The Department of Nutrition is one of seven departments in the UNC-Chapel Hill School of Public Health and is the sole department in Public Health that is also part of the School of Medicine. The Department of Nutrition’s mission is to improve and protect the public’s health through teaching, research and practices that foster the best possible nutrition for the people of North Carolina and the world. The Department takes a cell to society approach in its three divisions: Nutritional Biochemistry, Nutritional Epidemiology, and Intervention and Policy. During FY 2015, the Department managed over $28 million dollars in sponsored research funding.

The Department of Nutrition consists of 48 primary faculty, 12 joint and 13 adjunct faculty, an administrative staff of 9, as well as postdoctoral fellows and research staff members. In the Fall of 2015, the Department had enrolled 174 students, including 52 doctoral students, 73 masters’ students and 49 bachelors’ students. The department has over 26,000 square feet of research, office and meeting space, including over 11,000 square feet of laboratory space. The Department is located on the second floor of McGavran-Greenberg Hall, Rosenau Hall and the Michael Hooker Research Center and all three buildings are connected via a sky walk. In addition, the Department leases research space off campus in the Eastowne Office Building nearby in Chapel Hill.

Laboratory

The Department of Nutrition has over 11,000 square feet of laboratory space, including 10,070 square feet in the Michael Hooker Research Center (MHRC), and 4,165 square feet in McGavran Greenberg Hall. Biochemistry trainees are provided lab space as needed to complete their research. The MHRC, open since 2005, contains state-of-the-art laboratory facilities, including tissue culture facilities, a common equipment room, a BSL-3 facility, a histology laboratory, a molecular biology laboratory, a biochemistry laboratory (including HPLC), a microscopy facility, a darkroom, walk-in cold and freezer rooms, and dishwashing and autoclave facilities. The laboratories in McGavran Greenberg Hall and MHRC are connected via a sky bridge, which allows for the sharing of equipment and shared facilities between all of the laboratories in the Department.

Nutrition Research Institute

The Nutrition Research Institute is dedicated to understanding why there are individual differences in metabolism and nutrient requirements. The institute comprises web labs with sophisticated analytic equipment for nutrigenomics; clinical facilities that include examination rooms and equipment, a pharmacy, phlebotomy laboratory, specimen laboratory, consultation rooms, a metabolic research kitchen; and metabolic rate assessment and body composition equipment. State-of-the-art facilities for human nutrition research include the following.

* Metabolic Research Kitchen (1,200 sq. ft.): This facility is utilized to prepare and deliver meals of exact composition. Staff are able to monitor consumption of meals, and to calculate the exact amounts of nutrients, micronutrients, and bioactives delivered. Four independent work stations, each with its own set of tools with the exception of large appliances, which are shared), one Dell Computer for kitchen office (Optiplex 780) and two Dell computers (Optiplex 780 Ultra Small Form) to sync with Ohaus scales (two each); HP Laserjet M3027; Mettler Toledo scales (two daily use scales and one analytical balance); 10 Software: Nutrition Data Systems for Research, ProNutra, ProNessy, Food Processor; Bally walk-in refrigerator/freezer; commercial kitchen appliances.
* Body Composition Laboratory (320 sq. ft.): This laboratory includes Lunar iDXA scanner (GE Healthcare): The DXA scanner’s body composition analysis software enables evaluation of fat mass, lean mass, bone density, and total mass for the entire skeleton and for individual sub-regions; BOD POD (Life Measurement, Inc.) that uses air displacement plethysmography to determine body fat; Xario Ultrasound (Toshiba) used in studies that require determination of fat composition of internal organs.
* Metabolic Rate Assessment Laboratory (250 sq. ft.): This includes two ParvoMedics TrueOne 2400 metabolic carts, one for measuring resting energy expenditure and another for measuring exercise induced changes in energy expenditure; electrocardiogram machine (Quinton), TrackMaster Treadmill; stationary bike (Lode Corival Bike Ergometer).
* Metabolic Chamber (415 sq. ft.): The Advanced Biosolutions Whole Room Calorimeter measures a person’s energy expenditure to an accuracy of within 35 calories per day. This device represents a slight improvement over the metabolic chambers installed at the NIH Clinical Center.
* Phlebotomy Lab and Examination Rooms (1,000 sq. ft.): Dedicated space for blood and urine collection, with a sample processing laboratory with a Thermo Sorvall RT1 Centrifuge; Biolis 24 Chemistry Analyzer with the capability to perform 100 diagnostic chemistry tests. In addition, the institute is the process of purchasing a hematology analyzer.
* Physical Examination Rooms (320 sq. ft.): This includes four examination rooms equipped with Midmark examination tables, sinks, privacy curtains, WelchAllyn Integrated Systems that includes blood pressure cuff, digital thermometer, otoscope, and ophthalmoscope.
* Pharmacy Suite: The 231-square-foot pharmacy suite is a locked room for storage of pharmaceuticals, placebos, or other treatments needed for clinical studies.
* Behavioral Assessment Suite: A networked dual camera to digital video disc system is part of two testing and observation rooms. Two EEG rooms include a 128-channel EGI electrophysiology system, an EGI photogrammetry system, a SmartEye Eye Tracking System, a BioPac System to measure autonomic nervous system functions, an Electric Maze to measure higher-order cognitive function and many elicited imitation props to measure memory. The behavioral assessment suite includes a mother’s room with a hospital grade Medela Breast Pump. There is a spacious play room outfitted with toys, art supplies, and age-appropriate furniture, as well as many high chairs, for effectively conducting behavioral tests on small children.

Diet and Physical Activity Core

The Diet and Physical Activity Core provides multidisciplinary aid to investigators for the purpose of improving and enhancing their dietary assessment research. Services include diet assessment, training and consultation; physical activity assessment training and consultation; body composition assessment; consultation; training on anthropometric measures; mobile body composition; research diet construction; research protocol design; and study implementation and training. Cores are described below:

* Diet Assessment services include diet recalls using the Nutrition Data System for Research (NDSR) 24-hour recalls and the National Cancer Institute’s Automated Self-Administered 24-hour recalls (ASA24); food record analysis (using NDSR); user recipe analysis (using NDSR); menu analysis (using NDSR); food frequency questionnaires; custom development; and administration of food frequency questionnaires.
* Diet Assessment Training services include 24 hour recalls (using NDSR or ASA24) and food records, menu or user recipe analysis.
* Diet Consultation services include consultation for project development; data analysis; database development; choice of biomarkers and write-up for dietary assessment.
* Physical Activity Training services include objective and self-report physical activity monitoring.
* Physical Activity Consultation services include consultation; project development; write up; and post-award assistance and consultation for data analysis and data reduction method.
* Body Composition Assessment services include: DXA; indirect calorimetry; PQcT; Bodpod and Peapod; anthropometric services- stadiometer, skin fold tests, tape measure, scales; and a Bioelectric Impedance Scale.
* Consultation and Concierge services include identifying advantages and disadvantages to help select the best tools; identifying where to find these tools; coordination of other services such as DXA, BodPod ∓ PeaPod; training of anthropometric assessments; height and weight (for adults and children); skinfold assessments; % Body fat regression equations; and circumferences.
* Research Diet Construction services include regular, research, therapeutic, inpatient, and outpatient meals.
* Nutrition Research Protocol Design Consultation services include pre-study consultation; study design; research diet; and methods development; developing menus; testing recipes; and training staff for production procedures.
* Study Implementation and Training services include nutrition counseling, questionnaire administration, screening for study participation, team meetings or training study staff.
* The Nutritional Biochemistry ∓ Molecular Biology Core includes atomic absorption spectrometry, choline and metabolites, molecular biology, nutritional biochemistry and metabolomics.
* Oxidative Stress analysis, including: catalase; glutathione peroxidase; glutathione reductase (GSH/GSSG); superoxide dismutase; lipid peroxidation products; thiobarbituric acid substances (TBARS); oxidized and reduced glutathione; and thioredoxin reductase.
* Inflammation (ELISA OR RIA) testing available includes: C-reactive proteins; E-selection; and VCAM-1 and ICAM-1.
* Cytokines and Adipokines services include: IL-6; IL-6 HS; IL-2; TNF-α; TNF-α HS; and adiponectin.
* Peptide Hormones analyzed include: ghrelin; Insulin; C-peptide; leptin; and prolactin.
* Nutrient analysis includes: vitamin C; vitamin E and ferritin.
* Drug Abuse Tests include testing for: amphetamines; barbiturates; benzodiazepines; cannabinoids; and cocaine metabolites.
* Other Assays including DHEA and urinalysis.
* Choline and Choline Metabolite assays include: choline and metabolites; betaine and fatty acid analysis; phospholipid fatty acids; folate; PEMT (high and low); extract and plate DNA; genotype (RT-PCR); and homocysteine.

NORC Concierge Services

NORC Concierge Services provide consultation support for the development, design and implementation of nutrition and obesity clinical and translational research. This includes: identifying research gaps and developing research plans; connecting investigators to potential mentors and collaborators; assistance with grant proposals, manuscripts and protocol reviews; facilitating development and implementation of pilot project grants; and linking investigators to appropriate services and core facilities on campus.

The NORC Animal Metabolism Phenotyping Core provides access to state of the art phenotyping techniques for metabolism and energy balance in mouse models of nutrition and disease. Services include: study design and implementation; body composition.

* NORC Study Design and Data Interpretation services include expertise on study design, quality control and analysis methods.
* NORC Body Composition services use MRI technology to evaluate whole body composition of live mice without anesthesia, including fat, lean tissue, and free and total water. The MRI also has a tissue probe for organs or samples up to 10 grams and a biopsy probe for samples up to 300 milligrams.
* NORC Voluntary Exercise services include home cage and running wheel compartments. The devise is able to collect months of running distance, time spent running and speed in requested intervals. Data can be converted to day/night total distance, on wheel time and maximum speed. Total food and drink taken during experiments are also available.
* NORC Energy Expenditure services evaluate and interpret energy expenditure using new, state of the art indirect calorimetry from TSE Systems. The system measures O2 consumption and CO2 production, respiratory exchange rate and energy expenditure in the home cage environment.
* NORC Home Cage Activity services evaluate and interpret 3D (X, Y and Z dimension) home cage activity via light beams for up to 10-days using intervals between 1 to 60 minutes.
* NORC Food & Drink Consumption and Behavior measurement for rodents provides three sensors (drinking /feeding) per cage. In addition to simply evaluating food and drink consumption in real time, the system is able to monitor multiple diets or drink combinations and eating behavior patterns.
* NORC Bone mineral density services use a DEXA scanner to measure total bone mineral density (BMD), bone mineral content (BMC) and bone area (BA) are analyzed in anesthetized mice.

Metabolism and Metabolomics Core

The Metabolism and Metabolomics Core provides cutting edge nutritional metabolomics services, biochemistry methods, and molecular biology techniques for nutrition research. The goals of the core are to encourage and facilitate the use of biomarkers for nutritional epidemiological and intervention studies and to provide access to state-of-the-art techniques, equipment and cost-effective assays for investigators. The core also provides training for students and postdoctoral fellows. A number of platforms are available for use in the study of endogenous and exogenous compounds that represent the metabolome and the exposome:

* Expert opinion related to study design, sample selection/collection and storage, proposal review and development, manuscript development and review
* Untargeted analysis analytical methods of Ultra High Performance Liquid Chromatography (UPLC) coupled with Mass Spectrometry (MS). UPLC-MS is performed using a variety of orbitrap (Orbi) and time of flight (TOF) mass spectrometry systems for the detection of signals. Innovative methods are used for peak picking and big data analysis in comparison with an in-house library established under conditions identical to the methods used for analysis of the study samples. Signals that do not match the in-house libraries are annotated through the use of literature and publicly available external libraries.
* Nuclear magnetic resonance (NMR) spectroscopy. Signals are assigned to metabolites through library matching, and using the structural information provided by the NMR chemical shift and coupling patterns.
* Targeted Broad Spectrum Metabolite Analysis via NMR and Mass Spectrometry. Quantitative targeted analysis of 188 endogenous metabolites is conducted using the Biocrates Absolute IDQ p180 Kit and LC-MS/MS.
* Cytokine Arrays. High-throughput, relative quantitation analysis is performed using the RayBiotech array.
* Atomic Absorption is used to determine the levels of arsenate, methylated and other organic forms of arsenic in solutions and/or matrices.
* Statistics and Multivariate Data Analysis is used to identify patterns and data trends that show the association of signals with phenotypic responses under investigation. These methods include supervised and unsupervised multivariate analyses, descriptive statistics, hypothesis testing and modeling (e.g., linear and logistic regression, structural equation modeling, random forest models).
* Pathway Analysisis used to map identified signals to biochemical pathways via specialized software, and expert biochemist interpretation.

Computer

The Department of Nutrition provides state-of-the-art computer resources for students, faculty, and staff. Each faculty, staff member, and trainee of the Department is provided a computer for daily use and has access to a wide range of software applications on a network system, including word processing, data base, spreadsheets, statistical analysis, graphics, and electronic mail. Departmental computer resources allow faculty, staff and students to link with University-wide computer facilities and world-wide web. Wireless connectivity is available in all conference rooms and most laboratories and research offices. Conference rooms with projectors, internet access and videoconferencing equipment are available to all faculty and staff. Collaboration through videoconferencing is facilitated within the Department through the use of our Virtual Teleconferencing system as well as BlueJeans Conferencing service which the Department provides access to for all faculty, staff and students.

Office

The Department of Nutrition has almost 3,000 square feet of faculty office space and over 4,500 square feet of office space for research projects. Office space will be provided for all trainees.

Equipment

Examples of laboratory equipment include the following: Lunar Piximus II X-Ray Densitometer, Sorvall WX-80 Centrifuge, Perkin Elmer FIAS-400 Flow Injection System, Roche Lightcycler 480 PCR System, Perkin Elmer Analyst 800AA Spectrometer, Agilent Tech 1100 HPLC System, CEM Mars 5 Microwave Reaction System, Bio-Rad Versa Doc MP4000 Imaging System, Roche Cobas Mira Plus Chemistry Analyzer, Bio-Rad Protean IEF System, Nanodrop 2000 Spectrophotometer, Bio Rad CFX Connect PCR System, Strathkelvin MT200 Respirometry System, Amersham Bioscience UltroSpec 3300 Spectrophotometer, Bio-Rad Icycler Thermal Cycler, Bio-Rad CFX96 PCR System, Amaxa II Nucleofactor, Bio-Rad Icycler IQ PCR Detection System, Beckman Z2 Couter Counter Analyzer, Accuri C6 Cytometer and an Echo MRI-100TM Analyzer.

*Updated: 1/29/21*