provide accurate genetic information, leading to a better understanding of the epidemiological landscape of infectious diseases, transforming how laboratories diagnose and further characterize the pathogens," Lee says. "Much of this information would either remain unknown or take a very long time to reveal using traditional microbiology and epidemiology."

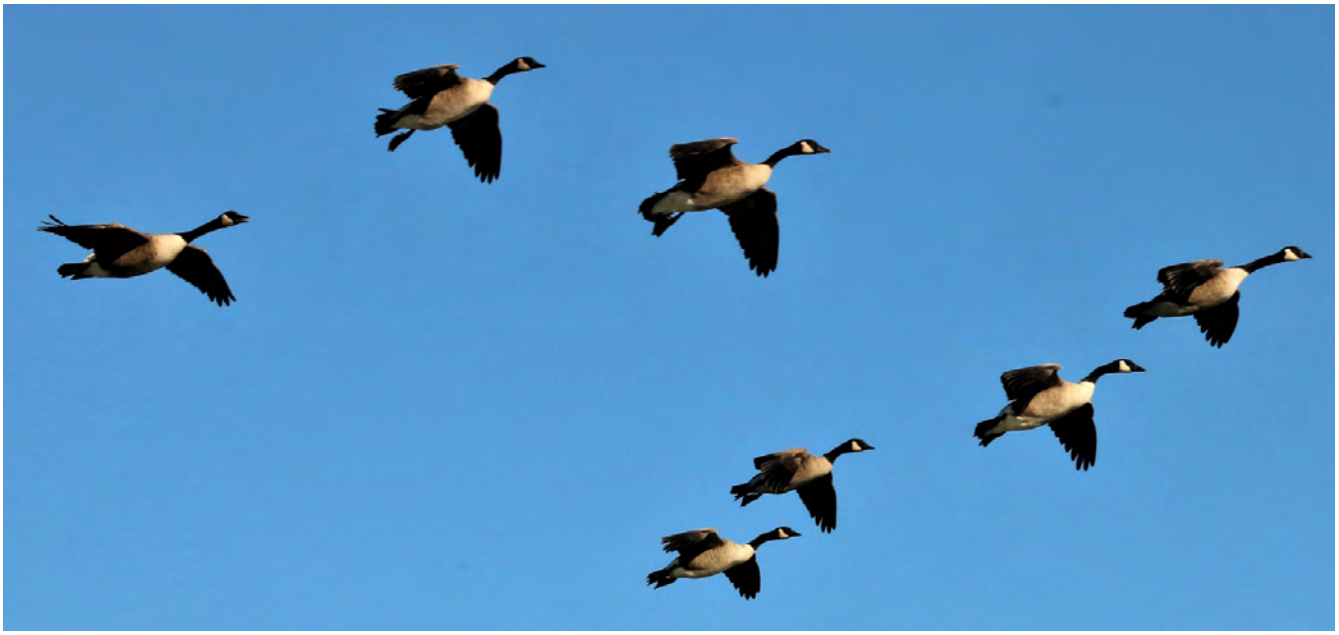
In a new project, Lee is working on developing rapid, low-cost, automated whole-genome sequencing for emerging pathogens. This technique would provide information about similar viruses, patterns of spread and adaptation to new hosts, including animal to human spread, and provide strategies for diagnosis, prevention, and control of diseases.

He says that high-throughput genome sequencing is driving dramatic progress in many fields of infectious disease research. Although genome sequencing can be used to answer a multitude of questions on emerging infectious diseases, Lee says that the complexity of workflows and interpretation of results and the high costs of instrumentation for DNA library preparation and sequencing of whole genomes and of the computational power required for data processing, transfer, storage, and analysis have been barriers to building an affordable sequencing environment.

"For practical use in clinical or diagnostic laboratories," says Lee, "my lab is working on an automated pathogen sequencing pipeline using a bench-top liquid handler robot, small-scale genome sequencing platforms, and a laptop computer." The goal is to develop an easier-to-use, less expensive way for smaller laboratories to produce accurate and complete genome sequences of emerging infectious diseases in a timely manner. The process would provide pathogen identification, virulence information, drug resistance profiling, and epidemiological data.

In addition to his work on avian influenza viruses, Lee has begun collaborative research with the Connecticut Veterinary Medical Diagnostic Laboratory on local infectious diseases in wildlife and livestock, including rabies, Lyme disease, and *Salmonella*.

The AI studies described in this articles have been supported by USDA US Government Interagency Agreement #60-6040-6-005 and the Konkuk University Industrial Corporation Foundation, South Korea, grant #NRF-2018M3A9H4056535. The automated genome sequencing study has been supported by UConn Research Excellence Program and the US Poultry & Egg Association Research Grant Program project #F088.



Remote sensing expert studies relationship between land change and climate change

By Kim Colavito Markesich

Zhe
ZHU

Assistant Professor
Department of Natural Resources
and the Environment

Zhe Zhu, assistant professor of remote sensing in the Department of Natural Resources and the Environment (NRE), conducts research to track land changes in the worldwide landscape. His global environmental remote sensing (GERS) laboratory focuses on these issues and how this data relates to climate change.

"The earth is a closed system, and we know the increase in CO_2 is creating an imbalance," Zhu says. "This is like a fish tank. We know human behavior affects the health of the fish in the tank. The earth is the same, and the greater the imbalance, the more danger."

"We are seeing more extremes in the climate. We know the CO_2 levels are increasing at an alarming rate, but I also notice some positive changes and feedback from current research, such as the increase in vegetation and its ability to trap CO_2 in the ocean. While nature has ways to reduce the effects from these imbalances, human impact is currently producing a greater negative impact."

Zhu has recently reached an agreement with PCI Geomatics to create a Center of Excellence between PCI and his lab, in hopes of further improving remote sensing capability for detecting landscape change. Students will have access to state-of-the-art tools as well as a connection to industry. Says Zhu, "We want to be the hub of remote sensing and geospatial data. This is a great opportunity to use science and technology to create useful products."

In another recent development, Zhu has been selected to be part of a new $14 million grant with IARPA, of which his lab will receive $720,925. His project is part of the Space-based Machine Automated Recognition Technique (SMART) program and is titled "WATCH: Wide Area Terrestrial Change Hypercube." Zhu has developed a new time-series-based reflectance adjustment approach for documenting human activity and land changes, in addition to continuous monitoring of land disturbances.

As a member of the US Geological Survey 2018-2023 Landsat Science Team, Zhu is working on a four-year, $870,000 grant to create near real-time monitoring and characterization of land change. In other USGS funded projects, Zhu is working on a $350,000 five-year grant to improve land cover classification and land change detection for the LCMAP, and on a $198,000 three-year grant to detect and characterize coastal tidal wetland change. He has just finished the provisional version of the coastal tidal wetland change map for the entire New England region, which is publicly available.

Zhu is also working on two forest-centered grants. One, funded by Eversource, is designed to assess forest risk to infrastructure. For the other, through the Department of Energy and Environmental Protection, Zhu is working with Assistant Professor in Residence Chadwick Rittenhouse to characterize understory shrub habitat in Connecticut.

"What I am trying to do is make this data management relevant to our environment and resources," Zhu says. "Any land change is on my target, including ice cap shrinkage, water-land dynamics, urbanization, forest change, fire, and disasters such as earthquakes and floods. I want to explore and quantify their frequency, severity, patterns, and changes."

He is working to create a near real-time (i.e., updated every few days) land change website of the contiguous United States and hopes to have live data by the beginning of next year.

Zhu has also received a two-year grant from NASA to study the impact of human nighttime activities based on the nighttime light images from NASA's Black Marble products. Some of his past research includes better classification of urban areas; the development of algorithms for automated cloud, cloud shadow, and snow detection in Landsat images; and algorithms for continuous monitoring of forest disturbances and land cover change.

"So far, we are very close to identifying human activity change over the period of time from 2012 to 2020 and should have preliminary evidence by the end of the year," Zhu says. Since the start of the pandemic, Zhu has noticed a change in activity from downtown areas to suburban areas, as many people are working from home.

"We are hoping to create a nighttime activity map that will provide information on human activity change. This information will help identify disaster areas, as well as areas of concern for excess CO_2 emission. The data will help in the development of environmental policy, or energy use guidelines for creating grids.

As a teacher, Zhu brings cutting-edge technology to his students. "I always show my research results in my class," he says. "Technology is changing so rapidly, bringing the newest, exciting technology is a good

way to attract their attention. I also encourage them to develop their own ideas with the possibility of publishing their results." Recently, NRE established a new online graduate certificate in remote sensing and geospatial data analytics, which is the first in Connecticut and one of just a handful of programs available nationwide specifically tailored to remote sensing technologies and data analytics, and Zhu is one of the instructors.

"We will teach remote sensing at the beginner's level all the way to very quantitative and advanced level such as satellite orbit calculation, bidirectional reflectance distribution function, machine learning, deep learning, image segmentation, and time series analysis," Zhu explains.

In addition to his research and teaching responsibilities, Zhu is a member of the EROS CalVal Center of Excellence Science Interface Panel and associate editor of *Remote Sensing of Environment* and *Science of Remote Sensing*. He is on the editorial boards of *PeerJ* and *Remote Sensing*.

Zhu's primary goal at UConn is to connect students and researchers with remote sensing technology. "One of the reasons I was attracted to UConn is the exciting environmental research being done in our department," Zhu says. "I see myself as a bridge at UConn to connect people to remote sensing technology to answer some of the science problems we need to solve. These problems may be global as in climate change, or they could be regional, such as the impact of bears in Connecticut."

"My ultimate goal is to try to determine the human impact on the climate and the future consequences of these changes, so we can determine the most important steps to take and the critical time frame for action. We need to protect the future."

The research related to Black Marble data is funded by NASA project #80NSSC19M0093. The research related to USGS-NASA Landsat Science Team on near real-time monitoring of land disturbance is funded by USGS project #140G0119C0008. The research related to coastal tidal wetland is funded by USGS project #G19AC00354. The research related to improve land cover classification and change detection for LCMAP is funded by USGS project #G19AC00365. The research related to habitat mapping is funded by DEEP project #19DEP20044AA.

Researcher studying ways to decrease hypertension in Black adults through dietary program

By Jason M. Sheldon

Loneke
BLACKMAN
CARR

Assistant Professor
Department of Nutritional Sciences

The COVID-19 pandemic has further exposed and exacerbated a number of racial inequalities in America, one of the most prominent being health disparities. According to the Centers for Disease Control and Prevention, Black people are twice as likely to die from COVID-19 than white or non-Hispanic persons. The reasons for these devastating losses extend far beyond an increased exposure to the virus from occupational risks, including a lack of access to quality health care and lower socioeconomic status that have long had adverse health impacts on Black communities.

One of the pervasive health problems facing Black adults is the prevalence of high blood pressure (hypertension), a leading contributor to cardiovascular disease. It is estimated that 55 percent of Black adults suffer from hypertension, more than any other racial or ethnic group. Assistant Professor Loneke Blackman Carr of the Department of Nutritional Sciences in the College of Agriculture, Health and Natural Resources (CAHNR) is looking for ways to improve the health of Black adults with hypertension by increasing participation in a dietary program shown to lower blood pressure. Her work is part of a new grant-funded collaboration with the Duke Global Digital Health Science Center at Duke University.

Blackman Carr is working with Associate Professor Dori Steinberg at the Duke School of Nursing to recruit Black adults to a Dietary Approaches to Stop Hypertension (DASH) study. DASH is an evidence-based strategy that promotes a sodium-reduced diet emphasizing fruits and vegetables, whole grains, lean protein, and low-fat dairy while limiting overall total fat intake. DASH has proven positive health outcomes, greatly reducing blood pressure among Black adults, particularly compared to whites. Their research is focusing on improving the representation of Black adults in health research by studying the factors that influence Black subjects' participation and success in dietary programs.

"We know the dietary changes that are tried and true, regardless of race and ethnicity, to improve blood pressure and overall health," says Blackman Carr. "The work we're doing will help us uncover what Black individuals specifically need to know or need to have to engage in research to improve their diet."

"But there is a long intergenerational mistrust of research and medical organizations. This has made recruiting Black individuals for research studies a challenge."

Studies have shown that Black individuals often decline to participate in clinical research, based on historical patterns of abuse at the hands of academic and medical professionals and researchers. While the infamous Tuskegee Syphilis Study, in which sharecroppers in Alabama were offered free medical treatment and instead infected with syphilis by researchers, who never informed nor treated the men for the disease, is one of the more prominent reasons for this historical mistrust, there are other recent incidents. In the 1990s, an American university conducted a study seeking to connect aggressive behavior to genetics. Researchers recruited only young Black men and medically mistreated them.

In addition to this troubled history, which extends further back in time, there are current issues of racial disparities and systemic racism. Black adults often report negative interactions with physicians and voice concerns that research will be used to disparage their ethnic group. This has created many obstacles to participation in health research that Blackman Carr hopes to understand how to overcome.

This research goal led to the creation of Diversity in Participation (DIP) into DASH, a study that will examine the hesitations that keep people of color from participating in this type of behavioral research in order to remove barriers and find ways to improve success in a dietary program as a way to increase health. The study is recruiting individuals in the Duke University community of Durham, Chapel Hill, and Raleigh, North Carolina. Blackman Carr has recently begun recruiting for her research in the Hartford area with the assistance of graduate and undergraduate students in the Department of Nutritional Sciences and the Department of Allied Health Sciences.

"We're using different recruitment strategies and interview methods to find what's the most effective, or ineffective, recruitment strategy across race groups," says Blackman Carr. "We'll be looking at Black adults in these areas, but we're looking at everyone who joined the study to help inform what we do next in order to be diverse and inclusive."

The research is examining passive and active methods of recruitment. Passive methods involve posting flyers at locations or on social media seeking participants for research. This allows individuals to make the choice to engage with researchers. The active method of recruitment has researchers going out into the community to find participants.

"I call it 'pounding the pavement,'" says Blackman Carr. "You're going out into the community, you're at church meetings, you're at fraternity and sorority meetings, you're where people are at and you let them know you

want to do research. I think a lot of researchers find a challenge with these active methods. It translates to an investment in the community and trusting relationships that takes time to build."

Prior to arriving at UConn, Blackman Carr spent many years as a doctoral student at the University of North Carolina at Chapel Hill and as a post-doctoral researcher at Duke University researching ways to use behavioral interventions to improve health outcomes. In her experience, she believes a key to success in this type of research is to keep in mind its bidirectional nature. Researchers want to gain knowledge, but they also have to remember they are serving the community. She says it is important for communities to know researchers are building lasting relationships and their intentions, not to get the data they need for their study and leave.

"You need to approach folks, as you would with any relationship, with a genuine spirit and intention in what you hope it can bring to them and have conversations with those individuals. They need to know you and your research team, so they know your intention and that it is not malicious and that when you're done with this particular study that you don't disappear," says Blackman Carr.

"Being at UConn, the state's land-grant research institution, our mission is to serve Connecticut. I think where this grant and the mission of the University, and CAHNR, intersect is service. To understand what people need and ask them about that. We have even more geographical reach because we're partnered with the Duke University community as well. I'm hoping these results inform how we think about recruiting and helping Black individuals improve their health."

The study described in this article is supported by Grant #3R01HL146768-01S1 from the National Heart, Lung and Blood Institute in the National Institutes of Health.

Economist studies effects of trade disputes, Arctic ice melt, and pesticide exposure

By Kim Colavito Markesich

Sandro STEINBACH

Assistant Professor
Department of Agricultural and Resource Economics

Sandro Steinbach is an assistant professor in the College of Agriculture, Health and Natural Resources' Department of Agricultural and Resource Economics. While his two master of science degrees and Ph.D. are in economics, he earned his undergraduate degrees in horticultural sciences and agricultural sciences. His wide knowledge facilitates Steinbach's study of a broad range of issues through the lens of an economist.

Says Steinbach, "I conduct collaborative and interdisciplinary research at the crossroads of applied economics and data science. I am particularly interested in research questions that relate to international trade and investment as well as the environment and human well-being."

Steinbach's current research projects relate to international trade and the effects of foreign trade policies on US agriculture. In one project supported by USDA-NIFA, Steinbach is working with co-investigator Colin Carter of the University of California, Davis, to evaluate the impact of trade disputes on agriculture in the United States.

"Because US farmers and food processors sell a significant share of their production abroad, the growing number of trade disputes is a primary concern for the viability of agriculture," Steinbach says. "So far, we know little about the implications of these trade policy changes." Steinbach is compiling a novel dataset of trade disputes targeting US agricultural exports from 1990 to 2020 and is developing an innovative statistical approach to accurately measure the impact of these policy changes.

The recent trade war with China is one example of how trade policies affect US agricultural producers. Says Steinbach, "We use machine learning techniques, a type of artificial intelligence, to infer the causal effects of retaliatory tariffs, taking into account what would have happened if this policy had not been put into place."

He continues, "We need to better understand the implications of foreign trade policy changes as they can impact not only foreign trade but also induce changes in the market structure. This is crucial knowledge as such policies alter the incentive structure for agricultural producers. We develop methods and tools to learn from past policy decisions with the goal to improve the design of new trade policies."

In another NIFA-funded project, Steinbach is working to measure the impact of foreign direct investment on agriculture in the United States. "These investments are vital for the agricultural and food industry as they ensure economic growth and prosperity, create employment opportunities, spur innovation, and drive international trade," Steinbach explains. "But we know little about their impact on firm performance and their potential to create labor market spillover effects."

"Our goal is to provide essential knowledge on the functioning of markets in light of a changing trade and investment environment, which in turn can enhance market efficiency and performance," he says. "We need to know how these investments by foreign investors affect US agricultural and food producers. This knowledge can help to better understand the underlying mechanisms that determine the agricultural system and could help to improve agricultural policies."

Steinbach is also working with Professor Rigoberto Lopez on a project funded by the USDA Economic Research Service to assess retail competition in rural food markets and investigate the impact of dollar stores on rural employment and independent grocery stores. "Since 2008, the growth of dollar stores has been remarkable," Steinbach says. "They are averaging a thousand new stores per year, adding to the 32,000 current locations, which tend to be in rural and low-income areas."

In another two-year collaborative project with Douglas Brugge, professor and chair of the Department of Public Health Sciences at UConn Health, and Eric Loken, associate professor in the Neag School of Education's Department of Educational Psychology, the team will measure the developmental impact of pesticide exposure on children and teenagers.

"Despite extensive research efforts, the human development consequences of pesticide exposure remain poorly understood," Steinbach points out. The team will focus on the San Joaquin Valley in California, for which they have access to field-level pesticide application data from the California Department of Pesticide Regulation. They will use this data as well as land use and weather datasets from the USDA and NOAA to determine pesticide spray movement, pollution levels, and pesticide exposure in the areas where the students live and go to school. The information from these studies will be related to academic test results from the California Department of Education in a statistical model.

In addition, to better understand the relationship between pesticide exposure and academic performance, the team will look at various other systemic factors that could affect student success, such as other envi-

ronmental influences, demographics, economic conditions, and individual risk factors.

Steinbach is co-lead author of a recent paper published in *Nature Communications* entitled "Biological Weed Control to Relieve Millions from Ambrosia Allergies in Europe." The study evaluated ragweed pollen exposure based on the European Pollen Monitoring Program to determine the benefits of biological control for ragweed management in Europe resulting from the accidental introduction of the North American leaf beetle (*Ophraella communa*). While many studies of invasive species highlight the damage caused to native plants from invasive insects, this study found that there may be benefits from this invasive beetle. Ragweed pollen allergies cause misery, and ragweed blooms seem to be increasing as weather patterns change with global warming. In test plots, the beetle impact showed a reduction in the number of days of offending ragweed pollen as well as an overall reduction of ragweed pollen concentrations. The study estimates that the overall health and economic benefits of a systematic beetle propagation would be substantial.

Moving forward, Steinbach is excited about a new project for which he is assembling a team to study the effects of global warming and the reduction of arctic ice on economic welfare, trade, and the environment. As the Arctic ice melts, the potential for economic activity in that area increases as cargo ships are able to significantly reduce travel time by going through Arctic waters. Steinbach is interested in the implications of this change for trade and global welfare, as well as other factors such as the governing structure of arctic waters, safety, environmental pollution, and the potential effects on local communities.

"I think it's an essential applied research question that requires an interdisciplinary approach that bridges economics to data science, climate science, and politics," he says.

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Extension educator creates programs and initiatives to protect water resources

By Jason M. Sheldon

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DIETZ

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As an educator in UConn Extension, Michael Dietz has been working for over a decade to strengthen Connecticut communities by studying ways to protect surface water and groundwater and by promoting the use of green infrastructure techniques throughout the state. In 2018, he became director of the Connecticut Institute of Water Resources (CTIWR). In that role (split between Extension and the Department of Natural Resources and the Environment, where Dietz is an affiliate faculty member), he collaborates with colleges and universities throughout the state to build connections between the academic community and water resource managers. These relationships serve to understand and resolve important water-related problems in the state and regionally, while also sharing research on water resources and general information with the public.

One of Dietz's top water quality concerns for the state is the application of road salt during the winter months. Deicing salts, consisting of sodium chloride and other chemicals, are heavily used on roads, walkways, parking lots, and driveways to prevent slips and falls, but their use carries environmental costs. Salt runs off these surfaces, or slowly permeates them, when warm weather and rain arrives in spring and makes its way into the soil and water, affecting vegetation and aquatic life, as well as human health when it reaches drinking water wells.

For the last several years, Dietz and fellow UConn researchers have closely studied the problem on the UConn Storrs Campus. Now, their research is helping inform new programs and initiatives designed to reduce the use of road salt around the state.

Working with the Connecticut Training and Technical Assistance Center (T2 Center) and the Center for Land Use Education and Research (CLEAR) at UConn, Dietz was part of a committee with several state agencies, including the Department of Transportation, Department of Energy and Environmental Protection, and Department of Public Health (DPH), and public works officials in South Windsor. The group tasked themselves with adapting a program to cut down on road salt use in order to lessen environmental impacts without creating unsafe conditions for pedestrians and drivers.

"From research, we know that the overapplication of salt has no safety benefit, but there's a huge environmental cost," says Dietz. "The only documented way we can reduce the amount of salt that's going into the environment is to reduce what's being put down on the streets. There's no other proven way to do it."

Dietz and his partners looked to the Green SnowPro Certification program in New Hampshire as a model. The program provides training for municipal public works staff and private contractors on ways to more efficiently apply road salt without compromising travel safety. Participants learn about salt and how it affects the environment while also studying strategies for spreading salt in different weather conditions and ensuring equipment is properly calibrated to meet those circumstances.

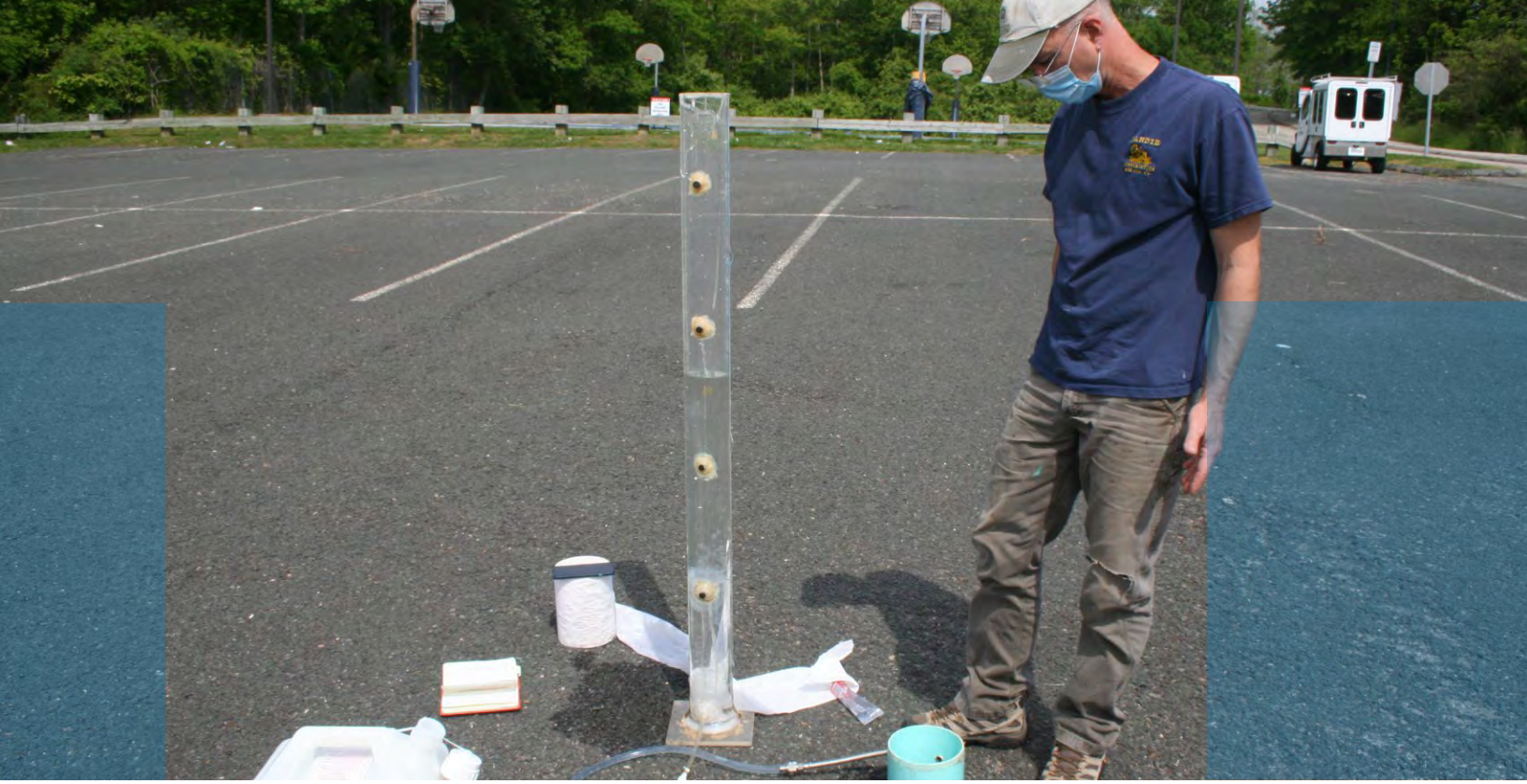
The success of the practices outlined in the program were reflected in a pilot program Dietz organized with UConn's Facilities Operations. Since 2011, he has been using a monitoring station at Eagleville Brook to track water discharge, temperature, turbidity, and conductivity from the Storrs Campus to the small stream nearby. Turbidity refers to the transparency of the water, its level of clarity or cloudiness, a sign of particulates. Conductivity is how the salinity of the water is measured. Using these data combined with training the T2 Center provided for crews, calibrating salt spreaders on plow trucks, and documenting salt application, Dietz was able to present a clear picture of how these steps can reduce salt application, improve water quality, and save money, with the University using less salt over the course of the winter. The T2 Center has since offered a handful of training sessions to municipal public works employees.

"Our ultimate goal was to take our program statewide, and that's what the T2 Center is doing," says Dietz. "Municipal workers can come and learn what they can do to reduce the salt going into the soil and water in their communities."

"The next step is to offer the training to private contractors. New Hampshire found that 50 percent of the salt applied in their state was put down by private contractors, so they knew reducing impacts meant them participating in the training as well."

The push to include everyone that uses road salt in the training has led to the introduction of legislation by the Connecticut General Assembly's Environment Committee. A bill, S.B. 97: An Act Concerning Training Standards for Road Salt Applicators, was raised in 2020 with the goal of mitigating the effects of sodium chloride contamination of private wells and public drinking water supplies.

"The Environment Committee held a roundtable meeting, and they invited several of us who were involved in the T2 project. They recognized road salt was a big problem and they wanted to know what we could do about it. I said

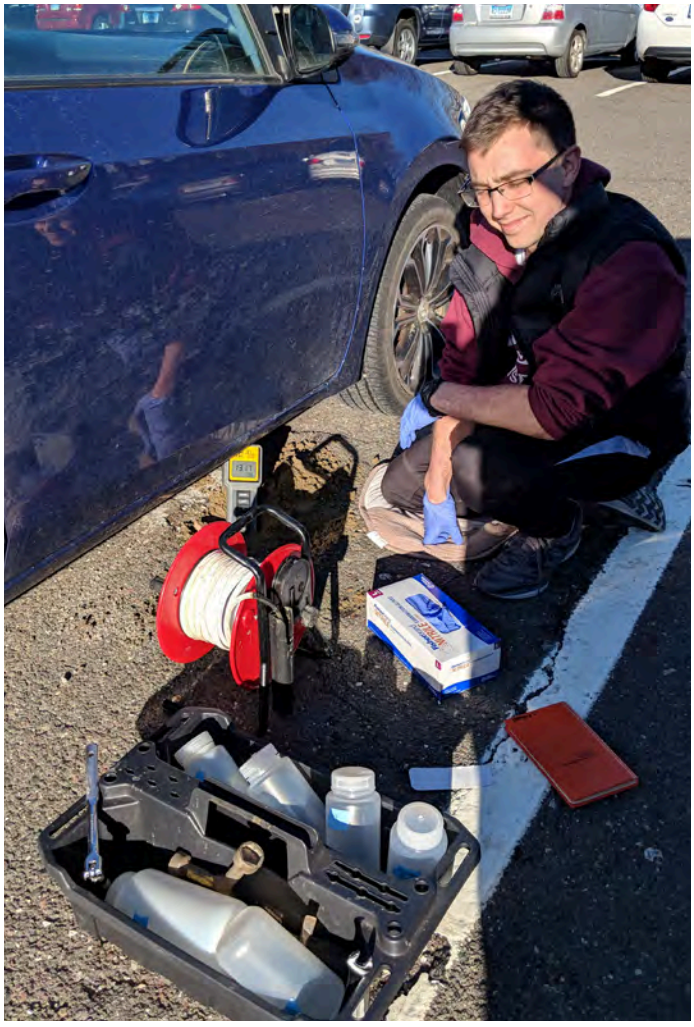


that this was the only way, and we had documentation at UConn showing that. There's no other great alternative that's a silver bullet. They heard it and put this legislation together," says Dietz.

Private wells and drinking water is an area in which Dietz is taking additional steps to ensure their safety for Connecticut residents. Recently, as director of CTIWR, he appropriated $25,000 in funding to initiate a free well water testing program to residents. Connecticut wells are required to be tested only upon their construction. There are more than 300,000 private wells in the state, and Dietz is concerned that in addition to road salt, there may be other contaminants polluting wells, including nitrate and bacteria, that are going unnoticed and unaddressed.

"I know from my own research and through speaking with the folks at DPH that this is a serious concern. I knew this would be a good thing to do for citizens of the state. The cost of the test is about $150, and I was maxed out almost immediately as soon as we got the announcement out. It showed there's obviously a need for it," says Dietz.

The well water testing initiative is one action Dietz has taken to increase the visibility of the CTIWR among state residents. Since becoming director, he has published yearly newsletters and other resources to inform state residents them about Connecticut's most pressing water problems. The CTIWR also helps fund students working to address important water issues in the state, helping to train the next generation of water scientists.



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