IFNH

ANNUAL REPORT | 2021

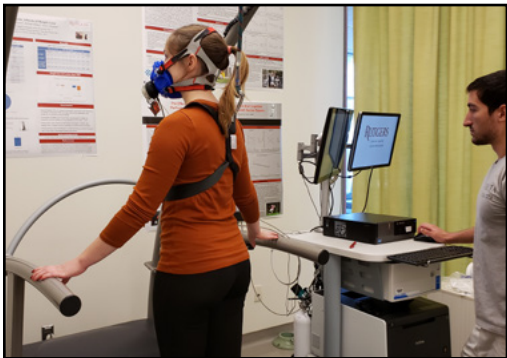RUTGERS

New Jersey Institute for Food,
Nutrition, and Health

NEW JERSEY INSTITUTE FOR FOOD, NUTRITION, AND HEALTH

On behalf of the IFNH centers and programs, we present our annual report for 2020-2021. This has been a challenging year in which, once again, we are learning how we are at the mercy of natural laws, and yet, science has shown its capacity to effectively respond. The COVID-19 pandemic has led to major crises, with nutritional challenges among the most important. IFNH, on par with the rest of Rutgers University, has been resilient and its mission is more relevant than ever.

Maria Gloria Dominguez-Bello
Director, NJ Institute for Food, Nutrition, and Health
Henry Rutgers Professor of Microbiome and Health
Department of Biochemistry and Microbiology and of Anthropology

RESEARCH CENTERS

Center for Human Nutrition, Exercise, and Metabolism **Sue Shapses**

The Center for Human Nutrition, Exercise, and Metabolism (NExT) is designed to examine how to optimize health, body composition, and metabolism through nutrition and novel techniques to improve muscle and bone strength, maximize growth, and delay loss of function associated with aging. Research is the primary focus of the center, which has state-of-the-art testing, performance equipment, and clinical facilities to provide training and test-

ing of body composition, metabolism, diet, and fitness. It serves various populations, including pediatric, adolescent, college age, elderly, sedentary, athletes, and obese individuals to improve their health. Dr. Steven Malin is leading research in the Fitness Facility and has expertise in physical fitness, aging, and cardio-vascular physiology. NExT Center also provides community service that includes testing for body composition, energy expenditure, and fitness with exercise, balance classes, and nutrition education. NExT Center emphasizes the integration of nutrition, health, and fitness to influence public policy and mitigate disease states.

There are two facilities within the Rutgers Center for Human Nutrition, Exercise, and Metabolism capable of testing all populations, from athletes to patient populations for collaborative research, and as a service to the community. chnext@sebs.rutgers.edu

Center for Childhood Nutrition Research **Daniel Hoffman**

The mission of the Center for Childhood Nutrition Research (CCNR) is to improve the health of children through optimized nutrition, increased physical activity, and innovative, evidence-based educational programs. CCNR accomplishes this mission by executing a multidisciplinary program that integrates nutrition education, free play, and research to better understand how the culture of health can be improved and take steps at the state and national levels to improve the health of children. Currently, the center has 20 active members from several Rutgers schools, including nursing, public health, arts and sciences, and environmental and biological sciences. In addition, CCNR includes active members at universities in Kenya, Brazil, and Mexico.

CCNR's essential role in childhood nutrition research is seen in its leadership within the New Jersey Healthy Kids Initiative and in supporting an active child study center where academics from across the university can conduct studies on childhood nutrition, growth, and development in the "Culture of Health Academy." In addition, CCNR formed strong international collaborations to study childhood nutrition and growth in diverse countries such as Mexico, Brazil, and Kenya.

Major accomplishments in 2020 included the convening of a leadership committee for strategic planning, along with several publications now archived on CCNR's website. Most recently, CCNR completed data collection on the microbiome and vitamin A deficiency in malnourished children in Brazil. And, in concert with another IFNH center—RUCAFE, the center completed a pilot study on micronutrient deficiencies and nutrient-dense vegetables in Kenya.

Center for Nutrition, Microbiome, and Health **Liping Zhao**

The center has had a few major activities this year. Two members of the center, Dr. Maria Gloria Dominguez and Dr. Liping Zhao, continue to help lead the Rutgers Big Idea Initiative's Rutgers University Microbiome Program (RUMP). They delivered a speech to a large audience of Rutgers alumni on microbiome in human nutrition and health. This event was well received. The center led the application of Microbiome and Metagenome Center for NIH Nutrition for Precision Health. This is a highly competitive U24 grant. Rutgers' application is among the top candidates, pending final decision. The Center also supported the successful grant application of a National Institute of Health - Centers for Multiple Chronic Diseases Associated with Health Disparities (P50), and five grant applications of center members by assisting with generation of preliminary data. Center members have published more than 25 papers listing IFNH as one of their affiliations. The center also continued the COVID-19 response project and gave technological support to two clinical trials on multiple sclerosis and Parkinson's disease, with nutrition to modulate gut microbiome and alleviate symptoms.

Rutgers Center for Lipid Research

George Carman

The Rutgers Center for Lipid Research (RCLR) promotes multidisciplinary research on the biochemical, biophysical, cellular, and molecular mechanisms involved in lipid metabolism, and extends this information to the underpinnings of lipid-based diseases such as obesity, lipodystrophy, diabetes, and heart disease. RCLR has 41 members (154 total when including students and postdocs) from inside and outside Rutgers. Members are nationally and internationally recognized, are supported by federal grants, and are published in top journals. RCLR fosters interaction among faculty, postdoctoral associates, and students. The center holds monthly research meetings where postdoctoral associates and students present their research and receive constructive feedback in a warm and friendly atmosphere. It also hosts an active seminar series that brings renowned scientists to Rutgers for interactions with RCLR members and the university community. This year's achievements include the seminar program (10 speakers), and monthly meetings (16 speakers). RCLR has supported meeting registration fees for five graduate students/postdocs and provided seed research grants to 11 graduate students/postdocs. Supporters of RCLR include Agilent, Avanti Polar Lipids, BBA-Lipids, BODYBIO, Cayman Chemicals, Genesis Biotechnology Group, Nestlé Skin Health, NeuroLipid Foundation, MilliporeSigma, and Research Diets.

Center for Agricultural Food Ecosystems (RUCAFE)
James Simon

The mission of RUCAFE is to develop novel and innovative food systems leading to increased consumption of safe and nutritious foods that also supports the future of agriculture. From urban rooftops and vertical farming systems to controlled-environment and field cultivation, RUCAFE pursues new opportunities and seeks to provide solutions to critical challenges facing the environmental and economic sustainability of food systems, particularly under the COVID-19 pandemic. There are 24 formal members in RUCAFE, representing 10 departments, four schools, and two campuses, including the New Jersey Agricultural Experiment Station and the New York Botanical Garden. Members have published more than 25 scientific papers. The center launched its official website, established informal partnerships with the Department of Marine and Coastal Sciences, and executed new MOUs with the New York Botanical Garden and the Yap and Pohnpei of the Federated States of Micronesia. RUCAFE was also invited to assist in developing the State of Pohnpei's new food security strategy. Collaboration in the new Rutgers Innovation Design Entrepreneurship Academy (IDEA) initiative was established and formalized. A partnership was also established with the Mirror of Hope CBO in Nairobi, Kenya, on an urban agricultural research and service project assessing a sack garden project with a women's empowerment group. The center supported pilot projects that ranged from food security systems in New Jersey to examining the impact of food security due to COVID-19 in western Kenya. RUCAFE co-hosted the 10th Annual American Council of Medicinally Active Plants virtual conference in June 2021, and hosted two seminars in spring 2021.

COLLABORATIVE INITIATIVES AND PROGRAMS

Culinary Health Program
Peggy Policastro

The Culinary Health Program (CHP) is a collaboration of community partners, academics, student ambassadors, and culinary literacy projects of the New Jersey Healthy Kids Initiative (NJHKI). Community partners provide funding and national exposure for CHP. For example, Wholesome Wave partners with CHP to provide fruit and vegetable vouchers to individuals as part of a NJHKI program, and the Culinary Institute of American collaborates with CHP on the use of olive oil versus butter or cream in sauces. CHP is involved with the Menus of Change University Research Collaborative (MCURC), which includes forward-thinking scholars, food service leaders, executive chefs, and administrators from national and international universities whose mission is cultivating long-term well-being of all people and the planet, one student, one meal at a time. IFNH Student Ambassadors had a successful year with scholarships, awards, and research poster presentations at local, state, and national conferences.

New Jersey Healthy Kids Initiative
Daniel Hoffman

The New Jersey Healthy Kids Initiative (NJHKI) is a partnership between two preeminent institutes at Rutgers: the New Jersey Institute for Food, Nutrition, and Health and the Child Health Institute of New Jersey. It was launched with a $3 million grant from the Robert Wood Johnson Foundation. The mission of NJHKI is to improve child health by conducting evidence-based research, education, practice, and programs in nutrition, physical activity, and culinary literacy. In 2020, NJHKI hosted a virtual symposium, "Systems Approaches to Child Health & Well-Being." NJHKI created and provided a free virtual Food Literacy Summer program for kids. NJHKI team members have produced three published abstracts, seven media interviews, one podcast, five scientific and clinical presentations; have been highlighted and quoted in two articles in the lay literature; and have been invited to provide their expertise on local, state, national, and international committees and councils, such as the New Jersey WIC Advisory Council and the Healthy Kids Healthy Futures New Jersey stakeholder group.

One Nutrition Program
Joshua Miller

One Nutrition is a paradigm within the concepts of One Health and Planetary Health that recognizes food and nutrition as not only essential to human and animal health, but also that human and animal nutrition are interdependent and dependent on a healthy environment. It also recognizes that integrative basic and clinical nutrition research is necessary for establishing responsible public policy that is evidence-based and effective in promoting healthy eating and nutritional awareness. As such, One Nutrition embodies core areas and consilience themes within the SEBS 2020-2025 Strategic Plan **sebs.rutgers.edu/strategic-plan**. One Nutrition seeks to promote interdisciplinary research and education. A primary focus during the COVID-19 pandemic has been on establishing a One Nutrition curriculum in conjunction with RUCAFE and SEBS undergraduate program in Agriculture and Food Systems. To this end, One Nutrition offered in Spring 2021, a 1-credit Byrne Seminar for first-year students titled, "Feeding the Planet: Why We Need a One Nutrition Approach to Food Sustainability," with support from the Rutgers Innovation, Design, and Entrepreneurship Academy (IDEA). This seminar will be offered again in Spring 2022, with the goal of converting it to a 3-credit core course in the 2022-2023 academic year.

Human Health

Veterinary Health

Food and Nutrition

Environmental Health
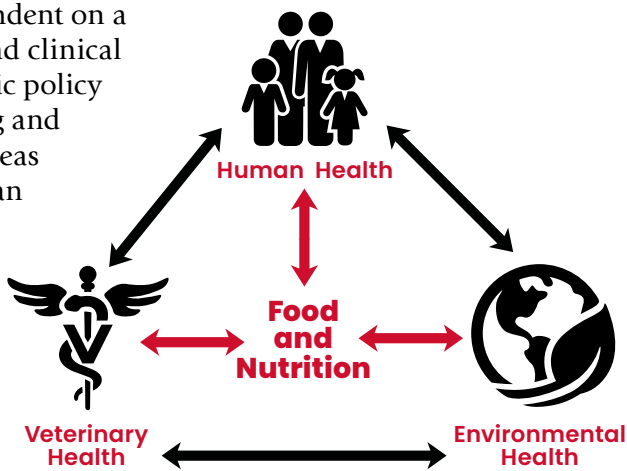
Clinical and Fitness Facilities **Sue Shapses**
The following facilities are components of the Rutgers Center for Human Nutrition, Exercise, and Metabolism.

Clinical Facility

This facility supports research protocols that require patient interviewing, blood draws or other human sample collection, consultations, oral tolerance tests, and group intervention sessions with counseling by a registered dietitian/nutritionist, nurse, physician or other qualified clinical researcher. There is a phlebotomy room, examination room, interview room, and larger clinical space for groups to accommodate both medical and nutrition studies.

Fitness Facility

This facility allows assessments that include VO2max and Exercise Tolerance Test (cardiorespiratory fitness with treadmill); resting metabolic rate (Cosmed Quark CPET metabolic cart); and muscular strength and power. These tests, combined with nutrition or exercise interventions, can be used for research questions, or to customize health and performance goals among the community.

Body Composition and Bone Facility

This facility has instrumentation to measure body composition (fat, muscle, bone) using a segmental analysis. Different instruments estimate body water, resting metabolic rate, and visceral adiposity to determine metabolic risk, and include the dual energy x-ray absorptiometry (iDXA; GE-Lunar), Bod Pod (Plethysmography: Cosmed Model Number 2007A). The peripheral computed tomography instrument (Stratec 3000) measures bone quality for human research and a DXA is available for individuals studying mouse models (PixiMus, GE-Lunar).

ANALYTICAL FACILITIES

Metabolomics
Qingli Wu

IFNH offers bioanalytical, bioavailability, and metabolomics support using state-of-the-art analytical instrumentation in botanical and food product authentication, adulteration, botanical integrity, and food quality. Random non-targeted compound and metabolite profiling is achieved using an Agilent 1290 Infinity II UHPLC (Agilent Technology, Palo Alto, CA, USA) system interfaced with an Agilent 6546 Quadrupole Time-of-Flight Mass Spectrometry (UPLC-QTOF/MS) with an electrospray ionization (ESI) source. MassHunter Workstation software (version B.10.00 Profinder) processes data obtained by UHPLC–QTOF in MS full scan mode. For targeted metabolomic studies, an Agilent 1290 Infinity II UPLC with 6470 Triple Quadrupole MS (UPLC-QqQ/MS) is used to determine range of metabolites in biological samples to support animal and clinical studies. Aromatic volatile compounds and fatty acid analysis is conducted using a Shimadzu TQ8040 GC with Triple Quadrupole MS, NCI, mass spectral libraries, databases, workstation, and a static Headspace Analysis AOC-6000 System with autosampler. There is a new lab for hemp analytics and potency testing using an Agilent 1220 LC for the quantitation of cannabinoids, including total THC and total CBD in support of research and industry needs. Analytical labs, equipped to conduct stability testing, accelerated aging, and metabolomics, are available to support Rutgers faculty and industry.

Lipidomics
Harini Sampath

IFNH houses an Agilent 7890 gas chromatography unit coupled to 5977B MSD for analysis of short-chain and long-chain fatty acids. Specific capacity include quantifying fatty acids from 2-26 carbons long and separating long-chain lipids into different classes, including triglycerides, diacylglycerols, free fatty acids, cholesterol esters, and totalphospholipids. Additional possible separations include phosphatidylcholine, phosphatidy linositol, phosphatidylserine, phosphatidylcholine, sphingomyelin, and cardiolipin. In addition, the Analytical Facility offers a Seahorse XFe24 analyzer for measurement of cellular respiration. This instrumentation enables consultation on experimental design, sample prep, protocol development, analysis and integration of data, and preparation for dissemination, as needed.

Microbiome Core
Guojun (Gary) Wu

The Microbiome Core maintains three laboratories in Lipman Hall, on Cook Campus. These labs are specifically equipped for processing biological samples and microbial culture, genomic DNA extraction, library preparation, and 16S rRNA V4 amplicon sequencing using the Ion GeneStudio S5 System. The core has access to the high-performance computing environment at Rutgers for bioinformatics and statistical analysis. Specifically, the core owns a 2X Intel Xeon Skylake 6130 Node (22M Cache, 2.666 MHz,192 GB RAM, 5 TB storage) of the "condominium style" high-performance computing cluster Amarel, providing high priority and guaranteed access to ensure efficient data handling and analysis. The Microbiome Core uses the QIIME 2 platform for quality filtration and de-noising of the raw sequencing data, which will then be analyzed based on the amplicon sequence variants (ASVs) to assess overall microbiota structure. In-depth data analysis includes identifying the ASVs that significantly contribute to outcome measures, performing co-abundance group analysis to identify guild-like structures among the key ASVs, and dissecting their relationships with host phenotypes.

SERVICES

Culture of Health Academy

The Center for Childhood Nutrition Research hosts the Culture of Health Academy (CHA) in collaboration with the Rutgers Department of Psychology. CHA is an educational research program with the primary mission of providing early education to children in the preschool ages. Secondary to this mission is the educational and research focus of providing high-quality and validated nutrition and health curricula with a parallel research program that is open to all disciplines across the university. Notably, CHA is an operational laboratory with a teaching kitchen that serves academic research across Rutgers.

HARVEST Dining

Due to the COVID-19 pandemic, HARVEST dining venue is closed. There are plans to resume operations once the threat of the pandemic is past.

Strength Training and Conditioning

A Health and Fitness Program is designed for those looking to lose weight, gain lean muscle, enhance physical function, and improve overall health. Rather than endless hours on cardio equipment, cardio classes are short and effective in keeping with established evidence that only 30 minutes of high-intensity activity, three times per week, are enough to improve glucose control and skeletal muscle metabolism in Type 2 diabetics. Classes are designed to improve exercise capacity and facilitate fat loss, and are conducted in a small group format for 30 minutes. All fitness levels and abilities are welcome.

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

New Jersey Institute for Food, Nutrition, and Health

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IFNH | BY THE NUMBERS

12 funded **UNDERGRADS**

15 funded **GRADUATE STUDENTS**

28 **RESEARCH CONTRACTS**

27 **DONATIONS**

$5.3 MILLION in funding this year

2021 IFNH Funding Sources:	
NIH	2.6M
SEBS	813K
Foundation	650K
USDA	552K
Endowment	535K
Revenue	59K
Industry	45K
Total Funding	**5.3M**
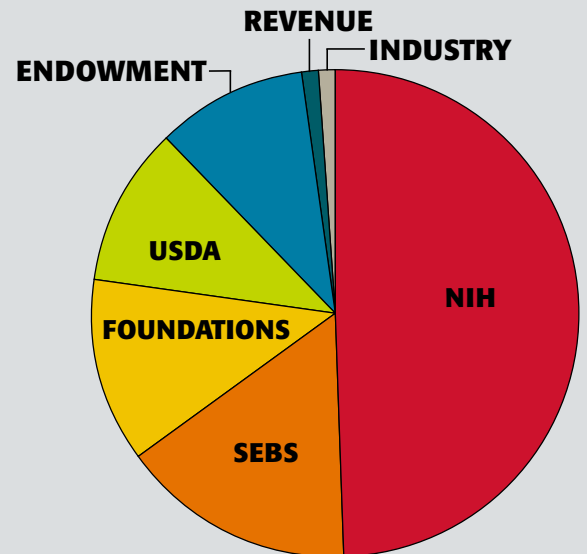
FUNDED STUDENTS

Student Category	Count
Graduate Students	15
Undergraduate Students	12
Grand Total	**27**

RESEARCH CONTRACTS:

Funding Type	Count
NIH	15
Foundation	7
Industry	3
USDA	3
Funding Total	**28**

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