

Temple University

Annual Progress Report: 2005 Formula Grant

Reporting Period

July 1, 2009 – December 31, 2009

Formula Grant Overview

The Temple University received \$2,034,995 in formula funds for the grant award period January 1, 2006 through December 31, 2009. Accomplishments for the reporting period are described below.

Research Project 1: Project Title and Purpose

A Novel Approach for Targeting Drugs to Tumors - Cancer patients are often treated with radiotherapy, chemotherapy or a combination of both. In most cases, using modern clinical radiotherapeutic techniques, radiation damage can be limited to the tumor and the immediate normal tissue surrounding it. Similarly, it would be ideal for a chemotherapeutic agent or a gene to be delivered only to the cancerous and not to healthy tissue. This project seeks to explore the feasibility of targeting drug carrying particles carrying molecules on their surfaces, which preferentially adhere to other molecules expressed on the vasculature of irradiated tumors. The immediate goal of this project is to provide proof that this therapeutic approach is feasible in animal models of cancer. The long-term goal is to develop a drug delivery scheme to selectively target drug/gene carriers to irradiated tumors in cancer patients.

Duration of Project

5/1/2006 - 2/28/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 2: Project Title and Purpose

A Novel Method for Obesity Control by Fat Cell Apoptosis - The goal of this project is to control the growth and/or cause the death of fat cells in the body by targeted drug delivery. Because fat cells produce enzymes that signal the body to save energy or eat more, most overweight persons who engage in dieting are unable to maintain their weight loss, leading to yo-yo weight behavior. The solution may be to cause the death of fat cells, resulting in a reduction of the production of these enzymes. A current procedure at Temple University, which shows promise in targeting the

death of cancer cells, will be adapted to look for methods of killing fat cells. Animal models will be found for in-vivo tests of these methods.

Duration of Project

1/1/2006 - 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 3: Project Title and Purpose

Serotonin Neuromodulation of Feeding Behavior in Young, Adolescent, and Adult Rats - The purpose of the present experiments is to compare the role of serotonin (5-HT), specifically 5-HT_{2C} receptors, in the development and maintenance of overeating (hyperphagia) and weight gain in weanling, adolescent, and adult rats. It is hypothesized that serotonin compounds will differentially alter weight gain and hyperphagia across the lifespan. Furthermore, the rewarding effects of food in adulthood will be greater in rats that were repeatedly treated with antagonists that block serotonin receptors throughout the weanling and adolescent months.

Duration of Project

1/1/2006 - 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 4: Project Title and Purpose

The Role of Exposures during Gestation and Subsequent Child Health - The goal of this investigation is to determine if cigarette smoking during pregnancy, confirmed by urinalysis results, is an independent risk factor for obesity in the offspring. If significant findings are reported, these data will provide additional evidence for fetal life as a critical period in the development of obesity. In addition, evidence of the role of maternal substance use during pregnancy as a risk factor for obesity in the offspring may be a strong motivator to stop smoking before or during pregnancy. This may lead to tremendous public health benefit, both for the children and the mother.

Duration of Project

1/1/2006 – 2/29/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 5: Project Title and Purpose

Electrophysiological Correlates of Action Perception and Imitation in Children - A current theory in psychology is that when someone observes an action carried out by someone else, particular brain areas in the observer are activated that are associated with planning or carrying out that same action. This “mirror neuron system” may enable people to understand another person’s actions by mapping those actions onto their own stored representations of the same actions. Recent research has suggested that the activity of specific parts of this system may be dysfunctional in individuals with autism. The project aims to test this hypothesis in autistic children using electroencephalographic (EEG) techniques. If this hypothesis is confirmed, this may help to explain the neurobiological and psychological basis of certain aspects of the social deficits that are exhibited by many autistic children.

Duration of Project

1/1/2006 - 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Infrastructure Project 6: Project Title and Purpose

Electronic Research Administration (ERA) Infrastructure Project: Phase II - Proposal Development and Laboratory Animal Management - This project represents the second phase in establishing a new electronic research administration system to meet all new and emerging Federal requirements for electronic commerce in grants administration, as well as to improve the efficiency and functionality of the University’s current research enterprise, including proposal development, award tracking, budgeting, compliance, and regulatory processes.

Duration of Project

1/1/2006 - 12/31/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 7: Project Title and Purpose

Interactions of AIF-1 with Signal Transduction Proteins - Our laboratory has shown that AIF-1 is a protein not present in normal arteries, but is expressed at high levels in injured and atherosclerotic human arteries. Through experiments over the last several years, we have developed a hypothesis that AIF-1 is an inflammation-responsive signaling protein that plays a central role in regulation of VSMC activation and development of neointimal hyperplasia.

Duration of Project

1/1/2006 - 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 8: Project Title and Purpose

Role of Tyrosine Kinase Src in the Regulation of Bone Formation and Differentiation - The non-receptor tyrosine kinase Src is one of the key regulators of cell proliferation, migration and differentiation. Deletion of Src gene in mice results in osteopetrotic phenotype (increase in bone mass) suggesting, that Src plays an important role in bone biology. The role of Src kinase is well characterized in osteoclastic bone resorption; however, there is increasing evidence that Src family kinases are also involved in osteoblast function. The proposed study will undertake a comprehensive analysis to evaluate the role of Src kinase in osteoblast function by determining Src kinase activity and expression during normal course of bone formation in mice and by evaluating the role of Src kinase activity in osteoblast differentiation.

Duration of Project

1/1/2006 – 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 9: Project Title and Purpose

Mechanism of E. coli Termination Factor Rho - The broad goal of this work is improved understanding of a fundamental process in gene expression. Transcription termination protein Rho from the intestinal bacterium *Escherichia coli* is a homohexameric protein that releases newly synthesized RNA from transcription complexes. Rho acts through ATP-fueled, directional travel along nascent RNA, achieved by coordination of the RNA-dependent ATPase activity of Rho with RNA binding and release. The molecular mechanism of travel by Rho along RNA is not understood. The goal of this work is to identify critical amino acids in the ATP hydrolysis site of Rho and their roles in the catalytic mechanism. Analysis of selected mutant proteins will establish the identities of active site residues whose roles are suggested by comparison with other ATPases.

Duration of Project

9/1/2007 – 6/30/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 10: Project Title and Purpose

Interactions of Cocaine and Opiates on Addiction Relevant Behaviors in the Rat - The abuse of cocaine and opiate combinations represents a growing subset of intravenous drug abusers. Results from published literature indicate that as many as 63% of intravenous drug abusers report self-administration of both cocaine and opiates such as heroin, morphine, or methadone. Co-administration of cocaine and heroin goes by the street name of 'speed-ball'. This project will investigate the interaction of cocaine and morphine on several addiction relevant behaviors in a rat model. The ability of prior exposure to cocaine to alter the behavioral response to morphine will be determined, as will the ability of prior exposure to morphine to alter a subsequent response to cocaine. In addition, co-administration of cocaine and morphine will be investigated in order to determine if co-exposure results in synergistic behavioral responses.

Duration of Project

1/1/2006 – 12/31/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 11: Project Title and Purpose

Role of Tiam1 in the Effects of c-Cbl on Cells Transformed by Abl Oncogene - The protooncogenic protein c-Cbl exerts a transformation-suppressing effect on cells transformed by Abl, a protein tyrosine kinase oncogene. Our recent studies have identified several other proteins involved in these effects of c-Cbl. One of these is Tiam1, a small GTPase critically involved in the regulation of cell spreading and migration. Neither the contribution of Tiam1 to the effects of c-Cbl nor the molecular basis of the involvement of Tiam1 in the effects of c-Cbl is clear. Given the importance of transformation-suppressing effects of c-Cbl for understanding cancer transformation and treatment, it is critical to decipher the molecular basis of the effects of Tiam1 on c-Cbl-dependent signaling in Abl-transformed cells. This study should advance our understanding of these effects and may suggest novel therapeutic approaches targeting Tiam1.

Duration of Project

1/1/2006 - 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 12: Project Title and Purpose

Chemokines and Chemokine Receptors in the CNS: A Neuro-Immune Link - The purpose is to evaluate the role of chemokines and chemokine receptors in providing a link between the immune and nervous systems through modulating neurotransmitter and neuropeptide systems within the brain. This will provide a better understanding into the cellular mechanisms of chemokine effects in the brain and further our knowledge regarding neuroinflammatory conditions.

Duration of Project

6/13/2006 – 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 13: Project Title and Purpose

The Role of Cbl in Platelet Activation - The major problem being studied is the mechanism of platelet activation by collagen. Collagen activation of the circulating blood cell, the platelet, is a step in blood clotting. Inappropriate activation of platelets can lead to stroke and heart attack. We hypothesize that the protein regulator Cbl plays a key regulatory role in platelet activation by collagen. We will test this hypothesis by complementary biochemical, pharmacological, molecular genetics and cell biological approaches. We will assay activation of platelets using several biochemical and physiological tools. By fully understanding the pathways that lead to platelet activation, new therapies can be developed that will decrease the risks associated with unwanted platelet activation.

Duration of Project

1/1/2006 - 12/31/2009

Project Overview

The most important physiological step that initiates platelet activation is the interaction of platelets with freshly exposed collagen. Two receptors play a primary role in the interaction: 1) The integrin, alpha2 beta1 causes adhesion between platelets and collagen and can also initiate some signaling pathways. 2) Glycoprotein VI (GPVI) is the receptor primarily responsible for activation of platelets that leads to generation of autocooids that recruit additional platelets to the site of injury. Many molecules that play a role in GPVI-dependent signaling have been identified, but the details of how this system is regulated remain obscure. Our overall hypothesis is that c-Cbl and Cbl-b play modulatory roles in the signaling pathways during collagen-dependent activation. We will specifically look at the role of Cbl family members in GPVI-mediated platelet activation using the GPVI agonists collagen, collagen related peptide and convulxin. Our specific aims are the following:

1. We hypothesize that Cbl family members play a key regulatory role in platelet activation downstream of GPVI. We will test this hypothesis by molecular genetics and cell biological approaches, using human platelets and cultured cells as model systems. Preliminary studies show that both c-Cbl and Cbl-b are rapidly phosphorylated upon activation of GPVI in human platelets.
2. Evidence indicates that Syk is rapidly ubiquitinated upon activation of platelets with convulxin. We hypothesize that Src family kinases such as Lyn and Fyn, are also ubiquitinated. We further hypothesize that c-Cbl interaction regulates the activity of these kinases by facilitating dephosphorylation. We will test this hypothesis both by biochemical and molecular genetic approaches.
3. Structural studies of c-Cbl suggest it acts as an adapter molecule. Cbl-b also appears to associate with a series of tyrosine-phosphorylated proteins different than c-Cbl. Preliminary studies show that c-Cbl associates with several tyrosine-phosphorylated proteins including Syk and possibly LAT. Thus we hypothesize that c-Cbl and Cbl-b play a role in platelet signaling by

acting as multivalent adapter proteins. We will test this hypothesis and identify the interacting domains on c-Cbl and Cbl-b using molecular approaches.

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Expected Research Outcomes and Benefits

Platelet activation plays an important role in thrombosis, and the development of better anti-thrombotic agents depends on a thorough understanding of the signaling events in platelets. Collagen is an important platelet activator and activates the important enzyme PLCgamma2 involving the proteins Syk and Src kinase. Despite years of work in the understanding of signaling by collagen, the exact steps involved in the activation of PLCgamma2 after GPVI stimulation are not clearly elucidated. The purpose of this project is to investigate such signaling molecules involved in the regulation of PLCgamma2 activation. It is proposed that proteins called Cbl regulate the activation of PLCgamma2 and are involved in the regulation of Syk and Src kinase activities. The work will define the roles of these Cbl family members in platelet activation and determine the interacting domains on Cbl family members with other signaling molecules. The studies in this project will thus enhance our understanding of the molecular mechanisms of PLCgamma2 activation and the signaling events downstream of GPVI stimulation by collagen. These studies will lead to better therapeutics to treat thrombotic diseases.

Summary of Research Completed

Since TULA is not well expressed in platelets whereas TULA-2 is very strongly expressed, it is reasonable to assume that the phenotype of TULA dKO platelets is due to the absence of TULA-2. Additionally, TULA-2 is a more active phosphatase than TULA. Recently, Alex Tsygankov backcrossed the TULA dKO mice on a C57BL/6 background and selected for mice that were single knockouts of either TULA or TULA-2. After 10 backcrosses sKO TULA and sKO TULA-2 mice were obtained. In order to confirm our hypothesis that the phenotype of the dKO platelets is due to the absence of TULA-2, we characterized aggregation, secretion, and Syk phosphorylation in each single KO.

Figure 1 shows a comparison of aggregation and secretion in wild type, TULA^{-/-} and TULA-2^{-/-} platelets. It is clear that the TULA-2^{-/-} platelets show enhanced secretion and aggregation in comparison to either the WT or TULA^{-/-} platelets. TULA^{-/-} platelets show comparable activity to WT platelets. Syk phosphorylation time courses show that TULA-2^{-/-} platelets are similar to the

TULA dKO platelets, in that Syk is hyperphosphorylated (*Figure 2*). In TULA^{-/-} platelet Syk phosphorylation is similar to WT platelets.

In order to determine whether dephosphorylation of Syk on other phosphorylated tyrosine residues is catalyzed by TULA-2, we determined the time course of dephosphorylation for another prominent phosphorylated tyrosine of Syk, Y352. *Figure 3* shows that Y352 is rapidly phosphorylated when GPVI-dependent agonists activate platelets. This residue shows much greater levels of phosphorylation in the TULA-2^{-/-} platelets. Phosphorylation of Y352 is sustained indicating that TULA-2 is the major phosphatase regulating dephosphorylation of other residues of Syk as well as pY525/526.

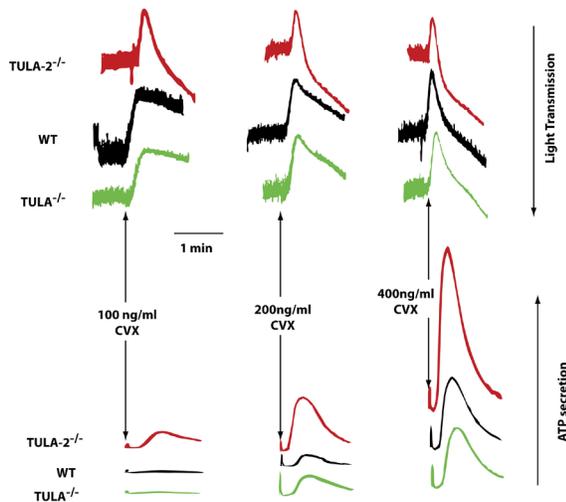


Figure 1 Platelet aggregation in TULA sKO platelets. The red traces are TULA-2^{-/-}; Black traces are WT and green are TULA^{-/-}.

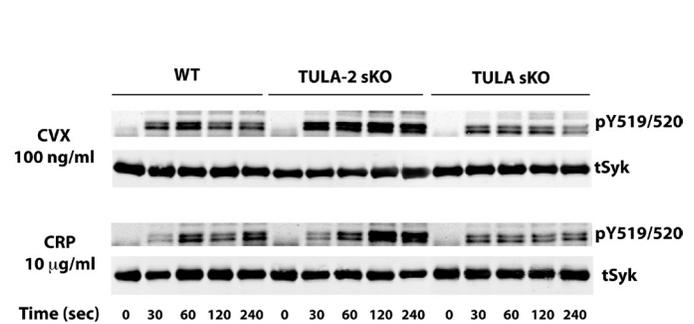


Figure 2 Phosphorylation-dependent activation of Syk in TULA sKO platelets. Platelets were activated as indicated.

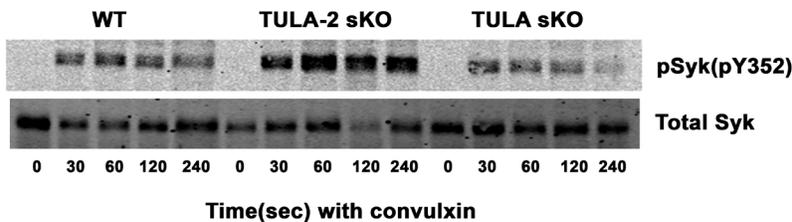


Figure 3 Phosphorylation of Syk tyrosine 352 in TULA sKO platelets, Platelets were activated with 100 ng/ml of convulxin for indicated times

Research Project 14: Project Title and Purpose

Characterization of Phosphatases Regulating Pocket Proteins - The pocket protein family consisting of the retinoblastoma tumor suppressor protein (pRB), p107 and p130 negatively regulates the cell cycle progression, in a manner dependent on tight regulation of their phosphorylation status. We have found that a protein phosphatase 2A (PP2A) holoenzyme plays a role in modulating the phosphorylation status of pocket proteins by reversing the action of CDKs throughout the cell cycle. However, the variable B subunit(s) of the PP2A holoenzyme

that targets pocket proteins is/are not known. The goal of this project is to identify and functionally characterize the pocket protein PP2A (pp-PP2A) holoenzymes or subsets of pp-PP2A holoenzyme that play a role in a dynamic equilibrium with CDKs in the control of the phosphorylation state of pocket proteins during the cell cycle.

Duration of Project

1/1/2006 - 6/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 15: Project Title and Purpose

Characterizing the Regenerative Potential of the Adult Human Heart - Heart disease is the leading cause of mortality in the U.S. causing more than 700,000 deaths annually. The discovery that stem cells can become cardiac myocytes has opened the possibility for cellular therapy as a treatment for heart failure. This project will assess the potential of human cardiac stem cells (CSCs) to differentiate into functional cardiomyocytes. Also, different sized myocytes will be studied to determine if they provide clues about cardiac regeneration in the adult heart. The goals of the project will involve 1) cloning and differentiating CSCs expressing the surface receptor c-kit from normal and failing myocardium; 2) molecular characterization of c-kit⁺ CSCs to assess their proliferative capacity; and 3) electrophysiologic assessment of CSCs and myocytes for specific ion currents, calcium cycling, and gap-junctional communication with other cells.

Duration of Project

6/13/2006 - 6/30/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 16: Project Title and Purpose

The Role of Implicit Smoking Attitudes and Motivations in Smoking Behavior - A number of models of drug use suggest that automatic or implicit processes play an important role in smoking and drug related behavior. The project will examine a model of implicit social cognition and behavior that combines implicit evaluative and implicit motivational information in the prediction of smoking behavior. Implicit liking of smoking is expected to predict cigarette use (i.e., to discriminate between smokers and non-smokers), while among smokers, implicit

wanting to smoke is expected to predict the degree of cigarette addiction (i.e., to discriminate between light smokers and heavy smokers) and to predict cravings for smoking. These predicted findings have implications for both smoking prevention and smoking cessation programs.

Duration of Project

6/13/2006 - 1/12/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 17: Project Title and Purpose

Pilot Project to Examine Environmental Effects on Heritable Epigenetic Traits - The purpose of the study is to determine whether assisted reproduction technology (“ART”; *in vitro* fertilization or intracytoplasmic sperm injection) increases the possibility of deregulated expression of genes involved in early development. We will examine a type of modification to DNA (DNA methylation) that is involved in regulating gene expression. We will examine DNA methylation over the whole genome by using a “whole genome gene chip.” The incidence of abnormal DNA methylation will be compared between DNA samples from placentas of children conceived by ART and children conceived in the traditional fashion.

Duration of Project

6/13/2006 - 6/30/2009

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 18: Project Title and Purpose

The Treatment of Child and Adolescent Obesity Using a Family Intervention Model - The purpose of this preliminary pilot study is to measure the effect of a Temple family therapy intervention on the BMI of overweight or obese youth and to explore potential mechanisms of change. It is hypothesized that overweight and obese youth participating in this family therapy intervention will decrease their BMI more than a matched control receiving primary care physician intervention as usual.

Duration of Project

6/13/2006 - 1/30/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 19: Project Title and Purpose

Behavioral Mechanisms of Cue Exposure Treatment for Smoking Relapse Prevention: A Feasibility Trial with Bupropion - Nicotine dependence is characterized by multiple cessation attempts and high rates of relapse well after the withdrawal phase of a quit attempt. This study is designed not only to test the feasibility of an innovative application of behavioral strategies to lower smoking relapse risk, but also to improve our understanding of mechanisms of action of Bupropion (Zyban™) on factors known to relate to smoking relapse. Data from this study would lead to a full scale treatment outcome study with potential to improve long-term smoking abstinence rates.

Duration of Project

6/13/2006 – 6/30/2009

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 20: Project Title and Purpose

Role of Tissue Factor-Factor VIIa Signaling in Pulmonary Epithelial Cell Function - Tissue factor is a membrane-bound protein that is the principal initiator of blood coagulation. Recently, roles for this protein have been shown in physiologic and pathologic processes other than blood coagulation that include inflammation, cellular signaling, angiogenesis, and tumor metastasis. Tissue factor is expressed in normal lung tissue and its expression is increased in lung diseases associated with inflammation. The role of tissue factor in lung epithelial cell function is not known. The purpose of this project is to study the tissue factor signaling pathway in lung epithelial cells. The overall hypothesis for this study is that the tissue factor signaling pathway modulates lung epithelial cell function and mediates an inflammatory response.

Duration of Project

6/13/2006 - 4/30/2007

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement C.U.R.E. Annual Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 21: Project Title and Purpose

Effects of Yoga Program on Postural Stability in the Elderly Female: A Pilot Study - The main goal of this project is to explore effects of a classical Iyengar yoga exercise program on postural sway in elderly females. This is based on an idea that Iyengar Yoga -- by promoting stretching, strengthening, and improving overall awareness of posture and locomotion -- may improve postural sway and reduce the risk of falls in the elderly female.

Duration of Project

11/7/2006 – 3/31/2008

Summary of Research Completed

This project ended during a prior state fiscal year. For additional information, please refer to the Commonwealth Universal Research Enhancement Annual C.U.R.E. Reports on the Department's Tobacco Settlement/Act 77 web page at <http://www.health.state.pa.us/cure>.

Research Project 22: Project Title and Purpose

Nutrition Education Outreach in Philadelphia Public Schools / Healthy Corner Store Initiative - The proposed research will evaluate the efficacy of an intervention in urban corner stores, surrounding 10 Philadelphia elementary schools. Community-based, environmental manipulation of corner stores is an understudied area and represents the next step in understanding and improving the nutritional intake of school students to prevent obesity.

Duration of Project

12/3/2008 – 12/2/2009

Project Overview

This project began 9/1/2007 and will continue through 3/31/10. Baseline data were collected in the first year of the project (9/1/07-8/31/08). Funding from this state grant will be used to capture data at the one year time point (9/1/08-8/31/09) and will compare changes from baseline to one year. Funding will address the primary and secondary aims that are outlined below.

Primary Aim

To compare the intervention and control participants on changes, over a 1-year period, in the

energy content (i.e., calories) of snacks purchased before and after school at corner stores. We predict that, relative to control participants, participants in the intervention group will purchase snacks and beverages that are significantly lower in calories (200 kcal/day).

Secondary Aims

1. To compare the intervention and control corner stores on the percentage of available healthy snacks in each intervention store, the percentage of dedicated space within each store for shelving healthy snacks, and the allocation of dedicated and “set-aside” space where healthy items will be grouped together for display. We predict that, relative to control stores, intervention stores will have a greater percentage and ratio of healthy vs. unhealthy items, a dedicated, “set-aside” area for healthy items.

2. To understand the correlates and determinants of corner store shopping behavior. We predict that children who do not eat breakfast at home or breakfast or lunch at school will shop more frequently at corner stores than children who do eat meals at home or school.

3. To compare the intervention and control participants on changes, over a 1-year period, in the prevalence and incidence of overweight ($\geq 85^{\text{th}}$ percentile) and obese ($\geq 95^{\text{th}}$ percentile for body mass index) as defined by the Institute of Medicine guidelines (Institute of Medicine, 2004). We predict that participants in the intervention group will have significantly lower rates of being (prevalence) and becoming (incidence) overweight or obese than children in the control group.

Principal Investigator

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Other Participating Researchers

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Expected Research Outcomes and Benefits

Primary Outcome: Caloric Value of Snacks. The caloric value of snacks will be obtained by surveying all snack items in the selected corner stores. A database of the nutrient content of these items will be developed. Nutrition labels will be used for packaged items. For prepared foods, nutrient content will be calculated using estimated portion sizes and nutritional analysis software (Nutrition Data System) as was developed for each store in our pilot. Data will be gathered through intercept interviews and by direct observation of purchases at corner stores. Intercept interviews will be conducted directly outside of the stores with consented youngsters. Trained interviewers will ask students if they have consented to be in the study. Consented youngsters will have been given a keychain from the study to attach to their backpacks for easy

identification. If students lost their keychain, they will be given another one after participation in the study is confirmed. Once study staff confirm that students have consented, they will be asked to allow their purchases to be recorded. Interviewers will record each item that the child has to allow for an accurate accounting of the caloric value of the purchased snacks.

Each youngster will be asked the frequency with which they visit the store, if they also frequent other stores before and after school and if they have observed the marketing materials and/or received nutrition education on healthy snack purchases in school. These interviews will be completed in up to four stores per community. If there are more than four stores in the 4 block radius, the closest four to the school will be assessed.

Interviewers will be trained to ensure that all interviews are conducted in a consistent fashion. Students who refuse to be interviewed will be asked about their refusal and observational information will be collected to determine if they are different from the sample that agreed to be interviewed.

Summary of Research Completed

Our research milestones during this reporting period include the collection of one year follow up data (i.e., height, weight, in-class surveys), intercept surveys (i.e., interviewing children as they leave corner stores with purchases) conducted outside of corner stores, and inventory data (collected at corner stores) and the start of two year follow-up data collection (i.e. intercept surveys and in-class surveys) in the fall of 2009. In addition, we conducted 25 focus groups with a total of 170 participating students and parents and we administered 2 additional in-class surveys. One was to collect pilot data regarding breakfast participation and the other to gain knowledge about the intervention in terms of fruit salad purchases at corner stores. These data are in the process of being entered and have not yet been analyzed for reporting purposes. We also developed two tools to aide in collecting data at the corner store level and two tools to collect data at the school level. At the corner store level, one was a Store Owner Interview and the other Store Inventory Interview. At the school level, one was a fruit salad questionnaire and the other a breakfast questionnaire.

During the summer 2009 we worked to organize, clean and enter data from our baseline data collection period. Baseline data on snacking was published in October 2009. Year one and year two data are still being cleaned and analyzed for publication as part of a final study publication (<http://pediatrics.aappublications.org/cgi/reprint/124/5/1293>).

During the September 2009-December 2009 time period we began repeat data collection in schools and corner stores when school resumed on Sept 7, 2009 with in-class surveys as well as intercept surveys at corner stores. We also repeated store inventories in 20 stores.

In addition to collecting and scheduling data collection for all primary and secondary outcomes during this reporting period, we completed the development of several additional data collection tools to enhance the evaluation. The first tool we developed, the Store Inventory Interview, aided in our collection of more detailed information from corner store owners about specific items purchased from their stores. For example, this tool allowed us to collect additional information

such as weight, serving sizes, brands and quantity on items like made-to-order sandwiches and “pizza fries” that have hard to assess energy contents not available in a public databases. With the store owner’s help, we could accurately collect the relevant details about these items to precisely estimate energy content of these made-to-order foods. We utilized this tool in the spring (January 2009 – June 2009) and fall (September 2009- December 2009) semesters. We also updated our product nutrition table with nutrition labels on products, which were previously unavailable. To date, our products table contains nutrition information on over 772 items.

The second tool we developed was a questionnaire administered to corner store owners (N = 21) called the Corner Store Owner Interview. The purpose of this tool was to collect valuable process evaluation data such as background information about store ownership, sales data, and distribution data during the course of the intervention. These data were collected in January 2009 and October 2009.

The third tool we developed was a 4-question in-class survey addendum to the Shopping Survey tool that we administer to children in the classroom to learn more about their shopping patterns. This addendum was specific to the fruit salad component of the intervention that kicked off at baseline. The purpose of this Shopping Survey Addendum was to collect data from children to find out if they purchase fruit salads or plan to, if not, then why and if so, then why. We implemented this survey at the remaining data collection point in the fall of 2009.

The 4th tool we developed in the fall semester was a two question in-class survey addendum to the Shopping Survey tool that we administered to children in the classroom to learn more about their breakfast patterns. This purpose of this Shopping Survey Addendum was to collect data from children to find out if they eat breakfast and where they eat breakfast. The data collected from this survey may aide in a pilot school breakfast intervention during the 2010-2011 school year.

In addition to adding these data collection tools, we decided to repeat two rounds of focus groups in through October 2009 to help guide the intervention. We conducted 25 focus groups with a total of 170 participants. Twenty of the groups (ten fruit and ten water) focused on the first and second components of the intervention, implementation of fruit salads (N=58) and Snackin’ Fresh water (N=58) to participating corner stores. This allowed us to gather first-hand data from the kids about their thoughts on the fruit and water, purchasing, money spent and continued participation. In the fall of 2009 we also ran 3 student focus groups (N=33) and 2 parent focus groups (N=21) around breakfast participation. We were interested in learning about how kids and parents feel about the school breakfast being served, where else they ate breakfast if not at school and thoughts on how to improve school breakfast. We also worked with each school community to develop the necessary schedules to facilitate final data collection during the fall semester.