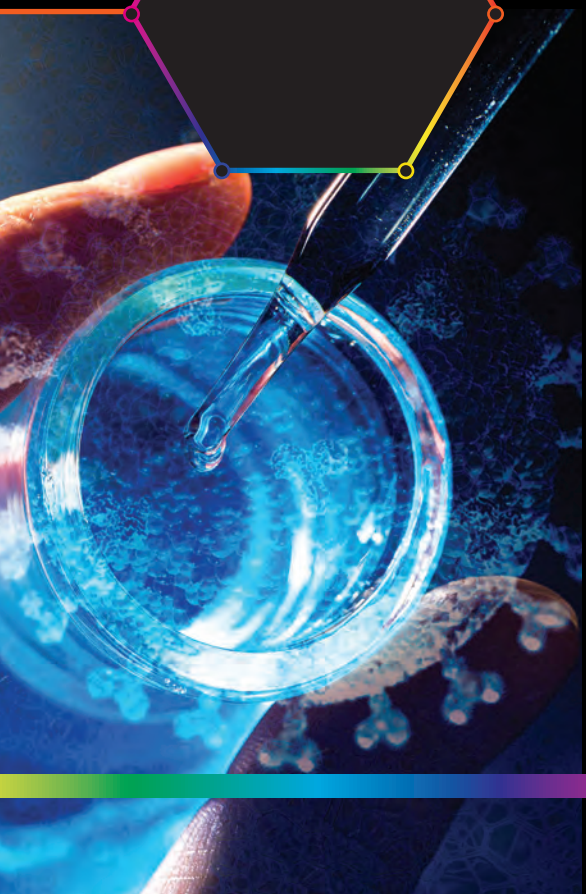
2024
Annual
Report

NORTH CAROLINA RESEARCH CAMPUS

Highlights from NCRC Campus Partners

NC | RESEARCH CAMPUS

Empowering Human Health



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A YEAR OF PARTNERSHIP
for North Carolina Research Campus

When you have a good thing going, others take notice. And when others have something to contribute, their partnership becomes a strong endorsement. This scenario is a privilege that makes the North Carolina Research Campus proud: corporate and community organizations have a physical presence on campus to collaborate with our educational partners. That three-way integration means that life-changing university research discoveries can be commercialized, funded, and brought to market.

Coddle Creek Capital's co-founder John Allen observes: "A great idea is just that, unless it can get to market and make an impact in communities." CCC helped commercialize research findings from UNC Chapel Hill that became the *Genate Test* which indicates a mother's nutritional needs while her fetus is developing, specifically for her fetus' neurological and cognitive development.

Our educational partners work alongside corporate partner Standard Process, a company providing holistically enhanced wellness supplements. Standard Process's researchers tap into global seed banks to re-establish traditional nutrients and phytochemicals in whole food oat grain.

Another campus contributor, North Carolina Biotechnology Center, works to accelerate the growth of the life sciences sector. Their Exchange Group program is one of many platforms of support to the campus since inception. The program structure and funding enable convening life sciences communities for research-based information sharing and career guidance.

International communities are also paying attention. Last fall, senior Japanese business and government officials toured campus during their 46th annual joint meeting between the Southeast US/Japan Association and its counterpart Japan-US Southeast Association.

Please review the remarkable changemakers highlighted in this year's annual report. Inspiring, collaborative teams of professionals improve the world when they start with great ideas and a common goal. Together, we will get there—one good idea at a time.

Sincerely,

Cory R. Brouwer, PhD
Executive Director of Research, North Carolina Research Campus

NORTH CAROLINA RESEARCH CAMPUS

CAMPUS METRICS

60 University Students (Undergraduate and Graduate)

258 Scientific Publications

33 University Post Docs

76 MD and PHD Level Scientists

307 University Partner Employees

94 Corporate Partner Employees

86 University Research Staff

105 Educational Affiliates

295+ Community Health Affiliates

600+ Civic Affiliates

1000+ Total Campus Affiliate Employees

CAMPUS AFFILIATES

Total* Federal & Extramural Funding:

$244,265,583*

** Cumulative since 2008*
** Public University Partners*

132 COMMUNITY EVENTS

- NCRC Catalyst Symposium
- UNC Chapel Hill Appetite For Life
- UNC Chapel Hill Seminar Series
- NCCU Food Security Seminars
- NCRC Research Notes Speaker Series

3,000+ Participants

57 STEM (Educational) EVENTS

- NC A&T Rural Food Forums
- NC A&T with USAID Farmer-to-Farmer Program
- NC State Seminars and Workshop Series
- NCFIL International Speaker Presentation
- UNC Chapel Hill Nutrigenetics, Nutrigenomics and Precision Nutrition Short Course

6,500+ Participants

FEATURE STORY

Rowan-Cabarrus Community College
LEADER IN REGIONAL WORKFORCE DEVELOPMENT

Rowan-Cabarrus Community College continues to lead the region in providing high-quality, responsive training programs that support biotechnology and healthcare industries. Since opening its Biotechnology building in 2010 on the North Carolina Research Campus, the College has remained committed to aligning education with workforce needs. Through the state's Customized Training Program, Rowan-Cabarrus delivers hands-on instruction tailored to the specific requirements of each employer, helping new and existing employees become productive quickly. This training includes needs assessments, consultations, and specialized instruction in areas such as BioWork, CPR and First Aid, Microsoft Office, and Expert On-the-Job Training.

"Our work with companies like Lilly is a powerful example of how intentional partnerships can transform lives and strengthen communities," said Dr. Carol S. Spalding, president of Rowan-Cabarrus Community College. "By aligning education with industry, we are creating opportunities for individuals while fueling long-term economic growth across Cabarrus County. We are building more than a workforce. We are building a strong foundation for the community."

To date, Rowan-Cabarrus has provided customized training for more than 390 employees at biotechnology and pharmaceutical companies such as Lilly. Fourteen BioWork cohorts have been completed, with the most recent session ending in November 2024. The eight-week BioWork certificate program prepares students for careers as process technicians in biotechnology, pharmaceutical, and chemical manufacturing. The program serves learners across all stages of life and career, supporting both regional employers and individual career advancement.

FEATURE STORY

Seventeen sessions of Train-the-Trainer instruction have also been delivered, with two more scheduled for April 2025. These offerings reflect the College's broader commitment to strengthening the local talent pipeline. Cabarrus County leaders continue to recognize the importance of educational partnerships in fostering economic development and preparing residents for high-demand careers.

To meet growing demand for advanced manufacturing skills, Rowan-Cabarrus is also launching a new Aseptic Processing program. This training initiative will align with pharmaceutical industry standards and expand the College's capacity to meet future workforce needs.

By working closely with biotechnology and pharmaceutical companies, Rowan-Cabarrus is not only supporting immediate hiring goals but also investing in the long-term success of the region. These partnerships ensure that local talent is prepared, competitive and positioned to thrive in a rapidly evolving industry.

BY ALIGNING EDUCATION WITH INDUSTRY, WE ARE CREATING OPPORTUNITIES FOR INDIVIDUALS WHILE FUELING LONG-TERM ECONOMIC GROWTH ACROSS CABARRUS COUNTY. WE ARE BUILDING MORE THAN A WORKFORCE. WE ARE BUILDING A STRONG FOUNDATION FOR THE COMMUNITY.

MEET JULIE MANN: NEW NCFIL DIRECTOR

Julie Mann, PhD, *Director, NC Food Innovation Lab*

With a personal mission of leveraging food science to bring health and wellness to the masses and innovative options to the market, Julie Mann easily steps into her new role as director of the NC Food Innovation Lab.

Mann's 30 years in food science and technology will benefit NCFIL as she takes the reins of day-to-day management from NCFIL's Executive Director Bill Aimutis, who has led the lab since its opening in 2019.

LAUNCHES PLANT PROTEIN PROGRAM

With degrees in food science and nutrition, Mann's professional background is impressive.

She spent 20 years with Hershey in a myriad of roles, from product and technology development to work in innovation and marketing.

"I worked on teams charged with dreaming up the vision for R&D and the future direction in which the company should go," says Mann. She ended up building a protein program.

"I know it sounds strange. Hershey is a candy company—why do they need a protein program?" says Mann. "But they saw the health concerns about sugar and fat coming and sought to diversify. Hershey had a health and wellness platform, and I led the protein side, including animal, dairy and plant-based protein."

Mann built a team and an incubator model and started developing and marketing protein products. Ten years ago, Hershey was actually a pioneer in this new space.

PLANT PROTEIN EXPERIENCE GROWS

After her tenure at Hershey, Mann made her mark at Ingredion, where she started a new protein program. The company was focused on sugars, sweeteners and starches but lacked plant protein knowledge or portfolio. At Ingredion, Mann created a program based on pulses, dried beans and legumes, including fava, chickpea, lentil and yellow peas.

WHILE CONSULTING WAS A SUCCESSFUL ENDEAVOR FOR MANN, SHE EVENTUALLY LEARNED SHE PREFERS WORKING IN A TEAM AND WITH PEOPLE AND IS THEREFORE EXCITED ABOUT THIS NEW OPPORTUNITY.

FEATURE STORY

Julie Mann, PhD, new NCFIL director, with former NCFIL director William Aimutis, PhD

"Ingredion created a new division, and I was the Global Protein Lead," says Mann. "I worked in Germany, Singapore, China and Thailand, and I had to determine how to sell this totally new category for Ingredion in a market for which knowledge was limited."

Building on her knowledge, she pivoted again, to join PURIS Holdings, a smaller, family-owned company, and became the chief innovation officer for its pea and soy protein business, responsible for applications and product development.

Exploring the independence of entrepreneurship, Mann launched Appropriately Rogue Consulting in 2023 to work more closely with a variety of clients in the food science and innovation space. Soon thereafter, NCFIL became a client.

CONNECTION TO AIMUTIS

Although Mann started working with NCFIL in 2023, she has known Aimutis for most of her career.

"Our resumes follow a similar pattern," says Mann. "We both worked for large, global corporations and now have landed in higher education."

Mann started working with Aimutis in May 2023 under a consultancy agreement, supporting NCFIL operations as well as its collaborative pursuit of a Bezos Earth Fund grant, which led to the creation of the Bezos Center for Sustainable Protein at NC State.

Under Mann's leadership, NCFIL will be a major contributor to the Bezos Center for Sustainable Protein's future success in plant-based proteins.

BUILDING THE FUTURE OF FOOD

While consulting was a successful endeavor for Mann, she eventually learned she prefers working in a team and with people and is therefore excited about this new opportunity.

"NCFIL embodies unique expertise, experienced staff and a well-designed pilot facility to carry out a breadth of new research and development projects for clients," she says. "It is difficult to find all of these complementing capabilities in one spot."

Executive Director Aimutis anticipates continued progress for NCFIL with Mann at the helm.

"Julie will continue building NCFIL's reputation as a global leader in product development and pilot plant capability," says Aimutis. "She possesses the essential credentials to undertake this task, and I am excited to see where she can take NCFIL."

Mann stands ready to drive innovative growth at NCFIL: "NCFIL is thriving in the space of healthier eating, alternative proteins and eating for the planet. We are building the next generation of novel options for the consumer."

CODDLE CREEK CAPITAL MOVES IDEAS TO MARKET

coddlecap.com

CODDLE CREEK CAPITAL

With an extensive background in Life Sciences, John Allen worked for large pharmaceutical and start-up biotechnology companies beginning in the 1980s in the commercial and clinical operations. His passion is helping new, distributive Intellectual Property (IP) make it from academia through the commercialization process where it then can impact human health.

To enlarge that vision, Allen became co-founder and general partner of Coddle Creek Capital (CCC), a venture capital and business consulting firm. Since 2018, the company's primary focus is on the life sciences markets, especially companies in their early stages in the genomics, nutrition, immunology, oncology, microbiome and neurology sub-sectors.

As Allen says, "A great idea is just that, only an idea—unless it can be commercialized and make an impact in communities."

The scientific language in Allen's world includes terms like immunology, oncology, microbiome, genomics, neurology, and precision guided nutrition—scientific language for longevity. While CCC's Venture Fund II is not a "longevity fund" per se, CCC believes that the next 10 years will demonstrate the application of understanding DNA and RNA expressions (i.e., genomics) to impact human health like no other time in human history. Altogether, the immediate focus of CCC's Venture Fund II is investing and supporting companies at the heart of this revolution.

CCC's ownership of and investment in the clinical research organization Eremid Genomic Services (EGS) gives CCC a view into what is coming in the world of genomics. EGS serves many innovative, genomic biotechnology companies providing method development and commercial support of their genomic platforms. This gives CCC a unique view into the major sub-sector that CCC participates in.

Furthermore, being integrated in the North Carolina Research Campus (NCRC), a campus focused on genomics and nutrition, provides access to IP and Principal Investigators from leading universities who are leaders in this revolution—and CCC is at the heart of it.

FEATURE STORY

John Allen, General Partner, is a serial entrepreneur and seasoned capital raiser with extensive experience in the early-stage life science sector. In 2002, he co-founded the Open Finance Network (OFN), overseeing its growth from two founders with no assets to managing assets totaling over $23 billion. He co-founded CCC in 2018.

"It is both satisfying and challenging to ensure this work advances," says Allen. Although the state is ranked fourth in the nation for developing IP, North Carolina is far behind California and Massachusetts in receiving early-stage venture capital funding, which ultimately determines where these companies locate and grow.

Coddle Creek Capital fills that gap. It helped commercialize research findings from UNC Chapel Hill that became *Genate Test*, a prenatal genomic assessment test that indicates a mother's nutritional needs while her fetus is developing, specifically her nutritional needs for her fetus' neurological and cognitive development. Genetics-powered nutrition is a great idea and the starting point. As a campus presence and corporate partner, CCC enables those ideas and research questions to become part of the answer.

Leah Allen, *Managing Partner / Director Community Engagement*

Salisbury's Catawba College students also benefit from this alliance. CCC's support enhances the College's ability to offer an opportunity usually available only to graduate students. A unique undergraduate genomics course focused on next-generation DNA sequencing (NGS) is now available—the only undergrad NGS training in the US. This academic-private-corporate partnership yields exponential benefits. Students gain a distinct advantage as they enter graduate programs and launch careers in the expanding genomics arena.

A strong presence on the NC Research Campus, CCC supports work whose collaborative process moves it forward—faster. CCC's expertise commercializes genome research results and delivers benefits to the market quickly, thereby improving the health and wellness of the widest community.

David Helmer, *General Partner*

STANDARD PROCESS CAPITALIZES ON WHOLE FOOD BENEFITS

standardprocess.com

As one of the campus' major corporate contributors, Standard Process continues its work in nutritional advancement—one study at a time.

In addition to ongoing studies of an oral supplement from bovine thymus gland that supports immune challenges after traumatic brain injury (TBI), another recent development has been the advancement of new crop genetics in support of human health. Although breeding initiatives are historically targeted for profitability and disease resistance, there are different purposes for developing new lines of crops. Standard Process has nutritional targets in mind.

Brandon Metzger, PhD, Standard Process's Nutrition Innovation Center Director, explains that oats are a gluten free food that are used in many health focused products. Oat crops have been genetically selected over time to create a highly palatable carbohydrate source with greater farm yield for profitability. At the cost of breeding strategies to enhance carbohydrates, phytonutrients have also decreased, a trait that reduces bitterness and provides broader customer appeal. Even the grain's shape has been significantly altered to work better in process machinery as it moves into different processed food forms. The selective breeding over time has led to a very complex oat genome.

Standard Process performs targeted breeding for enhanced nutrition instead of more common targets of yield. Today, typical Mendelian genetic approaches are used with genetic sequencing and faster computer processing to accelerate development of new nutritional solutions that used to require full academic careers in breeding for trait improvement and stabilization. Researchers use the genetic diversity from global seed banks that have preserved ancient plant genetics to re-establish traditional nutrients and phytochemicals historically found in oat grains. Some of these plants have adapted to harsh environments over thousands of years and have expression of much higher levels of plant defense compounds, such as polyphenolic alkaloids, which can also be beneficial for human health.

In an upcoming clinical study, the Royal Ancient OatTM by Standard Process will be served in muffins for healthy participants to consume in a crossover study design. The study will also include a matched wheat-based muffin to understand the effect on glycemic response. Due to high levels of avenanthramides in ancient oats, endpoints such as changes in digestive enzyme activity will also be measured along with many other metabolic and inflammatory markers. This study is anticipated to build a knowledge around the functional benefit of this ancient grain for continued expansion in new supplement and food product innovation. Highly skilled food chemists contribute towards making formats that resonate with consumers despite the sensory differences of modern oats.

Continued crop breeding improvements on the cultivation of ancient grains will progress on the Wisconsin based organic farm to improve production. The local environment of the Midwest area puts a heavier environmental pressure on the oats,

FEATURE STORY

Brandon Metzger, PhD, *Nutrition Innovation Center Director*

likely from humidity and some types of invasive fence row species that significantly improve phytochemical levels due to stressors compared to more arid growing regions of US and Canada.

Another important plant-based solution in the Standard Process crop development program is Atriplex hortensis or mountain spinach. In active individuals, especially athletes, salt and other minerals are depleted during exercise. Standard Process believes in the power of nature and the whole food diet. Electrolyte salts can be found naturally in plants in high concentrations and utilized for repletion in a shake or supplement format. In addition to simple mineral salts in so many popular electrolyte products, the plant contains all sorts of other beneficial nutrition, antioxidants and phyto-actives that can also play a role in recovery after exercise. Halophyte plants that thrive in high-salinity environments—think coastal salt marshes and inland deserts—pull up minerals directly from the soil. These whole-food sources provide a direct benefit to our diets and can be utilized to formulate novel whole food solutions for active lifestyle individuals.

Another focus for Standard Process is producing a unique whole food folate supplement. In nature and within our food, the complexity and chemistry of vitamins and minerals is sometimes different from compounds manufactured as nutrients through synthetic chemistry from global suppliers. These manufactured nutrients help the population meet dietary recommendations in fortified food, such as the intake of folic acid to improve embryonic neural and cognitive development. However, there are also natural forms of folate, such as methyl and formyl versions in dark green leafy vegetables, that are different from synthetic folic acid. Our scientists at the Nutrition Innovation Center are researching the unique biology and metabolism of the food forms compared to synthetic equivalents. Whole food diets including turnips, collards, and dark green vegetables invite all of nature's complexity to benefit cognitive development and function. Standard Process utilizes a unique range of ingredients from our farm and ingredients from suppliers to present the complexity of nature. This includes other plant or algal sourced methyl donors with cofactors such as vitamin B12, choline, betaine, methionine, vitamin B6, and magnesium all working together to optimize cellular processes, along with folates, for enhanced nutritional benefit.

Standard Processes' research highlights new product solutions for improvement in human and animal nutrition with proprietary farm crops and unique processing strategies to maximize nutrient density. Even as supply chain and extreme weather events challenge harvests, Standard Process digs deeper to develop supplements that better serve us all.

Dr. Metzger says, "It is a rewarding challenge and the mission of the Nutrition Innovation Center to continue driving forward the legacy of our founder, Dr. Royal Lee: Nutritional solutions for an array of health challenges are best founded upon whole food nutrition."

North Carolina Biotechnology Center:

ADVANCING THE LIFE SCIENCES ALONG THE COMMERCIALIZATION CONTINUUM

North Carolina Biotechnology Center®

Since the inception of the NC Research Campus in 2008, the North Carolina Biotechnology Center has served as an essential partner. And that collaboration continues to thrive.

Established in 1984, NCBiotech is a technology-based, life sciences economic development nonprofit that works to create North Carolina's competitive advantage in the life sciences. The organization engages partners, maximizes opportunities, identifies challenges, and delivers solutions to accelerate innovation, investment, and job creation. Overall, the life sciences sector is an impactful economic contributor to the state with 840+ companies employing more than 75,000 people and an additional 2,500 support companies, generating $82B in annual economic activity and $2.5B in annual state and local tax revenues. *Source: 2024 Evidence & Opportunity: Impact of Life Sciences in North Carolina report by TEConomy Partners*

Operating five statewide offices, NCBiotech deploys robust programs and services to grow the life sciences sector. The Greater Charlotte regional footprint spans 11 counties around the Charlotte metro and includes the NC Research Campus. NCBiotech's office leads significant ongoing engagement with the campus, amplifying regional impacts.

STRATEGIC LEADERSHIP

Each NCBiotech statewide office hosts a Regional Advisory Committee comprised of life sciences leaders from academic institutions, industry, economic development organizations, and investment partners who provide guidance. Hailing from UNC Charlotte, Coddle Creek Capital, Rowan-Cabarrus Community College, Castle & Cooke, and North Carolina Agricultural and Technical State University, the five volunteers from the NC Research Campus collectively have more than 36 years of service. Their active participation, alongside advisors from the broader region, helps shape strategy and drive outcomes.

SOLUTIONS IN ACTION

Talent is key to the success of life sciences companies. Rowan-Cabarrus Community College (RCCC), located at the NC Research Campus, plays an important role in the region. North Carolina is a leader in biopharma manufacturing training with an enviable breadth and depth of training capabilities across the state. One example is BioWork, a foundational certificate program for process technicians in biotech, pharmaceutical, or chemical manufacturing. Developed by the NC Community Colleges Systems' BioNetwork, the BioWork curriculum is now offered at RCCC. NCBiotech's Greater Charlotte office supported the establishment of that program and maintains involvement through engagement with graduates and employers.

FEATURE STORY

Recognizing the demand for expanded manufacturing talent and augmenting NCBiotech's already expansive portfolio of programs, the organization launched The Life Sciences Manufacturing Ambassador Program in early 2023 to increase awareness of training and career opportunities. In concert with a myriad of partners, this community engagement project spans 79 counties across North Carolina. The Greater Charlotte region's first Ambassador Training was held in partnership with RCCC at their Advanced Training Center on the NC Research Campus. Two subsequent trainings have been held in the region with more planned.

Part of NCBiotech's programs and services includes grant funding to support innovation. Beyond funds awarded to researchers at the various academic institutions on campus, NCBiotech's Exchange Group program funding supports communities of academic, government and other life sciences professionals convening to discuss their science, network, find potential partners, and create new ideas. There are two long-standing NCBiotech Exchange Groups based at NC Research Campus. One is focused on career development, while the other is focused on research collaboration. The **Catalyst Group** fosters personal and professional relationships among trainees and employees on the NC Research Campus through various career development opportunities. The second group, **NCRC Research Notes**, promotes potential research collaboration by convening all NC Research Campus employees for poster presentations, new faculty introductions, and campus research-based information sharing.

2024 HIGHLIGHTS

In 2024, the Southeast US/Japan Conference program and NCBiotech's AgTech Investor Forum were each held on campus. These opportunities to spotlight the capabilities of the campus and elevate partner relationships were invaluable to innovation and economic development for the region.

The Greater Charlotte office collaborated with partners at the NC Department of Commerce, Economic Development Partnership of North Carolina (EDPNC), and the NC Research Campus to support the 46th SEUS Japan Annual Joint Meeting. This meeting, between the Southeast US/Japan Association and its counterpart, the Japan-US Southeast Association, alternates host sites between Japan and the US The conference attracted senior Japanese business and government officials committed to fostering an environment of collaboration and networking alongside Southeast US representatives. As part of their offsite session offerings, conference attendees toured multiple campus assets, attended a networking reception, and were welcomed to Kannapolis for a program entitled *New Approaches for Human Health in the Life Sciences North Carolina Research Campus*.

Additionally, the invitation-only AgTech Investor Forum, presented by NCBiotech, was held on campus and included presentations and content from entrepreneurs, investors, and food tech industry experts. Attendees concluded the day with a networking reception and tour of the NC Food Innovation Lab.

As these ongoing engagements demonstrate, NCBiotech is well integrated into the NC Research campus and its community. Continued strong collaboration will enable meaningful and significant outcomes and impacts for life sciences in this region and beyond.

EREMID® GENOMIC SERVICES

Eremid® GENOMIC SERVICES

Eremid® Genomic Services, LLC, is a specialty, high-complexity, CLIA-certified, CAP-accredited genomics contract research organization, enabling genomics research and the development of cutting-edge clinical genomic-based Laboratory Developed Tests (LDTs). With a focus on Next Generation Sequencing (NGS) Eremid boasts expertise and the latest sequencing platforms for both Illumina short-read and PacBio long-read sequencing.

Continued growth in 2024 has seen Eremid expand its customer base and technology platforms:

ILLUMINA SHORT-READ-SEQUENCING PLATFORM UPGRADES

2024 saw Eremid add both the NextSeq2000 and NovaSeqX+ Illumina sequencers, which use the new, improved and more cost-effective X-LEAP chemistry. This has enabled Eremid to add additional services while reducing pricing to our clients.

PACBIO REVIO LONG-READ SEQUENCING

Eremid continues to extend its world-leading expertise in long-read sequencing with the addition of the PacBio Kinnex and SPRQ chemistries, as well as Eremids own custom Kinnex application.

SINGLE-CELL SEQUENCING

Eremid continues to be at the cutting-edge of genomics research, adding new applications to its portfolio. Specifically, Eremid has worked to become a BioSkryb Certified Service Provider offering their ResolveOME platform for both research and clinical assays for both Illumina and PacBio applications.

BLENDED GENOME / EXOME (BGE)

To complement its established Whole Genome Sequencing (WGS), Whole Exome Sequencing (WES) and Targeted Sequencing applications, Eremid has developed a new Blended Genome / Exome (BGE) sequencing service. Using a combined low-depth WGS and higher-depth WES this new application provides a more cost effective whole genome screening assay that is now available for both research and clinical projects.

GLP ACCREDITATION

Complementing its CLIA and College of American Pathologists (CAP) certification, Eremid has added Good Laboratory Practice (GLP) accreditation through its partnership with a major international agrochemical company.

FUTURE OUTLOOK

Eremid embodies the spirit of innovation and collaboration, contributing to the growth in North Carolina's genomics landscape. We are continuing to expand our specialist genomic clinical tests with our US-based and international partners, that will have an increasing impact on early diagnosis and management of key disease states.

Julian Abery, MSc, *Chief Business Officer*

Julien Curaba, PhD, *Chief Scientific Officer*

SNP THERAPEUTICS, INC.

SNP THERAPEUTICS PRECISION NUTRITION APPROACH IN PERSONALIZED PATIENT HEALTH CARE

Predictive analytics powered by AI/ML facilitate early detection of health issues, allowing for timely interventions and optimized treatment plans based on individual patient data.The first Prenatal Precision Nutrition Test, developed through the research of Dr. Steven Zeisel, MD, PhD, founder of SNP Therapeutics, Inc. to help women and their Health Care Providers to optimize nutrition plans to support their unique pregnancy journey.

SNP Therapeutics is the first commercial precision nutrition company in the US developing a portfolio of products, (genetic test & therapeutics) for a variety of health conditions. The company develops AI/ML driven algorithms that analyze complex genetic data, revealing patterns that enhance the understanding of health risk and nutritional treatment responses providing personalized patient care.

The first product to launch in the US is the Genate™ Test. This at-home or in-office genetic test is a Prenatal Precision Nutrition Test allowing women to understand how they metabolize and share nutrition with their developing baby. The Genate™ report shares recommendations for nutrition solutions to help patients and their Health Care Providers to make decisions allowing for nutrition optimization to ensure the best outcomes. The company has also recently launched a new prenatal nutrition line under the Genate™ brand and offers prenatal / maternal health counseling through their own Certified Dieticians to assist as women develop their optimal nutrition plans. More information can be found at https://genate.com/.

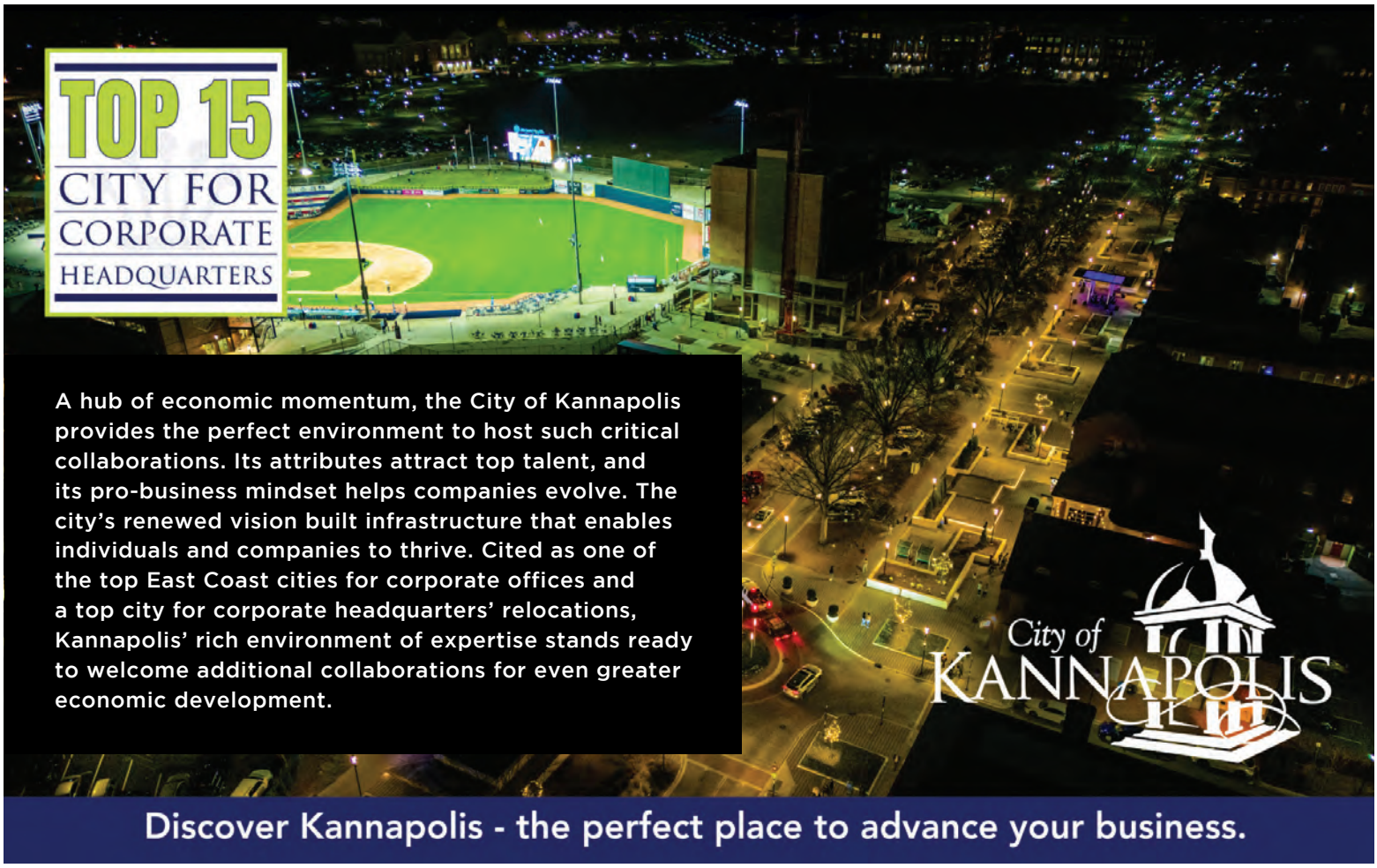
From Dr. Zeisel's research in male reproductive health, SNP Therapeutics has developed a patented genetic test and targeted nutrition treatment for males with a specific sperm function disorder. The company completed a clinical study with Boston IVF in 2024 and plans to initiate a treatment study in 2025. Within the Boston IVF clinic, 21% - 40% of the men were identified with the genetic signature causing this sperm function disorder. In the treatment study, men with this signature will be treated with the proprietary nutritional formula to improve or reverse the sperm function issue to validate similar human outcomes as were seen in the preclinical work.

Future plans have been developed to launch genetic tests in the areas of MASLD (fatty liver) and Muscle Wasting – Sarcopenia. The company's Precision Nutrition approach is currently being used to develop genetic tests and nutritional interventions for these disease states.

Steve Zeisel, MD, PhD, *Founder, SNP Therapeutics*

Jon Kleu, *CEO, SNP Therapeutics*

Beaconpoint Labs is proud to be a vital part of the North Carolina Research Campus, providing specialized laboratory testing for food, beverage, ingredient, supplement, and pet food products in the local community and beyond. With a foundation built on fearless transparency and relentless discovery, we deliver precise, reliable lab testing data to businesses, academic institutions, and innovators to support the quality, safety, and compliance of their products. Our ISO 17025 accreditation reflects our commitment to excellence, ensuring that every test meets the highest industry standards.Through steadfast collaboration, we work alongside researchers and industry leaders to drive innovation in nutrition analysis, microbial safety testing, regulatory compliance, and more. As part of the dynamic ecosystem at NCRC, Beaconpoint Labs is dedicated to advancing lab testing and analytical methodologies, empowering organizations with the insights they need to bring safe, high-quality products to market. Please reach out to us with any lab testing needs or questions—we are here to help.



A hub of economic momentum, the City of Kannapolis provides the perfect environment to host such critical collaborations. Its attributes attract top talent, and its pro-business mindset helps companies evolve. The city's renewed vision built infrastructure that enables individuals and companies to thrive. Cited as one of the top East Coast cities for corporate offices and a top city for corporate headquarters' relocations, Kannapolis' rich environment of expertise stands ready to welcome additional collaborations for even greater economic development.

Discover Kannapolis - the perfect place to advance your business.

THE NC RESEARCH CAMPUS CATALYST GROUP

The NC Research Campus Catalyst Group is composed of undergraduate and graduate students, post docs, and early career researchers.

The group hosts and supports multiple events annually that are open to all universities and companies across the NCRC. It is an extraordinary opportunity for professional skill-building workshops, networking events, annual campus symposium, and social events.

The Catalyst Symposium Poster

Rowan-Cabarrus Community College

THE ROWAN-CABARRUS FACILITIES AT THE NORTH CAROLINA RESEARCH CAMPUS support education and workforce development in healthcare, biotechnology and advanced technology. With state-of-the-art labs and classrooms, including the Dr. Carol S. Spalding Advanced Technology Center, the College offers hands-on training in high-demand fields. These programs equip students for careers that advance scientific research and strengthen health outcomes across the community.

KEY FINDINGS

BIOWORK & ASEPTIC PROCESSING PROGRAM

A new Aseptic Processing program is launching at Rowan-Cabarrus, designed to support careers in high-growth sectors like biotech and pharmaceutical manufacturing. This effort aims to meet regional workforce demands and ensure students are ready for specialized industry roles. It reflects the College's commitment to workforce readiness and innovation in emerging health-related fields.

EXPANDED NURSING PROGRAM

Rowan-Cabarrus is equipping more nursing students to go into our community and meet the ever-growing healthcare needs of this area. The College recently expanded its Associate Degree in Nursing program by increasing enrollment and launching a new evening cohort to provide greater access and flexibility for working professionals. These changes help ensure that more students, regardless of their schedules, can pursue a meaningful and impactful career in nursing. The program has also established a new partnership with the UNC Chapel Hill Nutrition Research Institute, allowing researchers to collaborate with faculty and enhance the nursing curriculum through targeted seminars and clinical activities.

ENGINEERING & ADVANCED MANUFACTURING

Rowan-Cabarrus continues to expand opportunities in cutting-edge industries by developing talent for roles that support innovation and precision-based production. In 2024, the College deepened its impact in engineering and manufacturing through upgraded equipment, industry-aligned instruction, and career-focused pathways that meet the evolving needs of employers. The Advanced Technology Center at the North Carolina Research Campus also served as a key training site for global leaders Okuma and RJG Inc., where students gained direct access to world-class instruction in CNC machining and injection molding. These partnerships strengthen the region's position as a competitive force in advanced manufacturing on a global scale.

Carol Spalding, EdD, *President of Rowan Cabarrus Community College*

Duke Kannapolis is a foundational part of the Duke Center for Precision Health (CPH).

The CPH vision is to harness the power of genomic, biomarker and health data to transform patient care and population health.

Duke Kannapolis functions to accelerate precision genomics and population health research with a large, diverse community of engaged research participants. A part of the Duke Clinical and Translational Science Institute (CTSI) and CPH, Duke Kannapolis manages a wide variety of research projects focusing on the exploration, discovery, and validation of biomarkers that will inform a deeper understanding of health and disease. Founded in 2007, Duke Kannapolis has enrolled over 15,000 participants using a successful community-engaged research model.

Duke Clinical & Translational Science Institute

Center for Precision Health

NORTH CAROLINA RESEARCH CAMPUS

Appalachian State University

HUMAN PERFORMANCE LAB: **The mission of the Human Performance Laboratory (HPL) is to investigate unique nutritional products as countermeasures to exercise- and obesity-induced immune dysfunction, inflammation, illness, and oxidative stress.**

KEY FINDINGS

In a collaborative study funded by Standard Process with UNC Greensboro, we showed that intake of a **beet-based supplement** during a two-week period **helped counter inflammation** caused by intensive and prolonged cycling.

- *Nieman DC, Sakaguchi CA, Williams JC, Mulani FA, Suresh PS, Omar AM, Zhang Q. Beet supplementation mitigates post-exercise inflammation. Front Nutr 2024; 11:1408804.*

This collaborative study with NCSU and UNC Greensboro showed that **consuming 1 cup of blueberries daily over an 18-day period enhanced the inflammation resolution process** following a "weekend warrior" exercise session in untrained subjects.

- *Nieman DC, Sakaguchi CA, Pelleigrini M, Thompson MJ, Sumner S, Zhang Q. Healthy lifestyle linked to innate immunity and lipoprotein metabolism: a cross-sectional comparison using untargeted proteomics. Sci Rep 2023;13:16728.*

In a collaborative study with investigators from UNC Chapel Hill, UNC Greensboro, and UCLA, **adherence to recommended lifestyle habits was linked to improved immune function** as assessed with proteomics.

- *Nieman DC, Sakaguchi CA, Pelleigrini M, Thompson MJ, Sumner S, Zhang Q. Healthy lifestyle linked to innate immunity and lipo protein metabolism: a cross-sectional comparison using untargeted proteomics. Sci Rep 2023;13:16728.*

David C. Nieman, PhD, DrPH, FACSM
Professor & Director, Appalachian State University Human Performance Lab

North Carolina A&T State University

CENTER FOR EXCELLENCE IN POST-HARVEST TECHNOLOGIES:

The Center focuses on discovering better ways to preserve or process fruits and vegetables to prevent disease, enhance health, and increase value of North Carolina agriculture by finding better ways to retain freshness, preserve health-promoting compounds and nutrients, and make food safer for consumption.

KEY FINDINGS

Microbial survival models are indispensable in food processing calculations and control, ensuring compliance with stringent food safety and quality standards. The traditional modeling method, which is based on differential equations, is not convenient. **Machine learning, as a rapid-growing tool, has been successfully used in various applications.** In this study, our lab applies machine learning (ML) models to calculate microbial survival curves during both thermal and non-thermal food processing. The ML method provides an accurate and convenient way to predict microbial models.

- *Li B, Zhu S, Chen G. 2024. Machine learning for calculating microbial survival curves during thermal processing from data obtained under constant conditions with come-up times, Conference of Food Engineering 2024 (CoFE 24), August 25-28, 2024, in Seattle, WA.*

To continue their efforts in developing nutritional regimens that use food as medicine to prevent chronic diseases, the Sang lab discovered that **a bioactive compound in apples can detoxify reactive lipid peroxidation products**. This finding provides scientific evidence and mechanistic insights into the adage, "An apple a day keeps the doctor away."

- *Djorgbenoo, R.; Wang, W.; Zhu, Y.; Sang, S. Detoxifation of lipid peroxidation aldehyde, 4-hydroxynonenal, by apple phloretin in vitro and in mice. J Agric Food Chem 2023, 71, 10629-10637*

Leonard Williams, PhD, MBA,
Director, Lead Scientist for Food Safety and Microbiology and Professor of Food Sciences

North Carolina Central University

NUTRITION RESEARCH PROGRAM: **The research groups in NCCU/Kannapolis have established unique expertise in zebrafish and mouse models to study hematopoietic disease and cancer biology. Our unique research program facilitates collaborations with researchers from different universities on the NCRC as well as among different university campuses of the UNC System.**

KEY FINDINGS

- This project involved a collaboration between the Research Centers in Minority Institutions (RCMI) Community Engagement Core and two key partners, the NCCU Advanced Center for COVID-19 Related Disparities (ACCORD) and the Health Equity, Environment and Population Health (HOPE) Program (based on the NCRC). Survey data were collected at community events held between January and August 2023 across six different North Carolina counties. A total of 180 people completed the survey. Respondents were predominantly African American or Black (91%) and most were women (79%). Findings from the food insecurity survey show that in the full sample, 48 respondents **(26%) reported that there was a time when they did not have enough food to feed everyone in their household during the previous seven days**. In addition, NCCU HOPE @ NCRC has sponsored or co-sponsored ten community events in seven counties that were attended by over a 1,000 persons. These have included medication assistance events in Gaston, Stanly, and Mecklenburg, fresh food giveaways in Cabarrus, and listening sessions in Rowan County.

Faye Calhoun, PhD, *Interim Director, North Carolina Central University*

- *European Society of Medicine (Lorraine C Taylor, Seronda A Robinson, William Pilkington and Irene A Doherty et al. Food Insecurity in the Rural South in the Wake of the COVID-19 Pandemic. Medical research archives. 2023. Vol. 11(12). DOI: 10.18103/mra.v11i12.4593*

North Carolina State University

PLANTS FOR HUMAN HEALTH INSTITUTE: The NC State Plants for Human Health Institute uses a transdisciplinary approach to drive its research efforts toward the discovery and translation of the links between plant compounds, disease prevention, and health maintenance. NC State Extension provides a bridge to the community through K-12 STEM education and healthcare-focused outreach.

KEY FINDINGS

AN ACCELERATED AGING PROCESS FOR DISTILLED SPIRITS

When an aged whiskey or rum hits your palate, you are tasting a years-long process. After fermenting and distilling, the astringent, clear liquor is stored in a wood barrel where it develops its amber-to-dark brown color and flavors from the wood tannins. The tannins are also to thank for mellowing the harsh flavors of alcohol. High-end rum and whiskey may sit in barrels for years, sometimes decades.

- *Invention Disclosure D2021-0076: "Clean Label Accelerated Aging Process for Distilled Spirits"*

Assistant Professor Marvin Moncada is unraveling the mysteries of aging spirits, to develop smooth-tasting rum and whiskey in a fraction of the time. "**We are aging rum in 21 days, and it is the equivalent of a 5-year-old rum in flavor and alcohol level,**" says Moncada. "And it tastes amazing."

- *Adapted from CALS Magazine, 2023*

Moncada—a native of Honduras—came to NC State's Department of Food, Bioprocessing and Nutrition Sciences with a research focus on creating functional ingredients and food products by upcycling wasted raw materials and byproducts. This includes but is not limited to plant-based protein concentrate production, rare sugar recovery, lipid recovery, and bioactive extraction.

Dr. K.P. Sandeep, *Interim Director, Plants for Human Health Institute, North Carolina State University*

In his lab at the Plants for Human Health Institute, Moncada started testing half-liter samples with a water-bath method using a low temperature to retain volatile compounds that are sensitive to heat. He also adjusted natural light, LED light, and a blend of wood to speed the aging process and develop flavor. "In collaboration with Dr. Slavko Komarnytsky's lab, we used gas chromatography to identify the compounds, so we know how the chemistry changed."

Now Moncada is working on scaling up the process. He hopes to run larger experiments and further test the patent-pending process. "The cost of aging spirits is significant, and handling large volumes creates strategic problems as the demand for spirits increases," Moncada explains. "The accelerated aging methodology is a sustainable process that involves the use of naturally occurring, energy-efficient, environmentally friendly processes and avoids the use of chemical reagents."

University of North Carolina at Chapel Hill

UNC NUTRITION RESEARCH INSTITUTE: The UNC Nutrition Research Institute is committed to conducting innovative basic and translational science studying precision nutrition, how individual differences in requirements and responses to diet affect our individual nutritional needs. We believe that our advances in nutrition science are leading to successes in preventing or mitigating the negative effects of chronic diseases and aging, and in improving human development, even prior to conception.

KEY FINDINGS

BREAKING BARRIERS IN CANCER TREATMENT: OVERCOMING DRUG RESISTANCE

Cancer cells' resistance to chemotherapy poses a significant challenge in treatment. Dr. Blake Rushing's lab at the NRI is tackling this by identifying how cancer cells change to evade drugs. **Their research has uncovered key differences between drug-resistant and drug-sensitive cancer cells, which can guide the development of more effective treatments**. For example, they found unique patterns in how resistant cells process vital molecules and survive stress. These insights are crucial for creating new strategies to combat drug-resistant cancers, offering hope for improved therapies and outcomes for patients.

By identifying specific changes in molecular networks and metabolic pathways, this work highlights new potential targets and strategies, paving the way for developing new treatments for drug-resistant cancers.

RESEARCHERS IDENTIFY MOLECULAR INDICATORS OF HEALTH

Researchers from the NRI and three other NCRC institutes focused on identifying indicators of good health. They compared two groups: one with healthy habits, such as regular exercise and a balanced diet, and another with less healthy habits, including being overweight and having a poor diet. **Researchers found that the healthy group had lower levels of immune system activity and fewer harmful substances. These unique metabolic profiles, or biosignatures, were linked to a lower risk of chronic diseases.** The findings show that measurable factors, reflecting lifestyle choices, can provide valuable insights into overall health and monitor the effects of lifestyle changes.

Specific metabolic signatures reflecting body composition, diet, and physical activity can serve as biomarkers for assessing overall health and monitoring lifestyle changes.

- *Rushing, BR (2023). "Multi-Omics Analysis of NCI-60 Cell Line Data Reveals Novel Metabolic Processes Linked with Resistance to Alkylating Anti-Cancer Agents." Int J Mol Sci 24, 13242.*
- *Rushing, BR (2023). "Unlocking the Molecular Secrets of Antifolate Drug Resistance: A Multi-Omics Investigation of the NCI-60 Cell Line Panel." Biomedicines 11, 2532.*
- *Rushing, BR, Molina, S and Sumner, SJ (2023). "Metabolomics Analysis Reveals Altered Metabolic Pathways and Response to Doxorubicin in Drug-Resistant Triple-Negative Breast Cancer Cells." Metabolites 13, 865.*

Deborah Tate, PhD, *Interim Director, Professor of Nutrition and Health Behaviors, UNC Nutrition Research Institute*

University of North Carolina at Charlotte

BIOINFORMATICS RESEARCH AND SERVICES: Researchers from UNC Charlotte's Bioinformatics Services Division and the Department of Bioinformatics and Genomics work at the intersection of computer science and biology to develop the tools and resources necessary for analyzing large, complex datasets in order to answer critical biological questions.

KEY FINDINGS

Yeasts are microscopic fungi that have existed for the last ~400 million years. Yeasts play diverse roles in our world—they are human pathogens, infect crops, support our gut health, make biofuels and medicine, inhabit the oceans, and are used to make bread, beer, and wine. The Y1000+ Collaborative (http://y1000plus.org) was formed to study how and why the over 1,000 known yeast species have evolved such incredible diversity. Abbe LaBella, PhD., a member of the Y1000+ group, recently published a paper in which they **identified genetic factors that differentiate yeasts that can eat lots of different carbon sources from those that can only eat a few** (Opulente, LaBella, et al. Science2024.) This analysis was made possible through the genome sequencing of 1,154 yeast strains. In her lab, Dr. LaBella is utilizing this dataset to explore other facets of yeast genetic diversity, such as the role of "silent" genetic changes and the dynamics of translation from RNA to proteins. They recently published a paper, led by a former Master's student, Bryan Martinez, on the diversity of "silent" genetic changes (Martinez, et al. G3 2024). The LaBella lab continues to use both experimental and computational methods to learn more about the amazing diversity of yeasts.

The data and analysis of Dr. Liz Cooper's lab, exploring comprehensive changes in gene expression across sorghum development were highlighted in the recent release of the JGI Plant Gene Atlas, which is a new public resource for plant genomics designed to improve our understanding of plant genes and pathways across species. Our study on sweet sorghum development across tissues was one of those featured in the article demonstrating the utility of this resource for gaining a deeper understanding of plant gene regulation.

Citation: Sreedasyam, A. et al. JGI Plant Gene Atlas: an updateable transcriptome resource to improve functional gene descriptions across the plant kingdom, Nucleic Acids Research, Volume 51, Issue 16, 8 September 2023, Pages 8383–8401 https://doi.org/10.1093/nar/gkad616

- *Opulente DA, LaBella AL, et al. Genomic factors shape carbon and nitrogen metabolic niche breadth across Saccharomycotina yeasts. Science. 2024 Apr 26;384(6694):eadj4503. https://www.science.org/doi/10.1126/science.adj4503*
- *Zavala B, et al. Genomic factors shaping codon usage across the Saccharomycotina subphylum. G3: Genes, Genomes, Genetics. 2024 Aug 30:jkae207. https://doi.org/10.1093/g3journal/jkae207*

Cory Brouwer, PhD, *Director, UNC Charlotte Bioinformatic Services and Professor of Bioinformatics and Genomics*

University of North Carolina at Greensboro

CENTER FOR TRANSLATIONAL BIOMEDICAL RESEARCH: The UNC Greensboro Center for Translational Biomedical Research conducts basic and translational research in the area of liver diseases and diabetes. Our research is primarily focusing on the mechanisms and development of therapeutic approaches for treatment of alcohol-induced liver disease. We also focus on developing bioanalytical tools for systemic biological investigation of diabetes and early biomarkers of diabetic complications.

KEY FINDINGS

Alcohol consumption enhances hepatic bile acid synthesis and causes a systemic elevation of bile acid levels. However, the causal relationship between bile acid accumulation and organ damage remains unclear. **We demonstrated that administration of bile acid sequestrant, cholestyramine, effectively reversed alcohol-induced bile acid accumulation along with amelioration of liver damage in mice.** Administration of cholestyramine also reversed alcohol-induced gut barrier disruption and endotoxin translocation to the liver, leading to attenuation of hepatitis. The study suggests that systemic elevation of bile acid levels plays a causal role in alcohol-induced organ damage at the gut-liver axis and removal of bile acids by cholestyramine has therapeutic potential in treating alcohol-associated organ injury.

- *Guo W, Zhong W, He L, Wei X, Hao L, Dong H, Yue R, Sun X, Yin X, Zhao J, Zhang X, Zhou Z. (2024) Reversal of hepatic accumulation of nordeoxycholic acid underlines the beneficial effects of cholestyramine on alcohol-associated liver disease in mice, Hepatol Commun 8, e0507.*

Alcohol consumption perturbs the gut immune barrier and ultimately results in alcoholic liver diseases, but little is known about how immune-related cells in the gut are perturbed in this process. **We investigated the consequences of alcohol exposure to functional proteins by dissecting cells from the crypts and villi regions of mouse small intestine, and found that enhanced alcohol metabolism and reduced bacterial defense in crypts, alongside increased lipid metabolism and apoptosis in villi.** Our work provides a detailed profiling of the proteomic changes in the compartments of the mouse small intestine and aids in molecular-level understanding of alcohol-induced tissue damage.

- *Suresh, P. S., Sun, X., Zhou, Z., and Zhang, Q. (2024) Spatial Proteomics Reveals Alcohol-Induced Damages to the Crypts and Villi of the Mouse Small Intestine, J Proteome Res 23, 1801-1809.*

Qibin Zhang, PhD,
Co-director and Professor, UNC Greensboro Center for Translational Biomedical Research

Zhanxiang Zhou, PhD,
Co-director and Professor of Nutrition, UNC Greensboro Center for Translational Biomedical Research

NC Food Innovation Lab

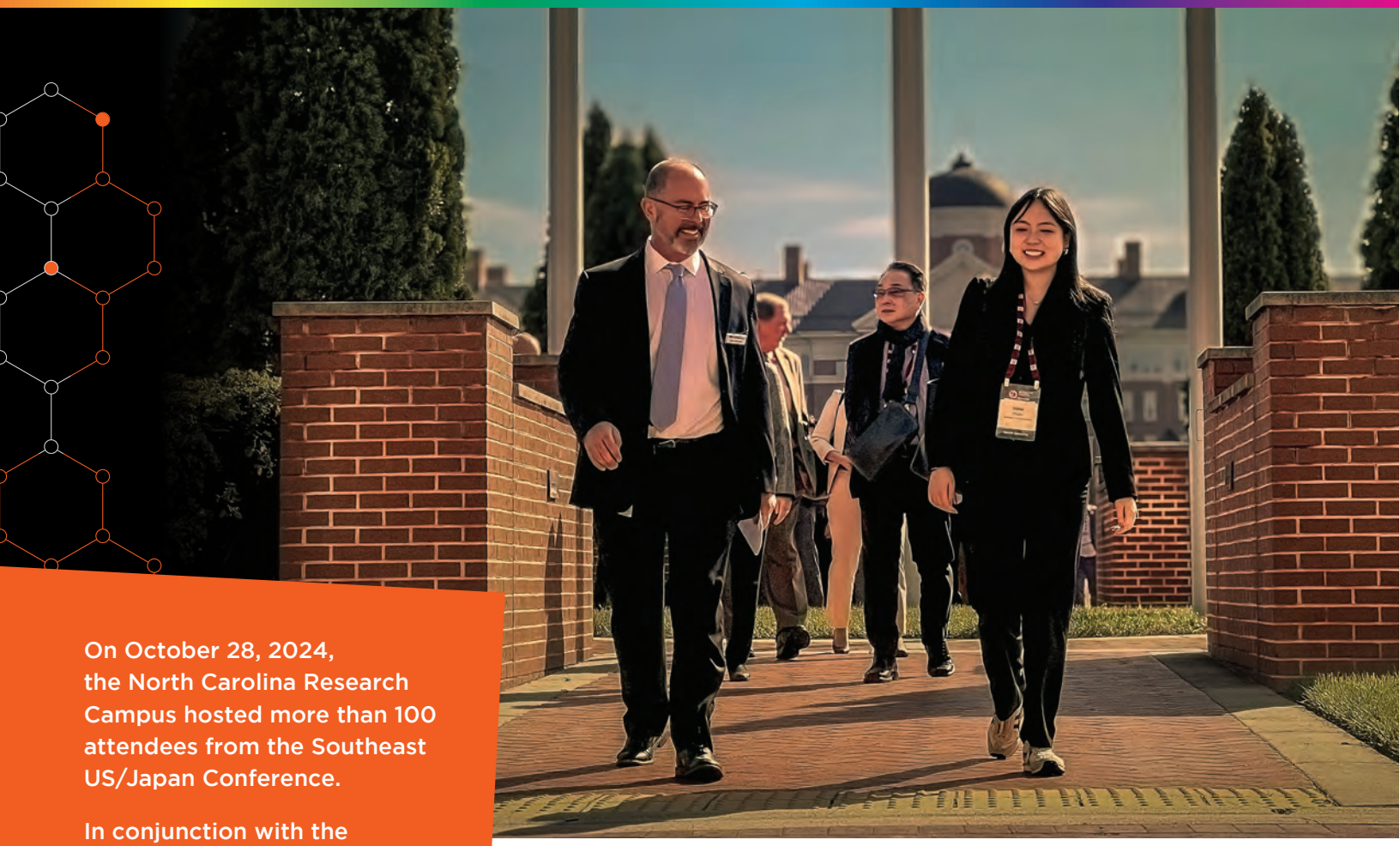
THE PLANT-BASED FOOD INDUSTRY faced serious challenges in late 2022 and early 2023. Product offerings had exceeded demand, and many of the products were not meeting consumer expectations. Those challenges and higher food prices caused consumers to buy plant-based products at a diminished pace compared to previous years.

Julie Mann, PhD, Director, NC Food Innovation Lab

The North Carolina Food Innovation Lab (NCFIL) started with a vision in 2018 to be a recognized leader for economic enhancement through the application of food technology in transformation of raw agricultural commodities to value-added products. While our original attention was devoted to produce grown in North Carolina, NCFIL has attained a global presence with customers to develop and scale-up many agricultural products from plant, animal, and fermentation derived (e.g. algal and fungal) raw materials. Our team continues to accelerate food research, development, and commercialization in a collaborative environment working with industry, entrepreneurs, and other universities. Downswings in the economy, along with rapidly rising commodity costs, have burdened the entire industry. However, this has not dampened the innovative spirit and NCFIL has assisted several new and existing companies this past fiscal year in realizing their targets and dreams.

This past fiscal year NCFIL's efforts assisted with the launch of over 30 new products in the consumer packaged goods space. Several other projects were finalized by NCFIL and are being positioned for launches by our customers. Additionally, our role in characterizing existing and new food ingredients was utilized by several customers and customer partners. We have been successful the past couple of years in establishing customer partnerships wherein they commit to longer term funding of our program that enables the partner access to our team members, equipment, and space to extensively characterize ingredients, develop prototype products to assist our partner for trade shows, or demonstrate the value of their ingredient to their potential customer. In some cases, our team assists our partners in demonstrating and selling new ingredients or products. NCFIL has also assisted several customers in designing manufacturing lines (unit operations) and developing business and strategic plans.

SOUTHEAST US/JAPAN CONFERENCE



On October 28, 2024, the North Carolina Research Campus hosted more than 100 attendees from the Southeast US/Japan Conference.

In conjunction with the North Carolina Department of Commerce, the conference welcomed more than 520 attendees.

Photo above: Dr. Cory Brouwer, Executive Director of Research, North Carolina Research Campus; Professor, Bioinformatics and Genomics and Director of Bioinformatics Services, University of North Carolina at Charlotte, leads visiting delegates into the first session.

Formally known as the 46th Annual Joint Meeting between the Southeast US/Japan Association (SEUS/Japan) and its Japanese counterpart, the Japan/US Southeast Association (Japan/USSE), the conference encourages foreign direct investment (FDI) from Japanese companies and aims to strengthen export ties for North Carolina and other Southeastern companies selling goods in Japan.

Those attending the NCRC OFFSITE session, *New Approaches for Human Health in the Life Sciences*, visited the labs and workforce training spaces at this unique center for life science research, home to eight North Carolina university research teams researching and developing safer, more nutritious crops, healthier foods, precision nutrition, and other research topics. Participants were greeted by the mayor of Kannapolis and had a chance to see Appalachian State University's Human Performance Lab, Rowan-Cabarrus Community College's additive manufacturing facility, UNC Chapel Hill's Nutrition Research Institute, and North Carolina's one-of-a-kind Food Innovation lab.





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