Healthy Foods, Healthy Lives Institute | University of Minnesota Driven to Discover℠

Healthy Foods, Healthy Lives Institute
Faculty Research Grants and
Graduate & Professional Student Research Grants
Awarded Spring 2016

FACULTY GRANTS

Grant Category: Prevention of Obesity & Diet-Related Disease

"Reduced Accumulation of Hyaluronic Acid as the Mechanism for Colon Cancer Chemoprevention by Red Wheat"

Amount Awarded: $49,932
Timeframe: September 2, 2016 – September 1, 2017
PI: Daniel D. Gallaher, PhD, Professor, Department of Food Science and Nutrition, CFANS
Co-Investigators: Senay Semsek, PhD, Bert L. D'Appolonia Cereal Science and Technology of Wheat, Endowed Associate Professor, Department of Plant Sciences, North Dakota State University, Fargo, ND
James McCarthy, PhD, Professor, Department of Laboratory Medicine and Pathology, Medical School

Abstract: Whole grain consumption has been associated with a lower incidence of colon cancer in epidemiological studies. However, this association may be due to differences in the type (class) of wheat used in whole grain products rather than whole grains themselves. Red wheat is used exclusively for bread making, which is by far the most common whole grain product consumed. Thus, I have suggested that it is the class of wheat, not whether it is whole or refined wheat, which is the important characteristic for reducing colon cancer risk. We have now conducted several anim al studies that support this view; that is, carcinogen-treated rats fed red wheat, either whole or refined, had reduced markers of colon cancer risk accumulation compared to those fed white wheat or a wheat-free diet. Specifically, animals fed red wheat had fewer number of precancerous colonic lesions (aberrant crypt foci, ACF) and fewer dysplastic ACF, the type of ACF thought to be more likely to progress to a tumor. In addition, the ACF showed less of β-catenin, a biomarker indicative of a dysregulate Wnt signaling pathway that is strongly associated with tumor development, and also decreased protein expression of metallothionein and CD44, two markers of cancer stem cells, in the ACF. We now hypothesize that red wheat reduces accumulation of hyaluronic acid in the extracellular matrix around ACF, which activates CD44, leading to increased cancer stem cells. We propose two experiments that will examine the ability of red wheat to reduce the accumulation of hyaluronic acid in the ACF extracellular matrix, as well as reduce β-catenin and CD44. These studies will confirm our previous findings and extend them by providing a mechanistic understanding for the observed chemopreventive effect of red wheat, and thereby greatly strengthen the case for promoting consumption of red wheat to reduce colon cancer risk.

Grant Category: Food Safety

"Prevalence of Campylobacter and Salmonella in Poultry: High-Resolution, Temporal Dynamics of the Pathogen Populations"

Amount Awarded: $49,981.50
Timeframe: September 2, 2016 – September 1, 2017
PIs: Satoshi Ishii, PhD, Department of Soil, Water, and Climate, CFANS; BioTechnology Institute, CBS

Timothy J. Johnson, PhD (co-PI), Department of Veterinary and Biomedical Sciences, CVM
Dan Knights, PhD (co-PI), Department of Computer Science and Engineering, CSE; BioTechnology Institute, CBS

Abstract: Campylobacter and Salmonella are the most common foodborne bacterial pathogens in the U.S., collectively causing >3 million illnesses/year. The main source of the Campylobacter and Salmonella infections is the consumption of contaminated foods, especially poultry products. To increase food safety and improve human health, it is important to decreases the prevalence and quantities of these human pathogens in poultry products. However, it is not well known how pathogens infect and colonize poultry guts in production farm environment. We aim to better clarify the ecology of infection and colonization of these pathogens in poultry guts and in the production farm environment. We hypothesize that the behavior of Campylobacter and Salmonella in poultry gut (e.g., levels of antibiotic resistance, ability to colonize intestine and compete with gut microflora) is different by strains. To test this hypothesis, we will develop an innovative tool to quantify and sequence multiple virulence factor genes, antibiotic resistance gene, and taxonomic marker genes in high throughput. By using this tool, we will be able to analyze the temporal dynamics of the pathogen populations at strain level in poultry guts without pathogen isolation. The results will be used to identify the environmental factors influencing the emergence of the specific pathogens, thereby contributing to the establishment of the proper farming practices to decrease the prevalence of these pathogens in poultry and to increase food safety. To achieve this goal, we have assembled an interdisciplinary team of scientists who are the leading experts in th e fields of biotechnology, veterinary microbiology, and bioinformatics.

GRADUATE AND PROFESSIONAL STUDENT GRANTS

"Throwing Away That Food?: Impacts of Food Date Labeling and Cosmetic Standards"

Amount Awarded: $7,055.00
Timeframe: September 2, 2016 – September 1, 2017
PI: Vaneesha Dusoruth, Ph.D. Program; Department of Applied Economics, CFANS, Fall 2015 - Fall 2019
Advisor: Hikaru Hanawa Peterson, Professor (Advisor), Department of Applied Economics, CFANS

Abstract: Food waste represents billions of dollars, gallons of fresh water, and barrels of oil wasted annually. In light of increased methane emissions in landfills and rising global food demand, food waste is a significant environmental problem and a public health concern as we face mounting food security issues. Food waste is an issue at home for policymakers, investors, businesses, environmental organizations and hunger - fighting institutions alike. Producers, distributors and manufacturers, retailers, food service providers, as well as households all contribute to the creation of this waste. Studies have shown that consumers, by far, generate the largest proportion of food currently wasted in developed nations. For households, food waste issues emphasize the complex interactions between food security, food safety, and nutrition at home. Public health interventions th at shape the contexts through which food is at risk of wastage is key for sustainable consumption. In this proposed study, we aim to investigate roles of two anecdotally important contributors to food waste by consumers – food product date labeling and cosmetic standards – on consumer behavior regarding food handling. Previous work has demonstrated that alongside with consumer education campaign s and packaging adjustment, standardized date labeling is one of the top three prevention strategies for food waste reduction. However, what is lacking is a thorough understanding of consumer behaviors of food handling in the United States and a rigorous test of proposed and possible solutions to shift wasteful behavior. We plan on conducting surveys with choice experiments and intervention treatments at the Driven to Discover (D2D) building during the Minnesota State Fair with the requested funds. Our driving motivation is to make a meaningful contribution to the ongoing discussion on this high impact issue. The research activities will not only

provide educational opportunities for study participants but also raise awareness of food waste among the Fair goers.

"Contribution of obesity and the microbiome to colorectal cancer progression"

Amount Awarded: $10,000.00
Timeframe: September 2, 2016 – September 1, 2017
PI: Ce (Angelo) Yuan, MS/Ph.D.Program; Biomedical Informatics and Computational Biology (BICB), Spring 2015 - Spring 2020
Advisor: Hikaru Hanawa Peterson, Professor (Advisor), Department of Applied Economics, CFANS

Abstract: Obesity is one of the leading public health concern worldwide. It is linked with increased risk of multiple chronic diseases, one of which is colorectal cancer (CRC). CRC is among the most commonly diagnosed cancers, causing 50,000 death s each year in the US alone. Recent advancements in high - throughput genomic technologies have enabled us to comprehensively and systematically study complex diseases like obesity and cancer. There is rising evidence pointing the microbiome as a major contributor to our wellness. Dysfunction of the microbiome (dysbiosis) has been shown to associate with both obesity and CRC. Excess body weight contributes to as many as 1 out of 5 of all cancer - related deaths and previous reports have linked excess belly fat with increased risk of developing CRC. Mechanisms behind this apparent increase in risk are unclear. Intriguingly, recent reports and our preliminary data in CRC suggest that once patients develop CRC, obesity is associated with longer survival times. Our preliminary data and previous publications also suggest that there is an association between differences in fatty acid metabolism, which is influenced by a patient's microbiome, and CRC progression – likely through changes in the tumor microenvironment. We hypothesize that obesity suppresses colorectal cancer progression, leading to longer survival time, through microbiome - mediated changes to the tumor microenvironment. The results from this proposal will help establish and characterize this connection. Genomics and metabolomics technologies and integrated analysis using bioinformatics tools will be utilized for the outlined study. To our knowledge, this will be the first comprehensive and interdisciplinary study aimed at elucidating the mechanism by which obesity contributes to CRC progression in the context of the microbiome and metabolome. These results should provide novel insights into the mechanisms of CRC progression and set the stage for novel therapeutic strategies and targets, thereby improving CRC patient treatment outcomes.