

VOL. 17, 2020

Re:

search

A MAGAZINE OF THE AGRICULTURAL RESEARCH PROGRAM IN THE COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCES AT NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

*Ginger
offers
farmers
a spicy
alternative*

INSIDE

- Team investigates SARS-CoV-2's potential to infect food animals
- Hemp Conference covers risks and rewards
- New farm Pavilion 'just what we need'
- Undergraduates hone skills through research



**NORTH CAROLINA AGRICULTURAL
AND TECHNICAL STATE UNIVERSITY**

AGRICULTURE AND ENVIRONMENTAL
SCIENCES



A magazine of the Agricultural Research Program
in the College of Agriculture and Environmental
Sciences at North Carolina A&T State University

Dr. Harold L. Martin Sr., Chancellor
Dr. Mohamed Ahmedna, Dean and Research
Director, College of Agriculture
and Environmental Sciences
Dr. Shirley Hymon-Parker, Associate Dean,
Agricultural Research
Dr. Antoine Alston, Associate Dean,
Academic Studies
Dr. Rosalind Dale, Associate Dean and
Administrator, Cooperative Extension

Produced by Agricultural Communications:

Interim Director: Daniel M. Nonte
Writers: Lydian Bernhardt, Robin Adams
Cheeley, Laurie Gengenbach,
Betsi Robinson
Editor: Daniel M. Nonte
Photographer: James Parker
Graphic Designer: Joshua Loftin

Send change of address and correspondence to:
Agricultural Communications
C.H. Moore Agricultural Research Station
North Carolina A&T State University
Greensboro, NC 27411

On the cover: Ginger grown by the College of
Agriculture and Environmental Sciences.

6,000 copies of this public document were
printed on recycled paper at a cost of \$xx,xxx,
or about \$x.xx per copy.

North Carolina Agricultural and Technical State
University (N.C. A&T) is accredited by the Southern
Association of Colleges and Schools Commission
on Colleges to award baccalaureate, master's and
doctoral degrees. | N.C. A&T does not discrimi-
nate against any person on the basis of age, color,
disability, gender identity, genetic information,
national origin, race, religion, sex, sexual orienta-
tion, veteran status, or any other basis protected by
law. | N.C. A&T is an AA/EEO and ADA compliant
institution.

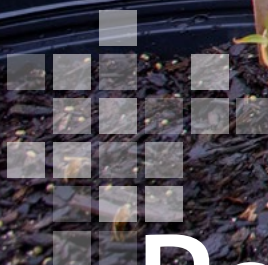
Distributed in furtherance of the acts of Congress
of May 8 and June 30, 1914. Employment and
program opportunities are open to all people
regardless of race, color, national origin, sex, age
or disability. North Carolina A&T State University,
North Carolina State University, U.S. Department
of Agriculture and local governments cooperating.

The projects described in this document are
supported in whole or in part by the USDA
National Institute of Food and Agriculture (NIFA).
Its contents are solely the responsibility of the
authors, and do not necessarily represent the
official views of NIFA.

© 2020 College of Agriculture and Environmental
Sciences, North Carolina A&T State University.
Re:search may not be reproduced unless prior
permission is granted and credit is given.



< 4 Keeping
livestock
safe



Re:search

North Carolina Agricultural and Technical State University is an 1890 land-grant, doctoral, high research activity university dedicated to learning, discovery and community engagement. The university provides a wide range of educational opportunities from bachelor's to doctoral degrees in both traditional and online environments. With an emphasis on preeminence in STEM and a commitment to excellence in all its educational, research and outreach programs, North Carolina A&T fosters a climate of economic competitiveness that prepares students for the global society.

Mission

The College of Agriculture and Environmental Sciences provides opportunities for individuals from diverse backgrounds to achieve excellence in the food, agricultural, family and environmental sciences through exemplary and integrative instruction, and through scholarly, creative and effective research and Extension programs.



21 Biomarking whole grains



8 Making ginger profitable



A magazine of the Agricultural Research Program in the College of Agriculture and Environmental Sciences at North Carolina Agricultural and Technical State University

- 3 CAES FACULTY IS PART OF \$10 MILLION POULTRY RESEARCH PROJECT
- 4 SAFE LIVESTOCK HANDLERS, SAFE FOOD SUPPLY *A research team is investigating SARS-CoV-2's potential to infect food animals.*
- 8 SPICING UP NORTH CAROLINA FARMING *Professors are working to make ginger a profitable, predictable crop choice.*
- 14 'JUST WHAT WE NEED' *The Farm's new Pavilion is the centerpiece of expanded programming.*
- 16 PAYING IT FORWARD *Craig Fletcher '95, DVM, Ph.D.: A&T "transformed me."*
- 19 HINTS ABOUT HEMP *N.C. A&T's first Hemp Conference covered hemp's risks and rewards.*
- 21 ON THE MARK *Shengmin Sang is discovering biomarkers for whole grains.*
- 24 UNDERGRADUATE RESEARCH SCHOLARS PROGRAM *The Agricultural Research Program provides opportunities for CAES students to develop advanced scientific skills.*
- 28 HAND IN HAND, MEETING THE DEMAND *New MEA Center aims to deliver a more diverse, better-prepared agricultural workforce.*



Shirley Hymon-Parker, Ph.D.

Sustaining Lives, Enriching Communities

Despite the challenges posed by the global COVID-19 pandemic, CAES research has continued to grow. During the past year, we earned \$23.4 million in grant funding, an increase of 10 percent over the previous year.

This growth is not an accident. We've been able to expand our research by emphasizing collaboration across disciplines, one of the goals in our strategic plan,

CAES Preeminence: Horizon 2023. Thirty-nine of the 100 grant proposals we submitted this year involved integrated projects and interdisciplinary teams.

We're aligning our research with the world's most urgent needs, including issues related to COVID-19. Radiah Minor, Ph.D., a professor in the Department of Animal Sciences, is leading an interdisciplinary team researching whether the virus that causes COVID-19 can infect pigs, chickens and cattle. If it can, the team will work on ways to protect the safety of farm workers who come in contact with these types of livestock. We're planning and seeking funding for more COVID-19 research projects.

Meanwhile, the college is continuing its important research on other health-related subjects. At the university's Center for Post-Harvest Technologies in Kannapolis, Shengmin Sang, Ph.D., is identifying biomarkers for whole grains with a \$2.8 million grant from the U.S. Department of Agriculture's National Institutes of Food and Agriculture. These biomarkers will help individuals tailor their diets based on their bodies' responses to nutrients in whole grains.

In addition to promoting human health, we're also working to promote the financial health and sustainability of farms, especially small-scale farms. Guochen Yang, Ph.D., and Sanjun Gu, Ph.D., are using a USDA Evans-Allen grant to test the market for U.S.-sourced, tissue culture-propagated ginger, which could provide farmers with another source of revenue.

Our researchers have continued to study another crop with great potential – hemp – and to share our findings with the public. In February,

we held the university's first Hemp Conference, attracting hundreds of farmers, industry partners and Extension agents to our campus from across the state.

In the future, this type of outreach may be held at the University Farm in our newest building: the \$6 million, 17,000-square-foot CAES Extension and Farm Pavilion. Our Pavilion will support outreach, teaching and research with its conference space, classroom, demonstration kitchen, labs and offices.

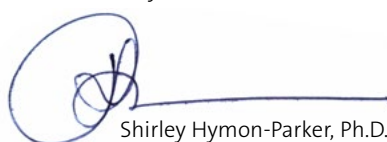
We're also expanding our virtual outreach as host of the 1890 Center of Excellence to Motivate and Educate for Achievement. This innovative virtual center, a partnership of 1890 land-grant institutions, is helping to recruit and graduate more underrepresented students in the fields of food, agriculture, natural resources and human sciences.

This mission of preparing students for successful careers is in our DNA. It's what we do through our Undergraduate Research Scholars Program, which enables talented students like Deja Carrington and Anisa Johnson to design and conduct their own research projects.

These students follow in the footsteps of successful alumni like Craig Fletcher. Twenty-five years ago, Fletcher, an undergraduate from Long Island, N.Y., discovered a passion for animal sciences at N.C. A&T. The university's academic rigor and the mentorship provided by faculty put him on a trajectory of success that continues today. Fletcher '95, DVM, Ph.D., is an associate vice chancellor for research at UNC Chapel Hill, among other leadership roles. In fact, his lab contributed to the development of the antiviral drug remdesivir, which is used to treat the virus that causes COVID-19.

We're continuing to overcome challenges, as we have since our founding, to serve our students, our farmers and all of humanity. That's what Aggies do!

Sincerely,

A handwritten signature in blue ink, consisting of a stylized 'S' and 'H' followed by a horizontal line.

Shirley Hymon-Parker, Ph.D.

CAES Faculty Is Part of \$10 Million Poultry Research Project

A multi-university team that includes two CAES faculty members has won a five-year, \$10 million grant from the U.S. Department of Agriculture to research the sustainability of antibiotic-restricted poultry production.

USDA's National Institute of Food and Agriculture awarded the grant through its Agriculture and Food Research Initiative, the nation's leading competitive grants program for the agricultural sciences.

"These grants are very hard to get," said Chyi Lyi (Kathleen) Liang, Ph.D., an agricultural economics professor and co-director of the Center for Environmental Farming Systems, who will be involved for the duration of the grant. "People have been discussing this topic for a long time. It's a much-needed study, and I'm very pleased that we were funded."

The N.C. A&T faculty members' portion of the grant is around \$760,000, according to Liang.

Liang and Yewande Fasina, Ph.D., both faculty members in A&T's College of Agriculture and Environmental Sciences, will bring their expertise to a team comprising researchers from 14 different universities who will examine the issue of antibiotic use in the poultry industry from all angles: the chickens, the humans who consume them, and the environmental impacts.

Other institutions participating in the grant include North Carolina State University, the University of Georgia, the University of Maryland and Prairie View A&M University. The team was assembled by the grant's principal investigator, Kumar Venkitanarayanan, Ph.D., professor and associate dean of research at the University of Connecticut.

The results could yield the blueprint for an overhaul of the entire industry's approach to disease management, said Liang.

"The industry is very interested in moving away from antibiotic use, partly because of the associated expense and partly because it's what consumers want," Liang said. "This study uses an integrated-systems approach to identify how each agent – the humans, chickens and environment – are affected by different strategies to tackle the antibiotic issues linking production to consumption and environmental concerns."

Fasina, an assistant professor in the Department of Animal Sciences, will test the efficacy of green tea extract, a natural immune-system enhancer, as an alternative to antibiotics for the control of necrotic enteritis, a gut disease in broiler (meat-type) chickens.

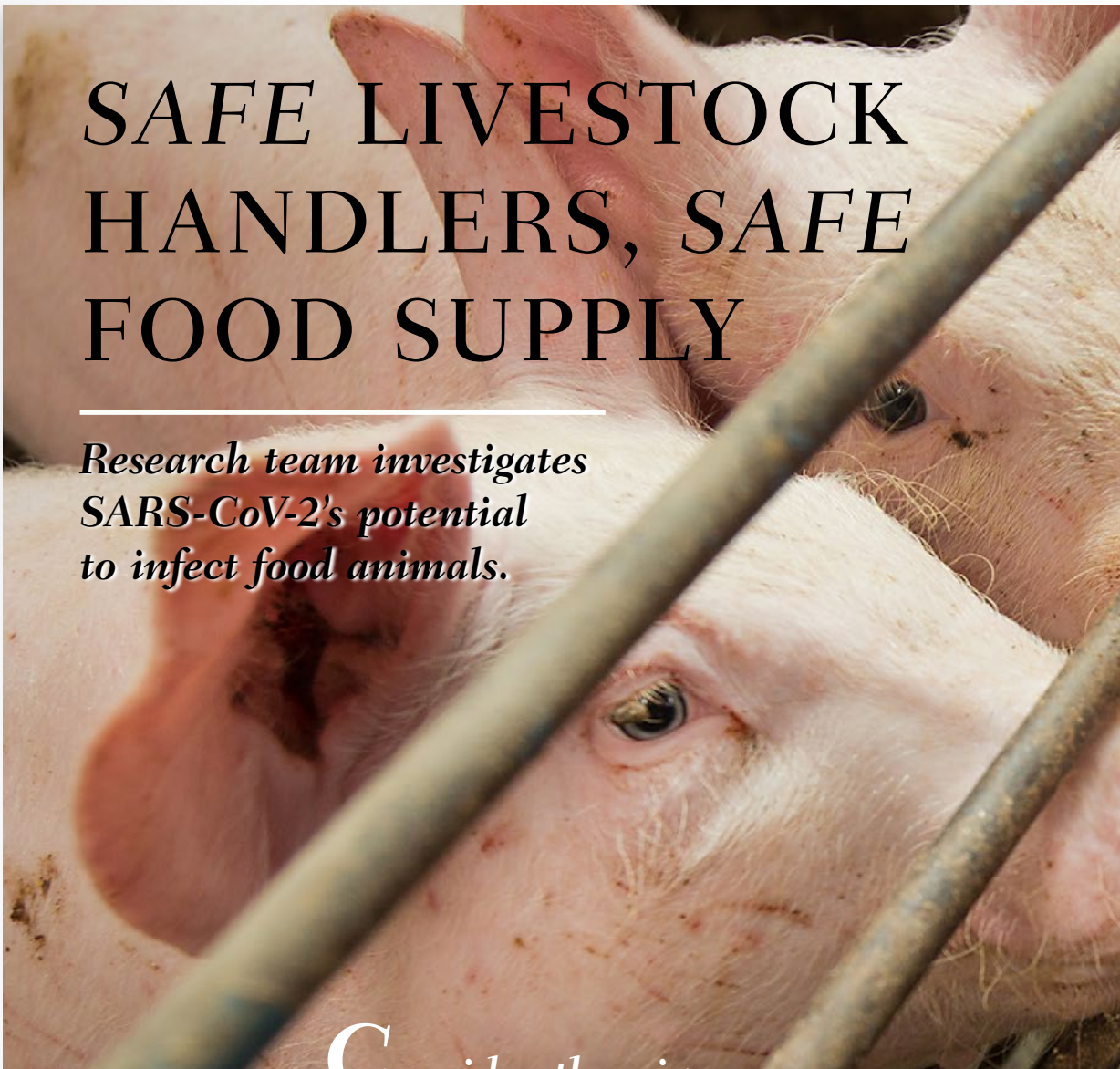
"No one has ever tested green tea extract's potential against necrotic enteritis, a disease that has cost the industry billions worldwide," Fasina said. "We have preliminary data showing that green tea



extract has potential, but this must be validated with live bird trials, especially since necrotic enteritis is a complex disease."

As an agricultural economist, Liang will assess the economic impacts of the study's proposed interventions. Those impacts could be big.

"These research outcomes will be applicable to producers anywhere, from urban to rural to suburban," Liang said. "We'll have alternative ideas for creating sustainable ways to raise healthy poultry."



SAFE LIVESTOCK HANDLERS, SAFE FOOD SUPPLY

*Research team investigates
SARS-CoV-2's potential
to infect food animals.*

Consider the pig.

A source of tasty meat. The inspiration for countless puns. Responsible for \$10 billion in yearly revenue and 44,000 jobs statewide, according to a recent economic impact survey, and a source of identity for North Carolina towns from Lexington in the west to Greenville in the east.

In addition to their economic impact and contribution to the food supply, pigs are connected to humans through a host of anatomical similarities known to every biology student. Pig skin, for example, is a go-to treatment for burn victims. Pig heart valves have been successful replacements for human heart valves, being of the same approximate size and shape. Fetal pigs' muscles are almost identical to those of humans.

As SARS-CoV-2, the novel coronavirus currently responsible for a global pandemic, swept across North Carolina in early 2020, animal sciences professor Radiah Minor, Ph.D. – an immunologist whose research has included swine – began to wonder whether those anatomical similarities could mean that pigs and, to a lesser degree, chickens and cattle could be infected by SARS-CoV-2. A respiratory virus, SARS-CoV-2 causes the disease COVID-19, which had caused more than 6 million confirmed infections and contributed to nearly 200,000 deaths nationwide by September 2020, according to the Centers for Disease Control and Prevention.

This fall, Minor and a team of colleagues from the College of Agriculture and



Intrigued by pigs' anatomical similarities to humans, Radiah Minor, Ph.D., is studying the susceptibility of pigs, chickens and cattle to infection from SARS-CoV-2, the virus that causes COVID-19.

Environmental Sciences will put that question to the test, thanks to a grant of more than \$240,000 from the N.C. Policy Collaboratory, the University of North Carolina system's research collaboration agency. The team includes Leonard Williams, Ph.D., director of N.C. A&T's Center for Excellence in Post-Harvest Technologies; Andrea Gentry-Apple, DVM, Uchenna Anele, Ph.D., and poultry specialist Yewande Fasina, Ph.D., all from the Department of Animal Sciences; and Jenora Waterman, Ph.D., and Vinaya Kelkar, Ph.D., from the Department of Biology.

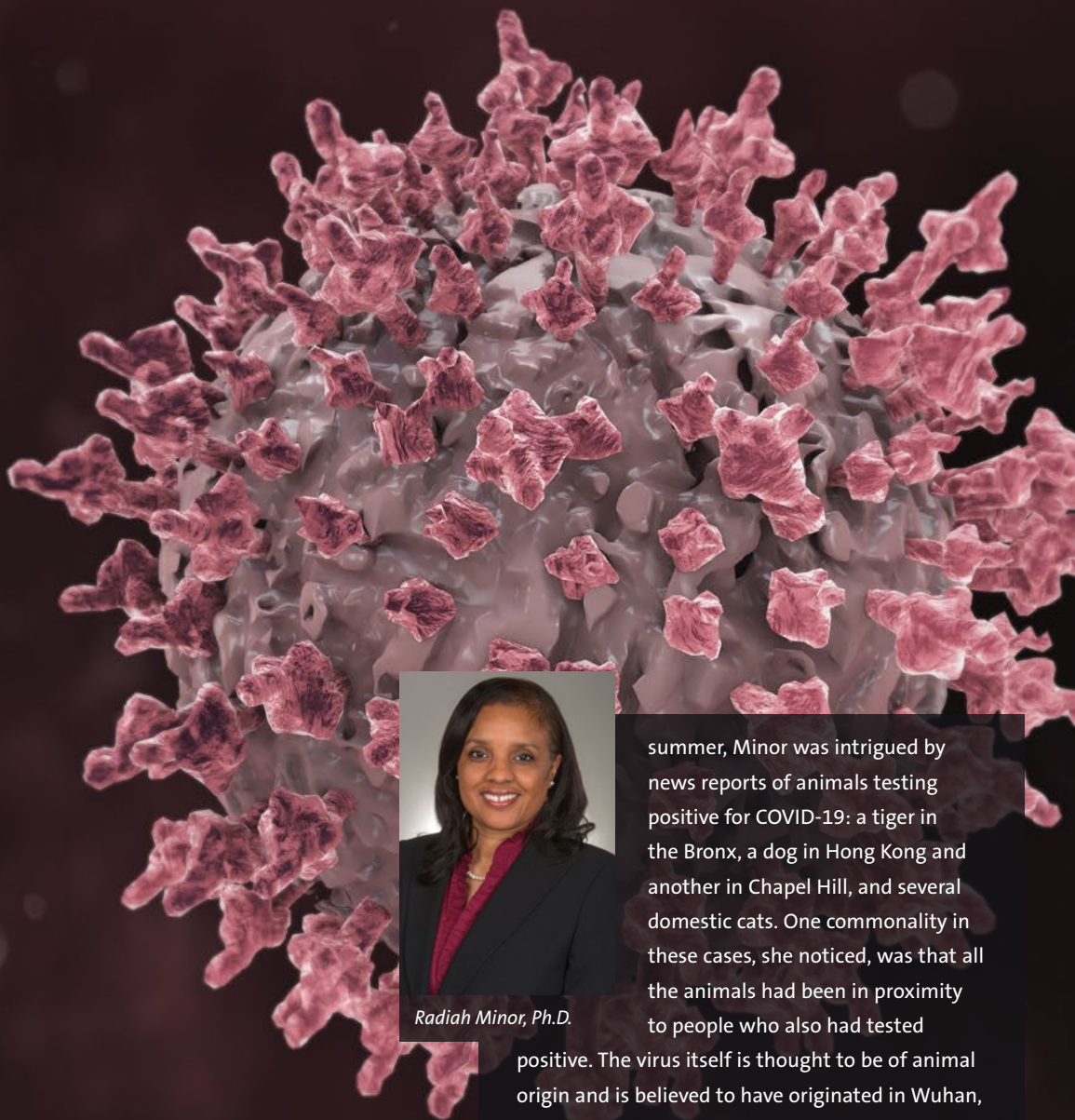
Their goal is twofold: first, to ascertain whether the SARS-CoV-2 virus can infect pigs, chickens and cattle; and, if so, to establish safety protocols to protect the thousands of workers

across the state who come into contact with each species.

"There seems to be a prevailing assumption that animals, particularly livestock, couldn't be infected by people with the virus, but that aspect really has not been studied," Minor said. "There are still so many unknowns. We became curious about food animals, particularly swine, which have a high percentage of genetic similarity to humans." Minor pointed out that pig and human lungs and hearts are similar in size and structure.

"Chickens and cattle are less anatomically similar, but we don't know if they can be affected. We really should."

As the virus raged through the spring and



Radiah Minor, Ph.D.

summer, Minor was intrigued by news reports of animals testing positive for COVID-19: a tiger in the Bronx, a dog in Hong Kong and another in Chapel Hill, and several domestic cats. One commonality in these cases, she noticed, was that all the animals had been in proximity to people who also had tested

positive. The virus itself is thought to be of animal origin and is believed to have originated in Wuhan, China.

In addition to this anecdotal evidence, Minor said, there's scientific evidence as well: Recent studies have shown that the virus uses angiotensin-converting enzyme 2, or ACE2, receptors in respiratory, cardiovascular, intestinal and nervous-system cells to infect humans and some animals, including pigs. Then, there's precedent: Two previous epidemic-causing coronaviruses – Middle East Respiratory Syndrome, or MERS, which became known in 2012, and Severe Acute Respiratory Syndrome, or SARS, first identified in 2003 – both were detected in agricultural animals.

"This summer, I overlaid a map of the less-populated hot-spot counties in North Carolina, where cases of the virus were doubling every

Minor's study could significantly impact the ways food animals are handled by farmers and ranchers.

two or three days, with a map of the counties significantly involved in pig, poultry and cattle production. They matched," she said.

"Given their proximity to humans, it seemed that food animals should be included in community testing initiatives, especially swine, poultry and cattle. It may be that animals can be reservoirs for the virus. Maybe they're not spreading the disease, but if it's in them, and people work with those animals, they may be exposing themselves."

The results of Minor's study could have a significant impact on how agricultural animals are handled by their human ranchers and processors nationwide, but particularly in North Carolina, where pigs and poultry are the top agricultural commodities. The state is the country's second-largest swine producer, with 9.7 million hogs on nearly 2,300 operations, and its fourth-largest producer of broilers, with nearly 515.3 million chickens on 5,700 operations, according to the Council for Agricultural Science and Technology. Together, swine and poultry accounted for nearly \$39 billion in revenue and nearly 200,000 jobs in the state in 2019, according to industry sources.

Risk to the food supply is generally low, Minor said. Humans can't get the virus by eating it because it can't survive the high temperatures of cooking or the rigors of stomach acid. Picking up a package with virus on the outside poses a fairly low risk also, Minor said; a "critical mass" of virus must be present to bring about infection.

Instead, the main risk to people is the potential for exposure where they didn't expect it.

"Knowing for sure that animals could harbor the virus would lead to protocols for people who work with food animals," Minor said. "We could take steps to safeguard the health of those workers."

Those steps might include changes such as farm workers wearing masks, face shields and coveralls that are changed daily, like those of hospital workers.



Using tissues of swine, poultry and cattle collected from the state's slaughterhouses, Minor and her team will test for the presence of SARS-CoV-2 virus and its specific antibodies, using guidelines and protocols established by the Centers for Disease Control. If the virus is found to be present, the team will develop animal-specific standard operating procedures for sampling, testing and herd-management practices, aimed at mitigating the spread of the virus. The guidelines would be shared with public health officers, state veterinary officials and farmers.

Although she doesn't know what the group will find, Minor's primary goal is to know all that can be known about how the virus spreads.

"COVID-19 is the most significant health crisis of the modern era. We need to determine all the places the virus can live, and if there's a potential for exposure, eliminate that exposure," she said. "Right now, there's a lot that we still don't know. If we're going to quell this pandemic, we have to do what we can."



Spicing Up North Carolina Farming

Professors work to make ginger a profitable, predictable crop choice.

Foodies and health advocates have long known about the benefits of ginger. Now, two researchers in the College of Agriculture and Environmental Sciences are working to bring North Carolina farmers to the table.

Drawing on their knowledge of the demand for ginger and its potential profitability, Guochan Yang, Ph.D., and Sanjun Gu, Ph.D., are inviting farmers to give growing it a try.

Yang, a horticulture professor in the Department of Natural Resources and Environmental Design, and Gu, a horticulture specialist for Cooperative Extension, want to bring ginger off the spice aisle and into more prominence as a niche specialty crop for North Carolina growers. Yang and Gu believe that ginger, though not destined to be a field staple or a production crop, has the earning potential, and the public interest, to help farmers replace some of the income once generated by tobacco.

“Baby ginger sells for \$15 a pound, conservatively,” Yang said. “Each plant easily has the potential to generate 1 to 2 pounds of ginger root. Using tissue-culture propagation, we can produce thousands of plants at once. After they have

A photograph of a man with short dark hair and glasses, smiling at the camera. He is wearing a bright yellow polo shirt with a logo on the left chest that reads "NC A&T" above a bulldog head and "AGGIES" below it. He has his arms crossed. He is standing in front of a dense background of tall green ginger plants growing in black plastic pots. The setting appears to be a greenhouse or a large indoor growing facility.

Horticulture professor Guochen Yang, Ph.D., stands amid a forest of ginger plants in the University Farm greenhouse. He is evaluating the plants for qualities that make ginger a desirable niche crop for N.C. farmers.



Ginger plants grown from tissue cultures, such as the varieties in containers in his lab, have higher levels of the compounds that enhance ginger's natural health benefits, Yang said.

factored out expenses, farmers can make a lot of money.”

Then, there are the value-added health benefits that make ginger not only good to eat, but good for you. Ginger is packed with phytonutrients – natural compounds in plants that can benefit health. Ginger’s phytonutrients are gingerols and shogaols, two compounds that have shown promise in fighting cancer, reducing inflammation, aiding digestion and buffering aspirin. As the public has become increasingly health-conscious and aware of these properties, ginger’s appeal has risen, Yang said.

Using a \$280,000 USDA Evans-Allen grant, Yang and Gu are testing the viability of a market for U.S.-sourced, tissue culture-propagated ginger. Theirs is one of the few research projects that has not been delayed by COVID-19 restrictions. The professors and their team have spent the year both in the lab and in the field, growing seven ginger varieties and evaluating them for yield, shade tolerance, resistance to

disease, cold hardiness and a host of other qualities. They will seek to extend the project through additional grants to continue their promising start.

A tropical crop, ginger currently is being produced domestically for U.S. commercial markets exclusively in Hawaii. But Hawaii can meet only about 20 percent of total U.S. demand; the other 80 percent is being met by imports.

Growers typically rely on “seed ginger” from Hawaii, the grey, gnarled root with tiny nubs that is sometimes called the “mother.” The tiny nubs, when properly sliced off, cleaned scrupulously and planted in a growth medium, can grow new plants, each of which can produce a marketable amount of ginger root in a little under a year.

Obtaining seed ginger depends on the situation in Hawaii, Yang said. Weather, disease and other field issues all have an impact.

“If they can’t produce it, we can’t purchase it, and then we’re completely reliant on foreign

markets,” Yang said. “Tissue-culture ginger has the potential to broaden the places ginger can be grown and remove all those variables.”

Growing plants using tissue cultures, or micropropagation, is Yang’s specialty. In his Carver Hall lab, thousands of tiny green plants in clear plastic boxes full of growing media chill in a glass cooler or turn rhythmically on a machine under artificial light.

“This is part of the study too,” Yang said, taking one out of refrigeration.

“It gets cold in North Carolina during the

winter. We need to see which varieties do the best when the weather is colder so that we can work towards extending the growing season.”

Tissue-cultured ginger has shown great promise in the past two years of testing, Yang said. It has demonstrated better resistance to disease, significantly more vigorous and healthier growth, higher yield per cultivar and an overall better consistency than seed-sprouted ginger. The amounts of the phytonutrients 6-gingerol and 6-shogaol have been significantly higher, too, so tissue-cultured ginger may be healthier for consumers.

“We’re not sure why yet, but the amount of 6-gingerol almost doubled from what is found in traditional seed-sprouted ginger,” Yang said. “That’s something that we’ll study as a next step.”

After tissue-cultured samples reach planting height in the lab, some of them are transplanted into pots in the University Farm’s greenhouses. Madonna, Hawaii Yellow, Big Kahuna and other fragrant varieties are grouped according to tissue-cultured or seed-sprouted



Yang works with graduate student William Lashley in the greenhouse. Some ginger varieties have shown greater shade tolerance, hardiness, resistance to disease and other qualities than others.





Sanjun Gu, Ph.D., checks humidity and temperature in the high tunnels where he is growing ginger.

origin, and then compared for shade tolerance, adaptability to different types of soil, substrate preference and other qualities.

Other small plants head to the field, where Yang and Gu are growing five varieties next to traditional seed-sprouted plants for comparison in high tunnels, an enclosed section of field designed to shelter the plants and extend the growing season. In the farm's organic high tunnel area, a forest of green ginger shrubs, several feet tall with slender, almost bamboo-like stalks and long, spiky leaves, grow in well-manicured rows. When crushed, the leaves emit a familiar ginger smell.

One of the challenges of producing ginger in North Carolina is that, summer humidity to the contrary, it's not the tropics. North Carolina growers can rely on a fairly predictable eight-month growing season from early April to early November, Gu said, but the longer the plants can stay in the field, the more money the growers can make.

Because North Carolina's growing season is not long enough to produce mature ginger, Gu and Yang are focusing on "baby" ginger, the same root only younger. When baby ginger is dug up from the ground, a round, radish-sized, reddish-white ginger root is at the end of each slender stalk. It is smaller, thinner-skinned and slightly less pungent than the larger, gnarled root currently sold in grocery stores.

"Each variety has unique characteristics and different responses," Gu said. "Some prefer a little shade, others prefer none. Some grow better in the microclimate we've created in the high tunnel. We work to find the best growing conditions, and when we answer our questions, we can arrive at best recommendations for farmers."

Farmers are taking notice. Yang and Gu have been collaborating with Plum Granny Farm, an organic small farm in King, since the USDA





Gu harvests baby ginger from the high tunnel at the University Farm, where several varieties are being grown.

One thing sparking the farmers' interest is the plant's versatility.

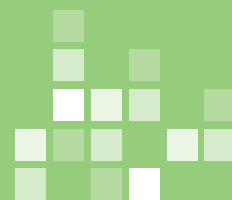
"Ginger is very high in value-added components," Gu said. "You can extract the oil from the roots, you can use the root itself, and there are possible uses for the greens as animal feed supplements. That will be an area for further study."

Although they are excited about ginger's possibilities, Yang and Gu are equally eager to resolve some of the questions their research has raised in the project's next phase.

"Why are tissue-culture plants bushier and healthier than seeded plants? Why are the levels of phytonutrients higher? These are things we need to know," Yang said. "Our next steps will be to figure them out. I'm very happy with our progress."

grant launched the project in 2017. Farmer Ray Tuegel and his wife, Cheryl Ferguson, have successfully grown two varieties of baby ginger using the professors' methods. They share their experiences in two or three ginger-growing workshops each year on their farm. The workshops have been popular, each drawing between 30 and 40 farmers before COVID-19.

In addition, Gu and Yang have introduced small farmers to high-tunnel ginger growing during Cooperative Extension's Small Farms Week, held each spring at N.C. A&T.



The new 17,000-square-foot, \$6 million Pavilion opened this fall for research, teaching, and use by Cooperative Extension. The building has been in the works since the early 2000s.



'Just what we need'

The Farm's new Pavilion is the centerpiece of expanded programming.

Initially, it was just a collection of lines, measurements and artist renderings drawn on white broadsheets, some of them coffee-stained, curling at the corners and developing small tears along the edges from being flipped back and forth. But after years of hard work, focus and dedication, the new 17,000-square-foot CAES Extension and Farm Pavilion opened this fall.

The \$6 million facility has a barrel-shaped roof and meshes visually with the other buildings on the University Farm. The Pavilion includes a multi-use great room that can be subdivided into smaller spaces, wet and dry laboratories, a 50-seat classroom, conference rooms, offices and a demonstration kitchen. The entrance hall is extra wide to allow it to be used as exhibition space, and a wall of accordion-glass doors can be folded away to expose an adjacent outside space to accommodate agriculture-related programs such as farm equipment shows or livestock exhibitions. The facility is equipped with state-of-the-art technology.

"This will be a highly visible structure that will help us better facilitate programs and activities for the community we serve," said Mohamed Ahmedna, Ph.D., dean of the College of Agriculture and Environmental Sciences. "This will extend our venue for training, offer labs for

demonstrations and provide a place where farmers can be engaged in learning."

Plans for the building, funded with federal appropriations from USDA-NIFA's 1890 Facility Funds, have been in the works since the early 2000s and have gone through a few changes and additions. But what hasn't changed is the vision for space and amenities that the facility adds to the University Farm, the campus's largest classroom and laboratory.

"This is more than we initially thought about, but it's just what we need," said Leon Moses, the Farm's superintendent.

Moses and several others were part of the original Farm Facility Committee, which anticipated the Farm's future needs.

"We were looking at something more rough and rugged, something like a barn, where we could hold farm shows and other ag events," Moses said recently while showing off the new facility. "I didn't envision anything like this. I was thinking about function. But this is more than that. This will capture the needs of the entire CAES."

The 492-acre University Farm, like most of the others at land-grant universities, initially was a working farm designed to provide food for the campus and hands-on work for students majoring in agricultural sciences. Over the years, it moved to its present location on McConnell Road, about three miles from campus, and its function has expanded to support projects and hands-on



Associate Dean Shirley Hymon-Parker speaks at the July 2018 groundbreaking for the CAES Extension and Farm Pavilion at the University Farm.

learning opportunities offered by Cooperative Extension at N.C. A&T, and agricultural research and teaching in the CAES.

Although the farm had plenty of facilities to support its work with livestock, vegetables and specialty crops, what was missing was a place where people attending activities and programs could gather.

“This just opens up the door for us to do so much more,” said Rosalind Dale, Ed.D., associate dean and Extension administrator.

For example, for the past several years, Extension has received a Walmart grant that provided instruction for young people in healthy cooking and eating. To do the work, the staff had the option of using the kitchen at the Guilford County Center of North Carolina Cooperative Extension, working around student needs in the campus kitchen, or renting hotel space. The Pavilion allows Extension specialists and associates to provide training to young people in a convenient location designed to meet their needs.

In addition, because of the flexibility of the great room, the space can be used to host workshops, demonstrations and even small conferences.

The ideal time to train farmers is from January to about March, when inclement and cold weather are the norm. The Pavilion provides Cooperative Extension and research staff a place to offer that training without having to be concerned about the elements.

While the Pavilion is a centerpiece, it is just one of three new farm facilities or spaces that will enhance the CAES's Cooperative Extension,

research and teaching efforts.

Directly behind the Pavilion is the 2-acre Student and Community Garden. Students and community members can request space for a raised-bed plot and get expert assistance in their endeavors. This is part of the USDA's Local Food, Local Places initiative designed to help alleviate food deserts. A campus committee is working out the details of how space will be allocated, and the garden will be ready for production soon.

The final piece will be an Urban and Community Food Complex that will allow space for developing value-added farm products and serve as a business incubator for new food-related entities. One value-added product will be Aggie ice cream, since the Food Complex will include a creamery. Plans for the Food Complex are in the design phase with completion of the facility expected in 2022, Ahmedna said.

“We will be ready to offer training and meetings and a lab in the Pavilion, hands-on training in production in the Student and Community Garden. And when the Food Complex opens, we will help small producers or entrepreneurs develop value-added products,” Ahmedna said.

“Part of our mission as a land-grant university is to provide the services needed to help the state's small farmers and to prepare students so they leave here ready for agricultural careers. These facilities are key elements to assist us in doing that work.”



Craig Fletcher, DVM, Ph.D.

Paying it forward

CRAIG FLETCHER '95, DVM, PH.D.:

A&T 'transformed me.'

As a high school senior in Long Island, New York, Craig Fletcher '95, DVM, Ph.D., wasn't advised to come to N.C. A&T. In fact, he wasn't advised to go to college anywhere.

"I went to the guidance counselor my senior year, and she looked at me and suggested that I learn to play an instrument or pick up a trade," Fletcher said.

Instead, Fletcher picked up his game. "I started researching colleges," he said. "I went on a couple of college tours, and I learned what an HBCU was. I found out about A&T and was attracted to it because of the STEM focus. A&T accepted me and gave me a scholarship."

Today, Fletcher is an associate vice chancellor for research, professor in the Department of Pathology and Laboratory Medicine in the School of Medicine, and the director of the Division of Comparative Medicine at UNC Chapel Hill. He also is a veterinarian and a member of the College of Agriculture and Environmental Sciences Advisory Board.

The difference, he said, was the path that A&T set him on and helped him navigate.

"I probably wouldn't be doing anything that I'm doing if it weren't for A&T," he said. "I went from being an average student to an honors student to the top 10 percent of my vet school class. I became a stronger student not only because the classes at A&T were rigorous, but because of my professors' mentoring and encouragement."

A second-generation American citizen – his parents were born in Jamaica – Fletcher encountered many unknowns, but he was eager to investigate all that the college had to offer.

"I didn't know the college was so big and had so much going on," Fletcher said. "I started just looking around."

One of his exploratory rambles took him inside Webb Hall. There, a chance encounter changed his life.

"I met Dr. Alfreda Webb, and she recruited me," he said. "I didn't know who she was or that she was so important; she was so unassuming and grandmotherly. I told her what I was studying but that I didn't feel inspired, and that I was interested in studying animals. She pulled up some information and told me about laboratory animal science and changed my major on the spot. I don't know how she did it, but I left that day as a laboratory animal sciences major. She transformed me that day."

Fletcher never saw Webb again. Already a cancer patient when they met in 1991, she died the next summer. But he later found out that the "grandmotherly" woman was the first of two African American female veterinarians in the nation, instrumental in founding N.C. State's veterinary school, and the first African American woman in the N.C. General Assembly.

While in the animal sciences program, Fletcher worked on the University Farm with small ruminants and beef cattle. He also worked in the Laboratory

Animal Resource Unit (LARU) in the more clinical side of animal science, which eventually became his calling.

“Members of my family had worked on farms in the islands, but I was a city boy,” he said. “Working at the University Farm was my first time handling animals or filling up a barn with hay. Even so, everyone was always encouraging. My professors would ask me how I had done on a test I’d had. Just the fact that they knew that I’d had a test was amazing to me.”

After A&T, Fletcher earned his DVM from the University of Florida and his Ph.D. from Johns Hopkins University, following postdoctoral fellowships in laboratory animal medicine and vascular biology. He then joined the faculty of the Johns Hopkins School of Medicine. In 2009, Fletcher took the opportunity to come back to North Carolina and join the faculty of the UNC-CH medical school.

“They knew that I liked North Carolina and that I’d been a student at A&T, so they recruited me,” he said. “They were right – I wanted to come back.”

Fletcher’s particular research interest is in animal models of human disease, discovering and analyzing the ways animal biology and diseases can provide insight into human disease. As the university’s attending veterinarian, he manages the care and housing of the university’s laboratory animals, advises the vice chancellor for research on strategic planning, and works to design new projects and programmatic areas of inquiry.

One of the recent discoveries that his lab at UNC-CH helped to facilitate was the development of the antiviral drug remdesivir, which is used to treat the virus that causes COVID-19. Remdesivir was authorized by the FDA under an emergency use declaration, meaning that it has shown effectiveness under some, but not all, circumstances. President Donald Trump, for example, received remdesivir, among other treatments, during his COVID-19 hospital stay in October 2020.

“I’m very proud that UNC had a hand in developing the drug,” Fletcher said. “A&T’s program had a clinical and research bent that set me in this direction.”

N.C. A&T alumnus Craig Fletcher, DVM, Ph.D., works with a student in the laboratory portion of the animal science course he is teaching on campus this semester. The class is split between two lab rooms due to COVID-19 restrictions.





Fletcher, who is also a professor and assistant dean in the UNC-Chapel Hill School of Medicine, enjoys working with students as his professors worked with him. "I'm trying to help them the same way that I was helped," he said.

This semester, Fletcher has come full circle in A&T's Department of Animal Sciences. At the department's invitation, he is teaching a junior-level course in laboratory animal biology and diseases to 36 students online. He also comes to campus to teach the lab to 18 socially distanced students at a time, working with nine students in one lab, then scooting across the hall to work with the other half of the class, then repeating the lab for the next 18 students an hour later.

Although the delivery may be unusual, the curriculum is very familiar.

"This is the class that started me off on my journey," he said. "Interacting with the students and answering their questions about the career, talking about internship opportunities and helping them learn, is integral because that's what my professors did for me. Now, I'm trying to help them the same way that I was helped."

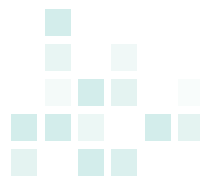
Living through a global pandemic has made learning about animal models and disease, lab animal care and the technology

involved all the more relevant, Fletcher said.

"I've been talking to the students about some of the COVID therapeutics and the development of vaccines, and why we have different animal models," he said. "The students' eyes are opening. They're starting to understand why these things are done because they're so applicable."

Now that he frequents A&T's campus, Fletcher notices all that has changed since his graduation, but also the things that haven't: The university's supportive nature is still the same.

"Now, everybody knows about A&T, and I have a lot of pride in that," he said. "I'll always sing the praises of N.C. A&T. The faculty's investment in the students, the family atmosphere – those are a constant. The campus may be bigger than it was, and it may look different, but it's still changing lives. It certainly did that for me."





Hints About Hemp

Farmers, ag professionals learn at N.C. A&T's first Hemp Conference

More than 250 industry partners, Extension agents and farmers from across the state came to N.C. A&T last February to get the latest tips and information for growing industrial hemp during the university's first Hemp Conference.

Attendees heard presentations from A&T, NC State, the N.C. Department of Agriculture and Consumer Services, and industry researchers and experts about the basics of hemp growing, marketing and bud-geting; the projected economic outlook for growers; and the best production practices for long-term success.

A panel comprising members of the N.C. Industrial Hemp Commission, the board that oversees hemp's development as a viable crop statewide, discussed changes in regulations

Tom Melton, chairman of the N.C. Industrial Hemp Commission, answers a question from the crowd during a forum at the first Hemp Conference.

governing hemp cultivation.

Exhibitors, including greenhouse owners and hemp product developers, also were on hand to share information and answer questions.

Chancellor Harold L. Martin Sr. encouraged the group to use N.C. A&T's researchers as a resource when getting involved in this emerging market.

"As a young boy growing up in the South, I remember the acres and acres of tobacco fields" that used to define the landscape, Martin said. "Who would have known that those tobacco fields would open up to new opportunities? We will keep

Exhibitors, including greenhouse owners and hemp product developers, were on hand at the conference to share information and answer questions.



exploring the possibilities so that we can open up new opportunities for you.”

Interest in industrial hemp has exploded since changes in state and federal law have allowed its cultivation again after nearly a century of dormancy. Hemp was once widely grown in the United States, including North Carolina, before becoming illegal in the 1930s because of its similarity to marijuana. Now, the USDA and state agriculture advocates are interested in resurrecting hemp as a viable cash crop.

In North Carolina, nearly 1,500 licensed growers are using more than 17,000 acres of land, with another 6.7 million square feet of licensed greenhouse space devoted to industrial hemp, according to the N.C. Hemp Commission.

“Hemp could make a big difference for North Carolina farmers,” said Guochen Yang, Ph.D., a professor in the Department of Natural Resources and Environmental Design and a member of the Hemp Commission. “It has the potential to be a high-dollar, sustainable domestic crop such as we haven’t had in a while.”

However, industry professionals cautioned that participating in the fledgling industry involves risks as well as rewards.

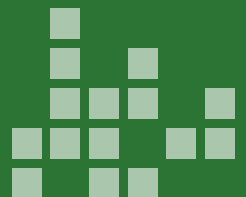
“This is an industry in its infancy,” said Tom Melton, Ph.D., the Hemp Commission’s chairman. “The regulatory environment is changing, as well as best practices. There is tremendous opportunity, but our advice is to start small.”

Local builder David Millsaps came to the conference to investigate possibilities for using the 40 acres that used to be his grandparents’ tobacco farm in Alexander County. The information presented gave him plenty of food for thought.

“I’d like to do something with that land,” he said. “Hemp may just be it. This is definitely a lot of good information.”

The Hemp Conference is likely to be the first of many, said Mohamed Ahmedna, Ph.D., dean of A&T’s College of Agriculture and Environmental Sciences.

“As the information changes, as we learn more, we will be here to share our information with you,” he told attendees. “We are here to help you be successful.”



DR. SHENGMIN SANG IS DISCOVERING BIOMARKERS FOR WHOLE GRAINS THAT WILL CONTRIBUTE TO PERSONALIZED NUTRITION AND BETTER DIETARY RECOMMENDATIONS FOR SPECIFIC POPULATIONS.

ON THE MARK



Shengmin Sang, Ph.D., is part of a project funded by a \$2.8 million USDA-NIFA grant to conduct research on whole grains. "Grain is the main food that people eat worldwide, so the impact of grain is huge" on health, he said.

Most of us know that sugary, fatty food choices on a daily basis can make us chronically ill. Conversely, the right food choices at every meal can prevent and even reverse ailments such as Type 2 diabetes or cardiovascular disease.

Nevertheless, the epidemic of chronic diseases related to poor dietary choices persists across the population, shortening life spans and taking a heavy toll on the economy and individual well-being.

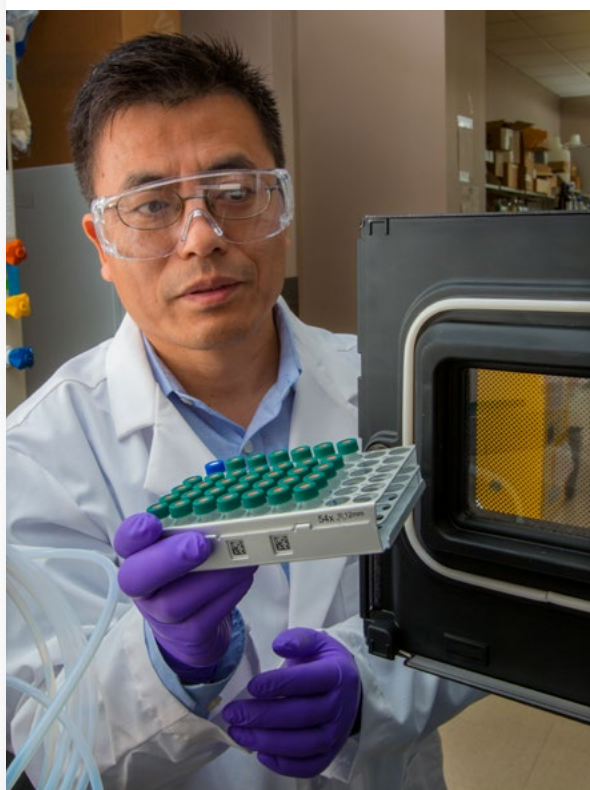
But what if there were tests to monitor more

precisely the health effects of specific foods, just as there are now clinical tests that can track cholesterol and blood sugar? Would people be more likely to eat right?

Nutrition advocates are counting on it, and they are beginning to pursue that goal by studying biomarkers that can be detected in blood, urine and tissue samples. Biomarkers can reveal how much of a specific food has been eaten and

trace the complex molecular changes that take place as the body digests it. More important, they could make personalized nutrition possible by providing clear direction for doctors and patients as to what an individual should eat.

Among the top food researchers delving into this topic is Shengmin Sang, Ph.D., at N.C. A&T's Center for Excellence in Post-Harvest Technologies at the North Carolina Research Campus in Kannapolis.



Sang's lab is studying food biomarkers, measurable substances in blood, urine and tissue samples that can help scientists analyze how an individual responds to a specific food.

Supported by a \$2.8 million grant from the U.S. Department of Agriculture's National Institutes of Food and Agriculture, Sang is searching for biomarkers for unrefined wheat and oats. The USDA's Beltsville Human Nutrition Research Center and the University of North Carolina at Charlotte's College of Computing

and Informatics are collaborating with him on the research.

The results of Sang's research could be a game changer for people pursuing healthier lifestyles. His numerous published findings are a rich resource, not only for him but for other nutritional researchers worldwide. In fact, the American Society for Nutrition has identified food biomarker research as one of the most important tools for advancing the field and achieving the goal of personalized nutrition.

Over time, such new knowledge will find its way into the marketplace in the form of better products, clinical protocols, improved food processes and personalized dietary recommendations.

"I have an interest in diet and human health. Grain is the main food that people eat worldwide, so the impact of grain is huge," Sang said. "I want to study something that will have a big impact and apply to our daily life."

Why biomarkers for whole grains?

Whole grains are better for health than refined ones because they contain health-promoting bran and germ – components that unfortunately are removed from most grains during milling. The bran and germ contain a rich array of fiber, vitamins, minerals and phytochemicals that are important for good health. In its My Plate dietary guidelines, USDA recommends that at least half of the grains people consume should be unrefined. The department reports that although most Americans consume the recommended amount of grains, too few of those are whole grains.

Sang's research addresses a long-standing challenge in nutritional science: the lack of tools to accurately assess how much of a specific food has been eaten and its precise effects on health. Dietary recommendations are based on research that relies heavily on questionnaires, which are notoriously error-prone.

On such questionnaires, research participants record what they eat and how often, and the results are correlated with health status in populations over time. The problem is, most

people forget what foods and how much of them they ate. Nor are they always diligent about keeping food logs.

In addition, studies show that unconscious social approval bias plays a role in self-reporting. Most people exaggerate the amount of healthy food they eat and underreport their consumption of soda, chips and alcohol when asked by doctors, dietitians or questionnaires.

Nutritionists also recognize that one-size-fits-all recommendations, although helpful, fall short of promoting optimal health for everyone. For instance, such recommendations fail to account for differences among ethnic populations, many of which have evolved genetically variable responses to foods. Lactose intolerance, as just one example, is linked to individuals of African descent.

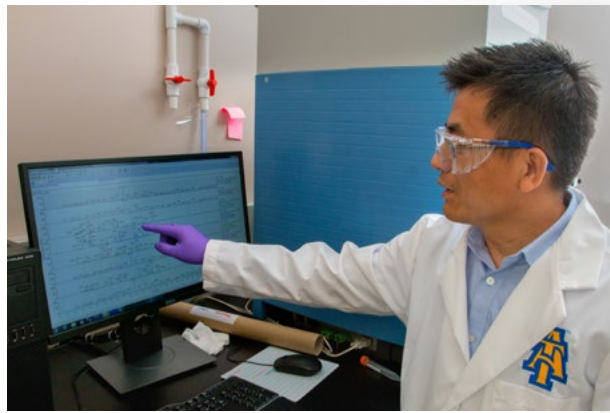
Nutritional science has long recognized that questionnaires are an imperfect tool for shaping dietary recommendations, but until recently, they have been the best tool available. Now, thanks to the relatively new science of metabolomics, researchers such as Sang are exploring biomarkers and how specific foods affect health.

New discoveries about grain

Biomarkers can be molecules, enzymes or hormones in blood, urine or other body fluids or tissue. To find biomarkers for specific grains, Sang first has to purify the individual compounds from grains and elucidate their chemical structures. He determines which molecules are unique to the bran portion of the grain and occur in high enough concentrations to be detected in bodily fluid samples.

Sang's lab has reported several novel unique compounds in whole grain wheat and oats that have the potential to be used as biomarkers of whole grain intake. In published studies, he is continuously adding new discoveries to the chemical profile of wheat and oats, especially in the compounds known to promote good health.

As Sang breaks new ground, some of his findings could be useful to consumers in the here and now. He has examined 19 commercial oat products for the presence of one type of the healthful, bioactive whole-grain compounds. He found that



Biomarkers can lead to a more personalized approach to nutrition, Sang said.

sprouted oat bran products have the highest concentration of the compound, followed in descending order by oat meal, oat bran and, finally, cold oat cereal. Genetics, environment and post-harvest processing all play a role in how grains retain their healthful components, he reports.

Furthermore, his lab has studied how these unique bioactive whole grain compounds are absorbed and metabolized in humans. Some of the newly identified metabolites also can be used as biomarkers of whole grain intake. Strikingly, he observed variations in the metabolism and absorption of these unique bioactive compounds among individuals. He discovered that a certain type of intestinal bacteria is indispensable to metabolizing some of the healthful compounds that are unique to oats.

Sang and his team are adding new biomarkers to the list that he recently created and are further investigating how an individual's age, gender and microorganisms mediate the biological functions of these biomarkers in humans.

Once biomarkers for food intake become an established clinical tool, nutritionists will be able to make more accurate assessments and provide more useful advice. Such discoveries will be crucial to quantifying intake, analyzing how an individual responds to a specific food, identifying deficiencies and, ultimately, helping people achieve optimal health.

"This knowledge could be used to improve how to assess the impact of whole grain on health and provide personalized dietary advice," Sang said.



UNDER-GRADUATE RESEARCH SCHOLARS PROGRAM

Deja Carrington '20: Finding research 'right up her alley'

During her first years at N.C. A&T, Deja Carrington thought she knew her perfect career path: Graduate with a degree in food science, concentrating in human nutrition, and become a registered dietitian working with the National Football League.

Then came her junior year and an opportunity to work with Heather Colleran, Ph.D., RDN, an assistant professor in the Department of Family and Consumer Sciences.

"I was looking for a job for the summer. Dr. Colleran invited me to come to work for her in her lab as an Undergraduate Research Scholar," said Carrington, who graduated in May. "She told me I'd also get to do research, present at conferences and do other things to improve my resume."

Carrington was intrigued by the offer. "I thought that all sounded good, so why not?" she said. "I applied to the program, and I was accepted."

Carrington began working with Colleran on her Evans-Allen study examining the ways that

exercise and diet can affect a nursing mother's health, particularly in regard to bone density. Known as MEEMA (Moms Exercising and Eating to Maintain Health and an Active Lifestyle), the project enrolls volunteer mothers for a 12-week period, engaging them in a plan of exercise and dairy intake – particularly yogurt – to determine their effects on bone density.

Carrington's role in the study was to look at dietary data. Once enrolled in the study, participating moms check in six to eight weeks after giving birth to report what they've been eating, and again between 18 and 20 weeks. Carrington collected the data using a computer software system known as NDSR (Nutrient Database System for Research) and examined what the women had eaten, their patterns of eating and the nutrient composition of their diets. She then evaluated that information according to the Dietary Guidelines for Americans (DGA) and the Healthy Eating Index (HEI), two national guidelines set by the USDA and the U.S. Department of Health and Human Services.

In addition, she helped with the exercise and dietary education components of the study.

The Agricultural Research Program provides opportunities for students in the College of Agriculture and Environmental Sciences to develop advanced scientific skills.

“This project is right up my alley,” Carrington said. “I look at how much fat, dairy, grains, proteins and vegetables the moms intake, and compare that to the dietary guidelines and the Healthy Eating Index to assess the moms’ dietary patterns and their (diets’ nutritional) quality to see the role that food plays in bone density.”

“Deja is an asset to the study,” Colleran said. “Deja likes the kids and the moms, and they respond well to her. She can handle both the lab work and the interpersonal connections, and she’s happy to help in any capacity that we need. If we’re processing serum samples, and we need someone to hold a baby, she’s the one who will do it.”

For Carrington, an important part of the study was learning the significance of breast milk: what makes it so special to babies, how lactation works and how to help new mothers.

“Formula feeding is for convenience, and it’s comforting to moms because you can measure it exactly,” she said. “But breast milk has all the nutrients that a baby needs for life. Formula lacks important immune system-building factors that breast milk provides.”

As a result of her experience in the program, Carrington said, her career plans have changed somewhat. She still plans to get a master’s degree

in dietetics and become a registered dietitian, but after that, she probably will take her skills to a neonatal intensive care unit (NICU) instead of a football field.

“I’d like to work with an NICU, because that’s where so much is needed. I can have a big impact,” she said. “I am still interested in sports dietetics, but also in neonatal dietetics.”

She also would like to be a lactation consultant and a doula, a trained professional who helps people through health care experiences such as childbirth. Carrington said she wants to help open the profession to a more diverse group of caregivers.

“Right now, there’s not a lot of diversity among lactation consultants, and that may mean that diverse moms may not feel comfortable getting help if they need it,” Carrington said. “I want to help with that, so that babies and moms can get better care.”

“This experience has been so much fun. I know the science, and now I can put it in layman’s terms. I’ve loved working with everyone.”

Scholar Deja Carrington practices making assessments of a baby’s health on a model in the lab of Heather Colleran, Ph.D., RDN. “I know the science, and now I can put it in layman’s terms,” Carrington said.





"I want to know what it is about food that makes it so good to eat," says nutrition major Johnson.

Anisa Johnson '20: Combining food with science

Anisa Johnson likes to talk about nutrition. In fact, she likes it so much that she made nutrition her major, graduating with her degree in May. But when she finds herself in a crowd, the response can be a bit overwhelming.

"There's a lot of misinformation out there, and everyone – my friends, random people, literally everyone – wants to ask me questions," she said. "People think that they know a lot about nutrition, and they want to talk to me about what they know. But what I've found that most people think is nutrition is really just the latest fad diet, or something they've heard about online that's being called 'nutrition information.'

"Real nutrition is more complicated than that. I try to fill in the gaps for them."

Taking the initiative to clear up misconceptions about nutrition is nothing new to Johnson. Her willingness to take the initiative is one of the qualities that brought her to N.C. A&T, made her a Dowdy Scholar and earned her a spot in the Undergraduate Research Scholars Program in the College of Agriculture and Environmental Sciences.

"I saw the URSP application in the department office, and I nominated myself," she said.

"And I was accepted."

While still a high school student in Richmond, Virginia, Johnson came to N.C. A&T to participate in the Research Apprentice Program (RAP) in nutrition. The next year, as she considered colleges, her scientific father, a biologist, gave her this practical advice: "There's the right school," he said, "and then there's the right school for you."

The right school for Johnson is A&T.

"Not every school has a nutrition curriculum, first of all," she said, "and then, there's the family atmosphere. I have always felt very supported and encouraged here."

After becoming part of the URSP program, Johnson joined the lab of Heather Colleran, Ph.D., RDN, working on Colleran's three-year Evans-Allen study examining the ways that exercise and diet can affect a nursing mother's health, particularly in regard to bone density. The study is known as MEEMA (Moms Exercising and Eating to Maintain Health and an Active Lifestyle.)

When a mother is breast-feeding, calcium is transferred to her infant, causing a temporary loss of bone density. When the infant is weaned, the mother's bone density often is restored to pre-pregnancy levels. But with women becoming

R C H S C H O L A R S P R O G R A M

pregnant later in life, closer to menopause, a full period of bone-density recovery may not occur. The study seeks to determine whether exercise can lessen the amount of bone lost during lactation and, upon weaning, restore bone density.

To test this, the study enrolls volunteer lactating mothers for 12 weeks at a time and starts them on a bone-building exercise regimen based on individual ability. Colleran and her team meet with the women three days a week for exercise. The team monitors the women's activity, including exercise and steps per day.

Since a diet rich in calcium plays a role in bone density, the team also monitors the moms' dairy consumption. Participants in the study are given 6 ounces of yogurt to eat at the end of each exercise session.

Johnson helped to process samples of breast milk, blood, urine and stool from the mothers and babies in the study for later analysis.

She also tested different lipid extraction methods for breast milk to determine which method gives the best yield for fatty acid analysis. Once the fatty acids were extracted from the breast milk, Johnson analyzed the samples using gas chromatography to generate a fatty acid profile. The fatty acid profile in the milk is compared with the mother's diet during the time the milk sample was taken.

"The goal is to figure out the percentages of the different types of lipids in breast milk and see how they change based on what the mother is eating," Johnson said. "This will help us understand what makes breast milk so special."

Despite its well-documented benefits, Johnson said, many aspects of breast milk haven't been analyzed yet, especially relative to what food the mother consumes.

"We know more about how cow's milk works for cows," she said. "What you put into your body

affects all other aspects of your life. By eating right, you could lower your risk for developing a chronic disease."

Just months into her freshman year, Johnson had her own firsthand experience with disease when she was infected by a strain of the bacteria *E. coli*. The illness left her sidelined for most of the spring semester and resulted in two major surgeries, including the removal of her entire large intestine.

Although she still doesn't know how she contracted the virulent strain, the notes she took throughout her ordeal, documenting what she ate and how she felt, helped her doctors understand what had happened.

"I found it very ironic that I, a nutrition major, was going through this," she said.

With her professors' support, Johnson was able to bounce back, missing only one semester. Working hard, she made up incomplete grades during the summers and kept her scholarship.

"Anisa is a very bright student," Colleran said. "She is a motivator and a mentor for other students here, and to bounce back from her illness like that is very impressive. She's one of those students that you know will go pretty far."

Johnson found a learning experience amidst the adversity.

"I learned that, if you let people help you, plenty of people will rise to the occasion and help you," she said. "I also learned that, if I can come through that, I can do anything."

After graduation, Johnson is considering taking her research skills abroad before entering graduate school.

"A&T has been so much fun," she said. "There are so many opportunities here. I've been able to create my own path, and I think that's beautiful."



Fatty lipids in human milk are examined as part of Colleran's MEEMA study.



HAND IN HAND, MEETING THE DEMAND

NEW MEA CENTER AIMS TO DELIVER A MORE DIVERSE,
BETTER-PREPARED AGRICULTURAL WORKFORCE.

Job prospects today are as promising as ever for college graduates in the fields of food, agriculture, renewable natural resources and the environment. Each year, in fact, nearly 58,000 openings await those with such degrees.

Most employers hiring in these fields prefer candidates with relevant expertise, according to a report on 2015-2020 employment opportunities by the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) and Purdue University. And yet, on average, the annual pool of U.S. graduates who fit the bill numbers only 35,400.

Put simply: The supply of experts in these areas falls far short of demand.

The new 1890 Center of Excellence to Motivate and Educate for Achievement based at N.C. A&T State University aims to close that gap – and, equally important, create a more diverse, better-prepared workforce – by

recruiting, retaining and graduating more minority students for careers in food- and agriculture-related disciplines.

Funded by a \$1.6 million grant from NIFA's 1890 Centers of Excellence Program, the groundbreaking virtual center launched July 1 in the university's College of Agriculture and Environmental Sciences. It serves all 19 of the 1890 Land-Grant Universities and is led by representatives from seven: N.C. A&T, Florida A&M University, Lincoln University, Tuskegee University, the University of Arkansas at Pine Bluff, the University of Maryland Eastern Shore and Virginia State University.



“While we at A&T lead, this is a team effort. It is taking our partners hand in hand and collectively lifting the caliber of the minority students who are being trained to

be the next generation of STEM leaders in a diversified workforce,” said Mohamed Ahmedna, Ph.D., dean of the CAES.

“There is a huge gap in skills in the market. And when you look at minorities, the gap is even larger. That makes this a lot more urgent. We see our strength in the collective actions that we take and how fast and how impactful we are in terms of achieving our objectives.”

The MEA Center of Excellence will focus on four primary objectives:

Beatrice Dingha, Ph.D., works with a student in her lab. Recruiting, retaining and graduating STEM students is part of the mission of the virtual MEA Center, headquartered at N.C. A&T.



- Recruit, retain, mentor and graduate young people from underrepresented groups for careers in food, agriculture, natural resources and human sciences.
- Provide workforce-development experiences for minority students to smooth their path from high school to college programs and careers.
- Increase student engagement in science, technology, engineering and mathematics (STEM).
- Provide students from grade school through college with experiential learning opportunities related to soft skills, research skills, international engagement, conference attendance, leadership training and technology skill development.

The heart of the matter

Antoine Alston, Ph.D., the college's associate dean for academic studies and a professor of agricultural education, says the center's work is nothing short of critical to the nation's security and well-being.

"As agriculture goes, so goes our country. If you look at nothing else, mankind has to have a steady food supply and a healthy environment

to survive," Alston said. "And as a nation, it's important that we have a diverse workforce that reflects the population we serve. There are so many health disparities in the African American community that are tied back to agriculture and a healthy environment."

Alston, a member of the task force that puts out the USDA jobs report, is quick to point out that the agriculture industry grew steadily despite dire economic downturns brought on by the 2008 recession and, now, the COVID-19 pandemic. Graduates with expertise in food, agriculture and environmental sciences have more than 200 career areas from which to choose. Available jobs include scientists, educators and advisors working with plants, animals and water resources, as well as specialists in sustainable land systems, renewable energy and supply chain operations.

"Food doesn't just appear on the shelves at Food Lion. People need to understand where it comes from and how it is produced," Alston said. "It is important that we produce African American scientists who can make an impact in the world. We cannot produce them if we don't recruit them. We can't recruit them unless we promote awareness of the industry

The MEA Center serves all 19 of the 1890 Land-Grant Universities. Part of its mission is to provide grade-school-through-college students with experiential STEM learning opportunities.



and its importance.”

Misty Blue-Terry, Ph.D., co-director of the MEA Center and the 4-H STEM specialist with Cooperative Extension at N.C. A&T, has devoted her career to working in underserved communities to promote agricultural awareness and expand the industry’s high school-to-college pipeline.

“Young people from underrepresented groups may see this as an extremely viable career opportunity if we can present it in a way that appeals to them,” she said. “Although we know that farming is a very high-tech business now, I think in their minds it’s still tractors and field work.”

Dispelling those notions is critical to increasing minority representation in the industry, she believes. Blue-Terry and her counterpart at the center, Paula Faulkner, Ph.D., share a strong commitment to inclusion and diversity.

“Diversity in the entire workforce, not just agriculture, is very important,” Blue-Terry said. “Minorities and women bring a diversity of thoughts to the table. When you are trying to develop for a changing nation, you need people who represent minority communities in all businesses.”

Faulkner, a professor of agricultural education who played a key role in writing the grant proposal for the MEA Center, has traveled the world to work with underserved populations in agricultural sciences and education, including women farmers and those with disabilities. Rarely does she get the opportunity to work on a project alongside a minority professional like herself.

“I am almost always the only African American female when doing this work,” Faulkner said. “And being the only one, it just encourages me more to try to reach out and give the younger generation the opportunities to do what I do.”

A similar desire fuels Blue-Terry’s passion. When asked to join the center’s leadership team, she didn’t think twice before accepting. “To be able to impact the lives of young people – to help someone make a decision about a career – is the absolute most exciting thing to me,” she said. “A lot of blood, sweat and tears go into this type of work, but the impact it has on the lives of the participants is worth every bit of it.”

The fruit of diversity is innovation, Alston said. And innovation, in agriculture or any other business, fuels the bottom line.

Workforce diversification is another of the center’s goals. “Minorities and women bring a diversity of thoughts to the table,” said Misty Blue-Terry, one of the center’s co-directors.





Funded by a \$1.6 million grant from the U.S. Department of Agriculture's National Institute of Food and Agriculture, the center seeks to expand students' ideas of viable careers.

"Our nation is No. 1 in agriculture innovation in the world. But this innovation won't continue if we don't invest in the next generation and our future. It is important that we understand that and have mechanisms such as the MEA Center to ensure that."

Strength in numbers

The MEA Center of Excellence provides the first virtual space of its kind for educators and researchers across the entire 1890 Land-Grant University System to collaborate and to nurture the innovation needed to create a more diverse, better-prepared agricultural workforce.

The platform, through which the center's partners now can share best practices, will continue to be expanded in the months ahead. And the leadership team intends to flex the partnership's collective muscle to pursue additional resources. In fact, the team already is working on its next grant proposal.

"The sharing of best practices across these communities is what makes us strong. We learn from each other and don't have to reinvent the wheel," Dean Ahmedna said. "We have collective power in terms of partnering with others on a grant of a larger scale than any single institu-

tion can do. Leveraging those connections and resources is an important factor. It's teamwork versus individual work."

The center's partners couldn't be more pleased, including Jurgen G. Schwarz, Ph.D., professor and chair of the Department of Agriculture, Food and Resource Sciences at the University of Maryland Eastern Shore.

"I think it is imperative that we work together. As individual universities, we are too small to take on a large project like this and survive in this competitive world," Schwarz said.

"We recognize that we have different expertise, and by working together from the get-go and developing proposals together, we can learn from each other and collectively do a better job of recruiting and retaining students and giving them the skills they need to be successful in the workplace."

The center already has funded 16 projects, from 4-H and STEM outreach in high school to internships, mentoring and advising programs, and leadership and workplace skills training in college.

Lincoln University in Missouri, for example, hosts 4-H Youth Futures, a program that guides underserved youth on their college



Training the next generation of scientists is vital, said Associate Dean Antoine Alston, Ph.D. Jobs in STEM fields are still plentiful, despite COVID-19, he said.

journey, from preparation to graduation.

Adrian Hendricks, Ph.D., 4-H and youth development state specialist with Lincoln University Cooperative Extension, believes the MEA Center will do more than simply increase diversity in the agricultural workforce. Ultimately, he says, it will improve the lives of the students and the communities from which they come.

“The truth is, the people on the receiving end of work like this, their lives are going to change and their opportunities are going to

change. Their families, their livelihoods, their legacies are going to be impacted by what we are doing here,” Hendricks said.

“That is really an inspiring place for all educators to launch into. We get to see how this changes communities and our country.”



Nonprofit Org.

US Postage Paid

Permit No. 202

Greensboro, NC

Re:search

A MAGAZINE OF THE AGRICULTURAL RESEARCH PROGRAM IN THE
COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCES AT
NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY



Tubes of blood go into a centrifuge for separation to extract the serum for later analysis as part of a study by Heather Colleran, Ph.D., on exercise and maternal health.