

RESEARCH

HUMAN HEALTH | NUTRITION | AGRICULTURE





THE NC RESEARCH CAMPUS

The North Carolina Research Campus (NCRC) in Kannapolis, just north of Charlotte, is a public-private partnership made possible by the \$700 million investment of David H. Murdock, owner of Dole Food Company, Inc., and Castle & Cooke, Inc., and the North Carolina General Assembly.

The NCRC's collaborative and multi-disciplinary approach to science spans the identification of health-promoting phytochemicals in fruits, vegetables, grains and herbs; exercise physiology; post-harvest physiology; population-based, genetic studies; and personalized nutrition. The growing base of scientific knowledge combines new understandings of how nutrients, the environment and lifestyle choices impact brain and fetal development, cancer, diabetes, obesity, heart disease, fatty liver and other metabolic disorders, all to find new ways to prevent and treat disease and improve the prognosis for human health.

For the people of North Carolina, the NCRC transformed a 350-acre site from a shuttered textile mill into a thriving life science research center that is home to corporate, academic, healthcare and technology partners that jointly share a mission to improve human health, nutrition and agriculture.

EMPLOYMENT

The seven UNC schools at the NCRC—UNC Chapel Hill, NC State, UNC Charlotte, NCA&T, NC Central, UNC Greensboro and Appalachian State University- have created 250 new local jobs encompassing fulltime and part-time positions as well as high school through graduate level interns. The UNC schools have also collectively brought in more than \$60 million in grant funding through the end of FY13. The combined employment associated with the campus is just over 1,000. Fifty percent of these employees were locally hired while the rest have relocated from other states and countries.

ON CAMPUS

Since 2006, over one million square feet of wet lab and Class A office space have been built on the NCRC including the:

- David H. Murdock Core Laboratory Building
- NC State University Plants for Human Health Institute
- UNC Chapel Hill Nutrition Research Institute
- Rowan-Cabarrus Biotechnology Training Center
- LabCorp Biorepository
- Cabarrus Health Alliance
- NCRC Medical Plaza
- Plants for Human Health Institute Greenhouse Complex

The 50,000-square-foot DataChambers data center and the 110,000-square-foot city of Kannapolis municipal center and police headquarters are now under construction and should be occupied in 2015.





DAVID H. MURDOCK CORE LABORATORY BUILDING

The 311,000-square-foot David H. Murdock Core Laboratory is the centerpiece of the NCRC. The core laboratory is home to the David H. Murdock Research Institute (DHMRI), UNC Charlotte Bioinformatics Services Division, General Mills, Monsanto, NCA&T core lab facility and JC Med, LLC, a biotech spin-out of the UNC Nutrition Research Institute that develops and manufactures products to reduce insulin resistance.

DAVID H. MURDOCK RESEARCH INSTITUTE

The David H. Murdock Research Institute (DHMRI) is a non-profit research organization established by David H. Murdock. In September 2014, Mr. Murdock announced a \$15 million annual endowment given in perpetuity to DHMRI. Previously, he invested over \$140.5 million to support the institute's development and growth. DHMRI works with the scientists on the NCRC and collaborates with large and small pharmaceutical, biotech and agricultural companies as well as academic, non-profit and government organizations. DHMRI houses unparalleled scientific expertise and advanced instrumentation in genomics, proteomics, metabolomics, nuclear magnetic resonance (NMR) spectroscopy, microscopy, analytical sciences and bioinformatics.

For more information, visit www.dhmri.org

DUKE UNIVERSITY MURDOCK STUDY

The MURDOCK Study (Measurement to Understand the Reclassification of Disease of Cabarrus/Kannapolis) is a multi-tiered, long-term, community-based genomic study funded by a \$35 million grant from David H. Murdock. The MURDOCK Study, which is a part of Duke University's Translational Medicine Institute, stores the biological samples of its participants from specific zip codes in Kannapolis, Cabarrus, Rowan, Stanly and Mecklenburg counties at the LabCorp BioRepository, located in Kannapolis about a mile from the NCRC. Using advanced technologies such as the study of genes, proteins, and other biomarkers, scientists use the MURDOCK Study samples to uncover at the genetic and molecular level how diseases begin, progress and can be better treated. Already, the MURDOCK Study is breaking new ground in the understanding of and potential treatments for hepatitis C, osteoarthritis, coronary heart disease, multiple sclerosis and other chronic diseases. For more information, visit www.murdock-study.org.





TRAINING

The NCRC is also a training center for the next generation of scientists and medical professionals. Rowan-Cabarrus Community College offers two-year degrees in biotechnology and nursing in their training center that is walking distance from all of the campus' research centers. The Plant Pathways Elucidation Project (P2EP) is a one-of-a-kind, collaborative program that combines the expertise of leading scientists with the campus' university and corporate partners to train undergraduate, masters and doctoral-level students in fields like plant genetics and bioinformatics.

CAMPUS RESEARCH CENTERS AND PARTNERS

- Appalachian State University Human Performance Laboratory
- Cabarrus Health Alliance
- Carolinas Healthcare System
- City of Kannapolis
- Crown Biosciences
- DataChambers
- David H. Murdock Research Institute
- Dole Nutrition Research Laboratory
- Duke University/MURDOCK Study
- General Mills
- JC Med, LLC
- LabCorp Biorepository
- Monsanto
- NCA&T State University Center for Excellence in Post-Harvest Technologies
- NC Central University Nutrition Research Program
- NC State University Plants for Human Health Institute
- Rowan-Cabarrus Community College Biotechnology Training Center
- Sensory Discovery Center
- UNC Chapel Hill Nutrition Research Institute
- UNC Charlotte Bioinformatics Services Division
- UNC Greensboro Center for Translational Biomedical Research



EXAMPLES OF SCIENTIFIC FINDINGS

EXERCISE

Appalachian State University (App State) participated in a study with scientists in China that was published in the *Journal of Sport and Health Science*. The study revealed that in just six weeks diet and exercise caused weight loss in obese children and lowered their blood pressure, cholesterol, insulin resistance and other risk factors for metabolic diseases like diabetes that could emerge later in their lives.

In collaborative research studies between Dole Foods, NC State University Plants for Human Health Institute and App State, an alternate route of bioavailability and a 14-hour, metabolic spike after eating a protein complex enriched with polyphenols from blueberries and green tea was found. The results revealed that exercise helps the body absorb beneficial plant compounds called polyphenols and keeps them elevated in the body for a longer period of time. Additional research found that eating polyphenols before intense exercise may reduce the occurrence of viral infections in athletes. These findings were published in *PlosOne* and *Phytotherapy Research*.

FUNCTIONAL/MEDICINAL FOODS

NC A&T State University Center for Excellence in Post-Harvest Technologies demonstrated in an animal model that the polyphenols in peanut skins can lower lipid (fat) levels in the blood. Lipid levels correlate directly to the incidence of cardiovascular disease. This finding, published in *Food Chemistry*, may lead to a functional food ingredient from peanut skins geared to lowering fat levels in the blood.

Reported in *Brain Research*, NC State University Plants for Human Health Institute

working with Purdue University and Rutgers University demonstrated that anthocyanin and proanthocyanidin compounds extracted from blueberry and grape seeds are effective against the neurodegeneration, or loss of nerve cell function in the brain, brought on by Parkinson's.

NC State scientists developed flours in which peanut proteins were bound with polyphenols from plants like blackcurrant, cinnamon, cranberry and green tea. In animal models, the flours lessened the allergenic effect of the peanuts. The findings were published in the *Journal of Agricultural and Food Chemistry*.

In *Theoretical and Applied Genetics*, UNC Charlotte with NC State University Plants for Human Health Institute reported the creation of a new genetic linkage map designed to facilitate the study of Brassicaceae, which includes plants like broccoli and cabbage.



EXAMPLES OF SCIENTIFIC FINDINGS (CONTINUED)

CANCER AND DISEASE PROGRESSION

NCA&T scientists have published in journals including *Molecular Nutrition*, *Food Research* and *PloS One*, numerous findings about the cancer fighting characteristics of shogaols, a component in dried ginger, and avenanthramides, polyphenols found in oats.

In *Cancer Prevention Research*, a NC Central scientist reported that metformin, a drug commonly used for the treatment of type 2 diabetes, has the potential to prevent HER2/neu overexpressing breast cancer, which is an aggressive form of breast cancer with a poor prognosis that is found in one-third of all human breast cancer cases.

Working together, NC A&T and NC Central University published findings in the *Journal of Agricultural and Food Chemistry* that showed using a zebrafish model that 10-gingerol, a natural compound in ginger, is a potential treatment to prevent anemia caused by chemotherapy or renal disease.

UNC Charlotte Bioinformatics Services Division published in *PloS One* the identity of a set of genes previously not implicated in oxidative stress, a biological process that is involved in aging and apoptosis (cell death), which is an underlying cause of cancer and many other chronic diseases.

UNC Greensboro Center for Biomedical Translational Research discovered that zinc deficiency is a risk factor in the development of alcoholic liver disease. Similarly, niacin deficiency plays a role in the development of alcoholic fatty liver disease, and similar to zinc, supplementation can reverse some of the liver damage. These findings were published in *PLoS One* and *Alcoholism Clinical and Experimental Research*.

PERSONALIZED NUTRITION

The UNC-Chapel Hill Nutrition Research Institute reported in the journal of the *Federation of American Societies for Experimental Biology* (FASEB) that folate deficiency can induce premature hearing loss.

UNC researchers published in the *American Journal of Clinical Nutrition* that seven to nine year-olds who eat higher levels of omega-3 fatty acids compared to omega-6 fatty acids have improved cognitive abilities.

The UNC-Chapel Hill Nutrition Research Institute published in the *International Journal of Women's Health* that the essential nutrient choline obtained through food or dietary supplements ensures pregnant women optimal maternal liver and placental function and fetal development, and in *Current Opinion in Clinical Nutrition and Metabolomic Care*, that choline is vital to the physiological pathways involved in proper liver function as well as dysfunction that can lead to fatty liver disease and other disorders.



Transforming Science at the Intersection of Human Health, Nutrition and Agriculture



www.NCResearchCampus.net

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