IFNH

New Jersey Institute for Food, Nutrition, and Health

ANNUAL REPORT | 2020

RUTGERS
New Jersey Institute for Food,
Nutrition, and Health

New Jersey Institute for Food, Nutrition, and Health

On behalf of the Directors of Centers and Programs at the IFNH, we are happy to present this annual report for 2019-2020, a productive year ending with new challenges brought by COVID-19, adding to the already existing nutritional challenges our society faces.

This year we at IFNH had the chance to see the fruits of the persistent and effective efforts of Center and Program Directors, significantly increasing the IFNH visibility and impact on SEBS research and education activities spanning from food production and quality to metabolism, microbiome and health.

The effects of the pandemic on food production, consumption, accessibility, and nutrition are substantial, and IFNH will continue using the expertise of our faculty to address the problems and help find optimum solutions.

We acknowledge the administrative and secretarial support of the IFNH Administration team and the support of our School. With the confidence to collectively continue accomplishing the IFNH mission in this coming difficult year.

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

Vision:
To be a world-class academic institute conducting transdisciplinary research aimed at producing nutritious food through sustainable practices, protecting biodiversity, and optimizing human and environmental health.

Mission:
To be the organizational hub facilitating transdisciplinary research at Rutgers University on metabolism, exercise, microbiome, nutrition, and food systems from cells to the ecosystems.

IFNH
COLLABORATION . DISCOVERY . CHANGE

Research Centers

RUCAFE:
Center for Agricultural Food Ecosystems
James Simon

The Center for Agricultural Food Ecosystems (RUCAFE) works to ensure and develop novel and innovative food systems that lead to the availability, access, affordability, and adoption in production of foods to increase consumption of safe and nutritious foods that support 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. In 2020, the 18 members of the center published more than 20 scientific papers, co-edited two of a three-volume special issue series in the Journal of Medicinally Active Plants on African Indigenous Plants and completed an edited volume III with the American Chemical Society on African Natural Products. Center members created an up-to-date website, established three new major partnerships: (i) the New York Botanical Garden, (ii) University of Tahoua and African Development University Niger in a partnership with the High Commission at the Republic of Niger, and (iii) a Micronesia Pohnpei State Governor's Office to explore sustainable food systems. In addition, center members played an instrumental role on the Rutgers Climate Task Force and have come together to develop new projects and alliances building upon a transdisciplinary research approach.

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

The Center for Human Nutrition, Exercise, and Metabolism (NExT) is a new center at the IFNH. It 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: **go.rutgers.edu/xnryapz9**. Research is the primary focus of the center, which is led by Dr. Sue Shapses, whose expertise is in nutrition, obesity, bone physiology, and metabolism. The center has state-of-the-art testing, performance equipment, and clinical facilities to provide training and testing of body composition, metabolism, diet, and fitness. It serves various populations, including pediatric, adolescent, college age, elderly, sedentary, athletes, and obese individuals in order to improve their health.

Dr. Peter Kokkinos is leading research in the Exercise Core 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: **go.rutgers.edu/myq9p871**. NExT Center emphasizes integration of nutrition, health, and fitness in order to influence public policy and mitigate disease states.

Center for Childhood Nutrition Research (CCNR)
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, evidenced-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 18 active members from a number of Rutgers schools, including Nursing, Public Health, Arts and Sciences, and Environmental and Biological Sciences. In addition, CCNR is comprised of active members at universities in Kenya, Brazil, and Mexico.

Research Centers

CCNR's essential role in childhood nutrition research is seen in its leadership within the NJ Healthy Kids Initiative and 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." CCNR has formed strong international collaborations to study childhood nutrition and growth in diverse countries such as Mexico, Brazil, and Kenya.

Major accomplishments in 2019 included the convening of a leadership committee for strategic planning along with several publications as found on our website: **go.rutgers.edu/glj7fjov**

Most recently, CCNR completed data collection on the microbiome and vitamin A deficiency in malnourished children in Brazil and a pilot study on micronutrient deficiencies and nutrient-dense vegetables in Kenya.

Center for Nutrition, Microbiome, and Health Liping Zhao

The center continued to focus on its mission to aggregate multidisciplinary efforts in basic science and clinical research to understand how nutrition and microbiome work together to impact on human health and diseases, and importantly to translate the findings into applications in both the clinical setting and everyday life. A significant milestone this year was the selection of the center's Big Idea Proposal, Preserving and Nurturing our Healthy Microbiome, which was presented in the Big Idea Symposium and was well received by the audience. As a result, it has become the Microbiome Big Idea at the university level after being integrated with all microbiome-related efforts on the Rutgers campus and has developed into Rutgers University Microbiome Program (RUMP) jointly led by Martin Blaser, Maria Gloria Dominguez-Bello, and Liping Zhao. The center supported 12 grant applications of center members by assisting with generation of preliminary data. This year, center members published more than 20 papers listing IFNH as one of their affiliations. The center also started a COVID-19 response project, nutritional modulation of gut microbiota as early treatment for COVID-19 patients with diabetes or prediabetes.

## 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. It extends this information to the underpinnings of lipid-based diseases such as obesity, lipodystrophy, diabetes, and heart disease. RCLR has 39 members (134, when students and postdocs are included) spread across the university, the medical school, and outside of Rutgers. Members have national and international recognition, are supported by federal grants, and publish in high-quality journals. RCLR fosters interaction among faculty, postdoctoral associates, and students, holding monthly research meetings, where postdoctoral associates and students present their research and receive constructive feedback in a warm and friendly atmosphere. The center also has an active seminar series that brings renowned scientists to Rutgers for interactions with RCLR members and the university community. This year's achievements included the Lipids in Health and Disease symposium (seven speakers and 28 posters), seminar program (four speakers), and monthly meetings (11 speakers). RCLR sponsored 11 travel awards to graduate students, postdoctoral associates, and junior faculty. RCLR supporters include Agilent, Avanti Polar Lipids,BBA-Lipids, BODYBIO, Cayman Chemicals, Genesis Biotechnology Group, Nestlé Skin Health, NeuroLipid Foundation, MilliporeSigma, and Research Diets.

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. Community partners provide funding and national exposure for the CHP, including a grant from the Mushroom Council to study preferred cooking forms of mushrooms; community participatory study with Wholesome Wave, a non-profit providing fruit and vegetable vouchers to food insecure families and college students; and the Monday Campaigns, a non-profit organization that uses Mondays as a jump-start to change behaviors. The 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. CHP recently participated in a multi-center research study, "A Randomized Controlled Multisite Intervention for Taste-Focused Labeling," published in the journal Psychological Science (Oct. 2019). IFNH Student Ambassadors had a banner year with research poster presentations at local, state, and national conferences and were recipients of multiple awards based on their work with the Culinary Nutrition Program.
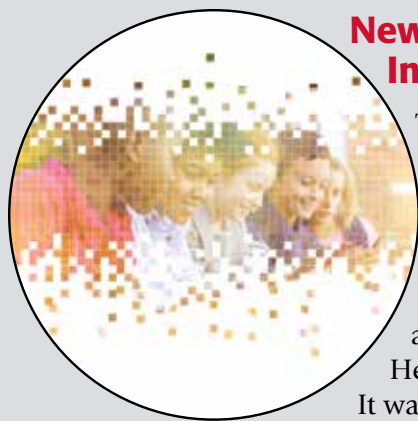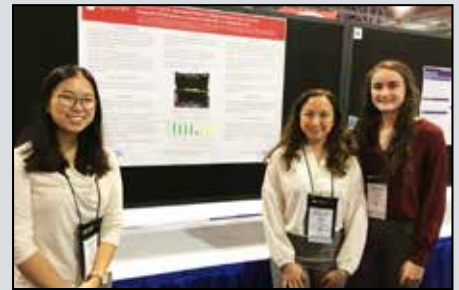
New Jersey Healthy Kids Initiative Daniel Hoffman

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 2019, NJHKI hosted two symposia, "The Healthy Child: Nutrition and Fitness Education for Lifelong Health" and "Big Data and Technology in Child Health." It received $275,000 in grant funding from Wholesome Wave and The Mushroom Council; partnered with three schools, including two school districts, to implement the Culture of Health School program; developed "healthy smoothie" recipes for Horizon Blue Cross Blue Shield that are being distributed at venues and events across New Jersey; and co-hosted a congressional hearing on hunger in New Jersey. NJHKI team members have produced two published abstracts, one book chapter, three media interviews, one podcast, two webinars, eight scientific and clinical presentations; have been highlighted and quoted in three 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 new SEBS 2020-2025 Strategic Plan **sebs.rutgers.edu/strategic-plan**. Within IFNH, the One Nutrition program seeks to promote interdisciplinary research and education. Successes include a pilot grant program that produced several collaborative research publications, presentations, and grants; a one-day symposium; and publication of an editorial in the journal Nutrition Reviews (75(1):1, 2017), thereby establishing the One Nutrition concept in print. Goals for the coming year include publishing a concept paper that expounds the One Nutrition concept, developing a One Nutrition curriculum, hosting round-table discussions geared toward interdisciplinary research, and establishing an annual symposium.
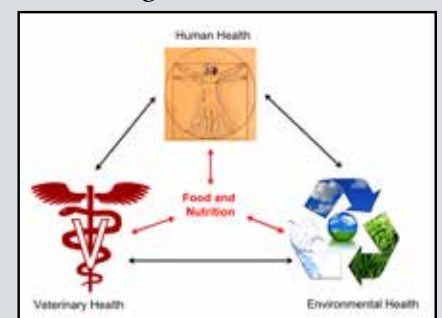
Services

Culture of Health Academy

Within IFNH, the Center for Childhood Nutrition Research hosts the Culture of Health Academy (CHA) in collaboration with the 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 and has been instrumental in obtaining external funding. For example, RWJF funded NJHKI collaborations with the CHA and participated in a number of culinary literacy activities. In fall 2018, CHA installed two aerotower gardens, providing the center with many herbs and vegetables that have been used as additions to snacks and lunches, as well as ingredients in cooking lessons.

HARVEST Dining

HARVEST dining venue continued to provide delicious, natural, minimally processed, organic, antibiotic-free food, with a plant- and grain-centric menu presented under the direction of Chef Ian Keith through March 2020. Chef Keith initiated *"Fridays Jazz"* with live noon performances by students from the Mason Gross School of the Arts. HARVEST was preparing to add *"Classical Wednesdays"* when COVID-19 interrupted plans to explore such unique fusions of arts, culinary trends, and nutrition. These plans are expected to resume once the threat of the pandemic is past.

Clinical Facilities

The clinical facilities within the Rutgers Center for Human Nutrition, Exercise, and Metabolism is ideal for 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, exam room, interview room, and larger clinical space for groups to accommodate both medical and nutrition studies.

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. Contact William Maldonado at **go.rutgers.edu/ww45pc00**.

Technical Cores

Analytical Core

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, and workstation, with 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 includes 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 total phospholipids. Additional separations possible include phosphatidylcholine, phosphatidylinositol, phosphatidylserine, phosphatidylcholine, sphingomyelin, and cardiolipin. In addition, the Analytical Core offers a Seahorse XFe24 analyzer for measurement of cellular respiration. With all instrumentation, services offered include consultation on experimental design, sample preparation, protocol development, analysis and integration of data, and preparation for dissemination, as needed.

Microbiome Core Yan Lam

The Microbiome Core maintains three laboratories in Lipman Hall (Cook Campus), which are specifically equipped for processing of 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 denoising of the raw sequencing data, which will then be analyzed based on the amplicon sequence variants (ASVs) to assess overall microbiota structure. For in-depth data analysis, we will identify the ASVs that significantly contribute to outcome measures, perform co-abundance group analysis to identify guild-like structures among the key ASVs and dissect their relationships with host phenotypes.

There are two cores 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 go.rutgers.edu/2ulav5i2.

Exercise Peter Kokkinos

The primary assessments 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 customize health and performance goals among community.

Body Composition and Bone Core Sue Shapses

Instruments 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).

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THE STATE UNIVERSITY OF NEW JERSEY

New Jersey Institute for Food, Nutrition, and Health

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IFNH | BY THE NUMBERS

38 funded **UNDERGRADS**

8 funded **GRADUATE STUDENTS**

30 **RESEARCH CONTRACTS**

19 **DONATIONS**

$6.1 MILLION in funding this year

2020 IFNH Funding Sources:	
NIH	3.2M
SEBS	934K
Foundations	917K
USDA	612K
Endowment	209K
Industry	64K
Revenue	138K
Total Funding	**6.1M**

ENDOWMENT REVENUE INDUSTRY USDA FOUNDATIONS NIH SEBS
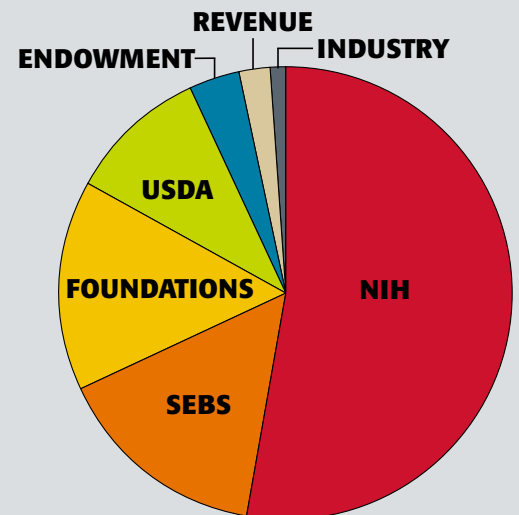
FUNDED STUDENTS

Student Category	Count
Undergraduate Student	38
Graduate Students	8
Grand Total	**46**

RESEARCH CONTRACTS:

Funding Type	Count
Foundations	6
Industry	5
NIH	15
USDA	4
Grand Funding	**30**

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