2018 Internship Directory: Summer Research Experience Program in Cancer Science (20 pages)

Mentor	Research area(s)	Internship category	Internship description
Boyko Atanassov *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Boyko-Atanassov**	Cancer genetics; Cancer molecular and cellular biology	Scientific Research	**Defining the functions of Ubiquitin Specific Proteases in the regulation of Receptor Tyrosine Kinase Signaling Pathways in Cancer** Abnormal expression of receptor tyrosine kinases (RTKs) has been recognized as a key factor driving tumor progression of several cancers. Work in our laboratory is focused on elucidating the molecular mechanisms by which ubiquitin-specific proteases (USPs) are involved in RTK stabilization in cancer cells and hence potentiate tumor growth.
Andrei Bakin *Dept. of* ***Cancer Genetics*** **www.roswellpark.org /Andrei-Bakin**	Cancer genetics; Cancer molecular and cellular biology	Scientific Research	**Tumor-Fibroblast crosstalk In Breast Cancer progression and Tumor Angiogenesis** Tumor microenvironment facilitates cancer recurrence and metastasis, and can reduce the efficacy of anti-cancer therapy. Tumor-infiltrating immune cells and tumor-associated fibroblasts (TAFs) play important roles in disease progression and treatment. We identified a molecular pathway that regulates tumor vascularization and may contribute to trapping of pro-tumorigenic myeloid cells in tumor stroma. The study will assess the contribution of the specific factors into interaction of the tumor-fibroblast crosstalk in cell culture and xenograft mouse models.
Joseph Barbi *Dept. of* ***Immunology*** **www.roswellpark.org /Joseph-Barbi**	Tumor immunology & immunotherapy	Scientific Research	**Exploring the mechanisms and therapeutic potential of novel factors capable of modulating immune responses.** The immune system's destructive potential is regulated by numerous regulatory mechanisms. By understanding these we can devise novel therapies to unleash optimal anti-tumor responses in cancer patients. These studies will utilize in vitro assays of immune cell function, in vivo (mouse) tumor models, and fluorescence-based techniques for visualizing immune cells.

Mentor	Research area(s)	Internship category	Internship description
David Bellnier *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /David-Bellnier**	Photodynamic Therapy	Scientific Research	**Photodynamic Therapy of Locally Advanced Tumors** Patients with refractory locally advanced cancer have a poor prognosis because of the absence of effective treatment options. In the RPCI PDT Center we assess the efficacy and safety of photodynamic therapy (PDT) and light induced tissue heating (LITH) in the treatment of patients with these advanced cancers. PDT is a treatment that uses certain classes of small molecules, called photodynamic sensitizers, along with light and molecular oxygen, to kill cancer cells. LITH is a treatment similar to PDT, but without the requirement of a photodynamic sensitizer. In addition to patient care, the PDT Center focuses on translational research. Translational research is the process of applying ideas, insights, and discoveries generated through scientific inquiry to the treatment or prevention of human disease. As such, we use a variety of small animal-based models of locally advanced cancer to study both PDT and LITH. These studies are multidisciplinary in nature – employing physicists, materials scientists, engineers, biologists and physicians.

Mentor	Research area(s)	Internship category	Internship description
Dhyan Chandra *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Dhyan-Chandra**	Cancer molecular and cellular biology; Cancer pharmacology and therapeutics	Scientific Research	**Role of Mitochondria in Cancer Prevention and Therapy** The main focus of our research is to understand the molecular basis of therapy resistance in multiple cancer types including in prostate, breast, and colon cancers. To accomplish our goals, we are investigating two different, but complementary projects. The first project delineates how mitochondria-mediated cell death signaling is defective in cancer cells and cancer stem cells. The second project defines the role of heat-shock proteins in cancer cell survival and death. We are also characterizing the role of mitochondria in health disparities among prostate and breast cancer patients. Our research suggests that protein complexes are important regulators of cancer cell death and survival. We use multiple biochemical, genetic, cellular, and molecular approaches to identify and characterize protein complexes in subcellular compartments including in the mitochondrion. Detailed understanding of protein complexes will lay a foundation for targeting cell death and survival machinery for cancer therapy. Our model system includes both laboratory cell culture and mouse model of cancer to examine cellular signaling in response to anticancer agents. Our ultimate goal is to target mitochondria and cell death for prevention and therapy of multiple types of cancer.
Gokul Das *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Gokul-Das**	Cancer genetics; Cancer molecular and cellular biology; Cancer pharmacology and therapeutics	Scientific Research	**Mechanisms by which Hormone Receptors and Tumor Suppressors Impact Cancer** The research in Das lab focuses on understanding the cellular and molecular mechanisms of cancer, especially breast ,lung, and ovarian cancers. For example, we are analyzing the role of hormone receptors (such as the estrogen receptor) and tumor suppressors (such as the p53 protein) in cancer onset and progression using cell culture and mouse genetic models. Summer projects will involve modern cellular and molecular biological techniques.

Mentor	Research area(s)	Internship category	Internship description
Subhamoy Dasgupta *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /Subhamoy-Dasgupta**	Cancer genetics; Cancer molecular and cellular biology; Cancer pharmacology and therapeutics; Tumor immunology & immunotherapy	Scientific Research	**Metabolic Control of Tumor Progression and Metastasis** Metabolic reprogramming is an essential hallmark of tumor progression and metastasis. Cancer cells use altered metabolic pathways to sustain rapid growth and to overcome enormous stress encountered in tumor microenvironment. Tumor cells constantly alter their metabolic state in response to oncogenic stimuli, nutrient availability, and interaction with immune cells however the precise regulation that precedes the metabolic alteration is poorly understood. Our lab uses state-of-art facilities such as metabolomics, proteomics, and genomics along with molecular biology techniques to investigate the crosstalk between metabolic signaling and transcriptional networks. Multiple animal model systems including genetically engineered mouse models (GEMMs), patient-derived xenograft (PDX), and syngeneic tumor models are used to investigate metabolic adaptations that tumor progression and metastasis. Projects: (1) Metabolic adaptations driving castration resistant prostate cancer, (2) Oncogenic drivers of bone metastatic prostate cancer, (3) Mechanisms of breast tumor recurrence and metastasis.
William Duncan *Dept. of* ***Biostatistics and Bioinformatics*** **www.roswellpark.org /William-Duncan**	Natural Language Processing, Machine Learning, Ontology	Scientific Research	**Advanced computational methods for exploring medical data** The purpose of this internship is to develop advanced computational methods for exploring medical data. This includes using natural language processing to extract information from clinic notes, machine learning to categorize patients, and ontologies to structure and reason about data.
Michael Feigin *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Michael-Feigin**	Cancer bioinformatics; Cancer genetics; Cancer molecular and cellular biology; Cancer pharmacology and therapeutics	Scientific Research	**G-protein Coupled Receptors In Cancer Progression** Our lab seeks to understand the molecular causes of cancer in order to develop better therapies and improve patient outcome. We employ a variety of methods, from computational analysis to biochemistry, 3D cell culture and mouse models. We are looking for motivated and enthusiastic students to join a new and growing lab.

Mentor	Research area(s)	Internship category	Internship description
Michael Fiandalo *Dept. of* ***Urology*** **www.roswellpark.org /Michael-Fiandalo**	Urology	Scientific Research	**Inhibition of Dihydrotestosterone Synthesis in Prostate Cancer by Combined Frontdoor and Backdoor Pathway Blockade** Androgen deprivation therapy (ADT) is palliative and prostate cancer (CaP) recurs as lethal castration-recurrent CaP. One mechanism of CaP resistance to ADT is backdoor androgen metabolism. The goal of the summer research project is to assist with identification of small molecules that target enzymes used in the terminal steps in the pathways using ImageStream and immunohistochemistry.
Irwin Gelman *Dept. of* ***Cancer Genetics*** **www.roswellpark.org /Irwin-Gelman**	Cancer genetics; Cancer molecular and cellular biology	Scientific Research	**The role of SIK2 in promoting PTEN-negative prostate cancer progression** The intern will test how the AKT2-specific substrate, SIK2, controls aggressiveness using mouse and human prostate cancer cell lines that vary in their PTEN status. This will involve cell culture, transfection, protein staining, fluorescence microscopy and signaling analysis (e.g.- immunoblots).
Kathryn Glaser *Dept. of* ***Cancer Prevention and Population Sciences*** **www.roswellpark.org /Kathryn-Glaser**	Medical Anthropology	Scientific Research	**Cancer Screening and Survivorship Research: Underserved and Special Populations** Summer interns will be involved in various activities through Roswell Park Cancer Institute's Department of Cancer Prevention and Control. Interns will have an opportunity to be part of outreach efforts, prevention activities, cancer screening and survivorship. Interns will learn the foundation of health disparities research as well as quality improvement processes through trainings, readings, department events, attendance of grand rounds, development of education materials, in-depth literature review methods, as well as developing/administering surveys and focus groups. Interns will use these skills to work towards the joint creation of a manuscript for peer-reviewed journal consideration, discussion of next-phase pilot research, and dissemination of education materials back to the community.

Mentor	Research area(s)	Internship category	Internship description
Maciej Goniewicz *Dept. of* ***Cancer Prevention and Population Sciences*** **www.roswellpark.org /Maciej-Goniewicz**	Cancer prevention and epidemiology; Public Health	Scientific Research	**Safety of electronic cigarettes** Research projects are focused on new nicotine-containing products and alternative forms of tobacco. We examine safety and efficacy of electronic nicotine delivery devices, commonly called e-cigarettes. These studies include the laboratory evaluation of the products, pharmacological and toxicological assessment, surveys among their users, and their potential application in harm reduction, cancer prevention and smoking cessation.

Mentor	Research area(s)	Internship category	Internship description
Katerina Gurova *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /Katerina-Gurova**	Cancer molecular and cellular biology; Cancer pharmacology and therapeutics	Scientific Research	**Control of chromatin stability in normal and cancer cells** Control of integrity of genetic information in cells includes activation of DNA damage response, DNA-repair pathways and elimination of cells with damaged DNA[1]. The control of the integrity of epigenetic information is equally important and critical for the development and function of multicellular organisms, but far less studied. Epigenetic information is stored as chromatin, the highly organized complex of DNA, histone proteins and their chemical modifications[2]. Accelerated replication and transcription during early embryogenesis and in cancer, resulting in more frequent nucleosome disassembly and enhanced histone turnover, may cause intermixing of histones bearing epigenetic marks and loss of epigenetic information. In cancer, this should lead to the dissolution of original cell identity. However, transcriptome analysis clearly demonstrates that tumors, including cell lines propagated for years in culture, bear easily identifiable traits of tissue of origin in their transcriptional program (TCGA data), which suggests that factors ensuring chromatin stability during early development are activated in cancer to support increased chromatin dynamics. To test this hypothesis, we will optimize methods, used to study of chromatin structure/organization, to measure and compare chromatin stability in normal and tumor cells and to identify factors responsible for the maintenance of epigenetic integrity. These factors may be a source of novel cancer targets. Our data suggest that histone chaperone FACT (FAcilitates Chromatin Transcription) is one such factor[3-7]. We will validate FACT as a chromatin stabilizing factor and cancer treatment target. To understand how epigenetic integrity is preserved, we will use novel tools (small molecules and FACT genetic inhibitors) to controllably disassemble chromatin in cells to study consequences and cell response to chromatin destabilization. Our studies will build a foundation for understanding various phenomena, including the stability of the cell differentiation state, low rate of reprogramming and high sensitivity of tumor cells to chromatin desilencing agents.

Mentor	Research area(s)	Internship category	Internship description
Rodney Haring *Dept. of* ***Cancer Prevention and Population Sciences*** **www.roswellpark.org/Rodney-Haring**	Cancer prevention and epidemiology; Other (please specify); Co-occurring conditions: diabetes and diabetes prevention	Scientific Research	**Strong Men/Strong Communities (SMSC) Program** Native American males experience greater health disparities compared to all other U.S. racial and ethnic groups. For example, Native men have the highest age-adjusted prevalence of type 2 diabetes (~18%) among U.S. men, while non-Hispanic White men have the lowest (~7%). In recent decades, Natives have seen a disproportionate increase in diabetes-related complications and mortality compared to all other groups, such that age-adjusted diabetes death rates in Native men are now almost twice those in White men. Several large studies in non-Natives confirm that type 2 diabetes can be prevented by interventions that promote healthy lifestyles, but little data exist on interventions to prevent diabetes in Native men. In the clinic-based U.S. Diabetes Prevention Program (DPP), only 55 out of 3,234 participants were Native men. Similarly, in the diabetes prevention programs in Native communities, participation by Native males is low, ranging from 33% to 74%. Many explanations have been suggested for the low participation rates among men of all races in lifestyle interventions. Recruiting Native men in clinic-based programs is difficult because they tend to seek clinical care less often than women. Therefore, an urgent need exists for diabetes risk reduction programs tailored to the unique values and habits of Native men. The project's Specific Aims are to: 1) Compare change in diabetes risk score and modifiable diabetes related risk factors (and cancer screening) in the SMSC intervention; 2) Evaluate the ability of SMSC to retain Seneca male participants, 18-65 years of age with no previous diagnosis of diabetes. The proposed study fills a gap in approaches to increase recruitment and participation in lifestyle programs that reduce diabetes and cancer risk in Seneca men. The proposed study will have broad implications for the ongoing epidemic of obesity, diabetes, and co-occurring conditions including cancer in Native communities.

Mentor	Research area(s)	Internship category	Internship description
Mollie Hutton *Dept. of* ***Clinical Genetics*** **www.roswellpark.org /Mollie-Hutton**	Clinical genetics	Clinical Research	**Exploring issues related to genetic counseling/testing for hereditary cancer risk** This internship is directed toward students specifically planning to pursue a graduate degree in genetic counseling. Students will complete clinical observations (a requirement when applying to graduate programs in genetic counseling) as well as gain valuable clinical research experience. Past projects have included data review of past Clinical Genetics Service patients to demonstrate the importance of periodic follow up and patient decision making when pursuing testing through a multi-gene panel. Additional opportunities include construction of genetic pedigrees through the Progeny program, composing patient literature, and possibly limited direct patient interactions.
Eugene Kandel *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /Eugene-Kandel**	Cancer molecular and cellular biology; Cancer pharmacology and therapeutics	Scientific Research	**Cell stress response pathways as new therapeutic targets.** We study cell stress responses in order to improve protection of normal cells and uncover vulnerabilities in cancers. We use culture, genetic engineering, pharmacological and biophysical treatment of mammalian cells, as well as biochemical analysis of cell functions and individual gene expression.

Mentor	Research area(s)	Internship category	Internship description
Eric Kauffman *Dept. of* ***Urology*** **www.roswellpark.org /Eric-Kauffman**	Cancer genetics; Cancer molecular and cellular biology; Cancer pharmacology and therapeutics; Urology; Medical Oncology; Surgical Oncology	Scientific Research Clinical Research	**Molecular and cellular research in kidney cancer and prostate cancer** The work in my lab is focused on discovering key molecular alterations responsible for kidney and prostate cancer formation and progression. There are two main projects undergoing. The first project investigates the role of heavy metal metabolism (iron, in particular) and the resulting effects on oxygen metabolism ("oxidative stress") in the development and progression of kidney tumors. Iron metal is among the greatest sources of oxidative stress in cells of the human body, but also provides the sole "ingredient" needed to transform precursor tissue into kidney tissue during embryo organogenesis. We hypothesize that iron is therefore similarly important in the development of kidney tumors and their progression. Our initial work has confirmed much higher levels of iron in kidney tumors than in benign kidney tissue; and also indicates that kidney cancer cells are highly dependent on iron, and that iron deprivation kills these cancer cells without killing the noncancerous kidney cells. In mice, administration of high levels of iron leads to mouse kidney tumors which morphologically mimic human kidney cancer. Important future studies will test whether these iron-induced mouse kidney tumors have the same molecular alterations that occur in human kidney cancers. Furthermore, drug treatments targeting iron metabolism and oxidative stress metabolism will be tested in vitro and in this mouse model to determine whether kidney cancer growth can be blocked. The second project investigates the existence of "circulating" cancer cells in the bloodstream of patients with kidney or prostate tumors. These cells exist at very rare concentrations in the bloodstream along with the patient's healthy blood cells. This project is exploring various technologies to identify and ultimately isolate these cancer cells from amid the numerous healthy blood cells—analogous to identifying a single grain of sand in an entire sandbox! The clinical goal is to use our understanding of these rare cancer cells in the blood to better guide treatment decisions of kidney and prostate cancer patients.

Mentor	Research area(s)	Internship category	Internship description
AnmNazmul Khan *Dept. of* ***Medicine*** **www.roswellpark.org /AnmNazmul-Khan**	Tumor immunology & immunotherapy	Scientific Research	**Role of neutrophil extracellular traps (NETs) in ovarian tumor progression** Cellular necrosis is associated with release of damage-associated molecular patterns (DAMPs) that activate innate immune responses. It has been shown that circulating DAMPs, specifically mitochondrial DNA (mtDNA), released following traumatic injury activate innate immune cells such as neutrophils, and elicit neutrophil-mediated inflammation. Our lab found that advanced epithelial ovarian cancer (EOC) is associated with accumulation of neutrophils and immature myeloid cells in the local tumor environment. We also observed that mtDNA accumulate in the cell-free ascites of patients with advanced EOC; however, their role in shaping innate immune responses and ovarian tumor growth is unknown. Furthermore, we have also shown that purified mtDNA and cell-free ascites from EOC stimulate ex vivo generation of neutrophil extracellular traps (NETs). NETs promote metastasis in tumor-bearing mice and presence of NETs was observed in resected human EOC, however the role of NETs in tumor progression in human cancer is unknown. The goal of this project is to evaluate that mtDNA in cell-free ascites of EOC induce NET generation and NETs can augment tumor growth and metastasis. To achieve this aim in vitro cellular assay and flowcytometry will be used involving human ovarian tumor cell lines.
Sergei Kurenov *Dept. of* ***Surgical Oncology*** **www.roswellpark.org /Sergei-Kurenov**	Cancer biostatistics; Surgical Oncology; Visualization; Surgical Simulation	Scientific Research	**Liver Surgery Preplanning Using Virtual Reality (VR) Simulation System** There are two goals for project: 1.Create modifications into existing preplanning VR surgical simulation system for liver specific surgical oncology cases such as hepatocellular carcinoma (HCC). 2.Continue to develop a liver specific surgical risk calculator based on national datasets. Both goals of work require intermediate skills in C++ and C# programming.
Fengzhi Li *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Fengzhi-Li**	Cancer molecular and cellular biology; Cancer pharmacology and therapeutics; Anticancer drug development and mechanism study	Scientific Research	**Study the novel anticancer drug FL118 mechanism of action in pancreatic cancer** The student will be trained for basic technology (e.g. cell culture, western blots, etc.) for studying drug action mechanism. the goal is for the student to be family with lab anticancer drug research. **Camptothecin sturcutre-related anticancer drug mechnaim of action in bladder cancer.** N/A

Mentor	Research area(s)	Internship category	Internship description
Asoke Mal *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /Asoke-Mal**	Cancer genetics; Cancer molecular and cellular biology; Cancer pharmacology and therapeutics; Pediatrics	Scientific Research	**Deciphering the molecular mecanism regulating PAX3-FOXO1 fusion oncoprotein function in childhood muscle cancer alveolar rhabdomyosarcoma** The chromosomal translocation encoding PAX3-FOXO1 fusion transcription factor protein acts as oncogenic drivers for the develoment and prograssion of aggressive alveolar rhabdomyosarcoma (aRMS) in childern and adolescents. Evidence accumulates that fusion-generated gain of PAX3-FOXO1 transcriptional activity aberrantly activates downstream target genes contributing for its oncogenic activity in aRMS. Our recent studies have discovered a functional impact of alteration of Akt signaling pathway in modulating PAX3-FOXO1 function in aRMS malignant behaviros.. Akt, a protein serine/threnine kinase presents in three isorms; Akt1, Akt2 and Akt3 and exhibit differential biological roles in modulating tumor properties associated with growth and progression.We plan to investigate the role of Akt isoforms in controlling PAX3-FOXO1-associated aRMS malignant phenotypes. Our effort on this study will be key to the novel understanding of the complexity Akt isoforms in the regulation of PAX3-FOXO1-associated aRMS malignant behavior, and importantly may provide new insight for the development of therapeutic approachs for this disease.
Kent Nastiuk *Dept. of* ***Cancer Genetics and Genomics, Urology*** **www.roswellpark.org /Kent-Nastiuk**	Cancer experimental diagnostics; Cancer genetics; Cancer molecular and cellular biology; Cancer pharmacology and therapeutics; Urology	Scientific Research	**Signaling in androgen deprivation therapy for prostate cancer** My lab is investigating how androgen regulated growth and apoptosis signaling pathways are changed in prostate cells in culture, in mouse models and in patient samples of prostate disease (BPH, inflammation, cancer). Since androgen deprivation therapy (ADT) is the principal treatment for advanced prostate cancer, and when administered for extended periods causes frailty, a major focus is examining the mechanism of ADT-induced muscle loss. We use a broad range of techniques from whole animal imaging to protein biochemistry to gene expression analysis to determine mechanism in order to develop better therapies for prostate diseases.

Mentor	Research area(s)	Internship category	Internship description
Richard O'Connor *Dept. of* ***Cancer Prevention and Population Sciences*** **www.roswellpark.org /Richard-O'Connor**	Cancer prevention and epidemiology; Regulatory Science	Scientific Research	**Consumer responses to alternative tobacco products** Students will have the opportunity to assist with data processing from several studies examining consumer response to various tobacco products, including cigarettes, heat-not-burn products, and electronic cigarettes. Activities would include secondary analysis of existing datasets, observing data collection from ongoing studies, and helping to prepare materials for upcoming research studies.
Scott Olejniczak *Dept. of* ***Immunology*** **www.roswellpark.org /Scott-Olejniczak**	Cancer molecular and cellular biology; Tumor immunology & immunotherapy	Scientific Research	**Harnessing the power of microRNAs to improve tumor immunotherapy** MicroRNAs are small non-coding RNAs that function to repress expression of target genes and thereby possess the ability to fundamentally alter how cells behave. We hope to co-opt this ability of microRNAs in order to enhance the immune response to tumor cells. A common means by which tumor cells evade immune cell killing is by signaling to immune cells through so called checkpoint molecules that repress the ability of these immune cells to function. We believe that certain microRNAs have the ability to instruct immune cells to ignore checkpoint molecule signals and therefore kill tumor cells more effectively. A major challenge, however, is to determine which microRNAs possess this ability. Summer interns will participate in screening of many known microRNAs for their ability to limit repressive signals propagated by checkpoint molecules. These studies will expose students to translational research in a basic laboratory setting with a focus on immunology, cell biology and molecular biology.

Mentor	Research area(s)	Internship category	Internship description
Santosh Patnaik *Dept. of* ***Surgical Oncology*** **www.roswellpark.org /Santosh-Patnaik**	Cancer bioinformatics; Cancer biostatistics; Cancer genetics; Cancer molecular epidemiology; Cancer pharmacology and therapeutics; Tumor immunology & immunotherapy; Surgical Oncology; Cancer molecular and cellular biology; Radiation Oncology; Cancer exper	Scientific Research	**Experimental and computational examination of genes in cancer and immunology** We are interested in genetics (gene mutations, gene expression, etc.) and epigenetics (microRNAs, RNA editing, etc.) as it pertains to cancer and the human body's immunological response to it. This is a very broad area, and allows for a visiting student to contribute their ideas to develop an exciting yet feasible project to carry out during their stay. The project work will involve one or more of the following: (1) Cell biology: cell culture, genetic engineering of cells, etc. (2) Molecular biology: various DNA, RNA, and protein assays, including their development. (3) Animal biology: growing foreign tissue/cells in the mouse, analysis of DNA/RNA/proteins of mouse, etc. (4) Patient biology: various assays of diseased tissues, including association with clinical parameters; (5) Computation: large-scale data analysis, data visualization, bioinformatics, software programming, etc. As a mentor, my goal will be to help the visiting student attain the following: (1) Experience these aspects of scientific research: collate facts from published knowledge and knowledgeable individuals; use facts and imagination to generate hypotheses and exploratory ideas; design, prepare for, and execute experiments; collect, analyze, and present data; set forth a future direction. (2) Learn some common biomedical or computational research techniques. (3) Bring to completion during the student's stay a small but independent project that the student helps with the design, execution, and analysis of.

Mentor	Research area(s)	Internship category	Internship description
Beth Pflug *Dept. of* ***Urology*** **www.roswellpark.org/Beth-Pflug**	Cancer molecular and cellular biology; Cancer pharmacology and therapeutics	Scientific Research	**PDK Inhibitors Target Altered Pyruvate Metabolism for Prostate Cancer Therapy** The metabolism of pyruvate, a key intermediate in several metabolic pathways, is frequently altered in cancer. This alteration is, in part, due to decreased pyruvate dehydrogenase complex (PDH) activity. PDH is a mitochondrial multi-enzyme complex responsible for converting pyruvate into acetyl-CoA, which is then utilized in the TCA cycle. This irreversible reaction promotes mitochondrial pyruvate utilization. Phosphorylation of the PDH alpha 1 (PDHA1) subunit by pyruvate dehydrogenase kinases (PDK) inactivates the entire PDH complex. This pivotal metabolic shift plays an important role in cancer stem cell (CSC) differentiation. Blocking pyruvate import into mitochondria has been shown to increase prostate CSC (PCSC) properties, while enhancing import has the opposite effect. PDHA1 knock-out cell lines show increased PCSC features, and PDK1 has been shown to be overexpressed in PCSCs. The PCSC population plays a key role in sensitivity and responsiveness to PCa treatments, including androgen deprivation therapy (ADT). ADT commonly fails due to expansion of the ADT-resistant PCSC population. Thus, there is a critical need to identify novel treatments to prevent relapse after ADT. We propose that modulating the direction of pyruvate utilization in PCSCs can force differentiation and consequently result in sensitivity to ADT. Therefore, we hypothesize that PDK1 inhibition will force PCSCs into a differentiated state, making them more sensitive to ADT by reactivating PDH. We are currently testing the effects of PDK1 inhibitors, dichloroacetate and JX06, on PCSC metabolic flux and differentiation.
Matthew Podgorsak *Dept. of* ***Radiation Medicine*** **www.roswellpark.org/Matthew-Podgorsak**	Radiation Oncology; Medical Physics	Scientific Research	**Medical Physics applications** A student intern will study clinical aspects of medical physics. Medical physics is the branch of physics that combines physics with medical applications. Our group is primarily involved in the treatment of cancer patients with radiation, so a student intern would learn basic clinical approaches to the application of radiation in the treatment of cancer.

Mentor	Research area(s)	Internship category	Internship description
Steven Pruitt *Dept. of* ***Molecular and Cellular Biology*** **www.roswellpark.org /Steven-Pruitt**	Cancer bioinformatics; Cancer genetics; Cancer molecular and cellular biology	Scientific Research	**Stem/progenitor cell replication in cancer and aging** Work under this internship will be directed at understanding how normal and abnormal DNA replication and cell proliferation of stem and progenitor cells contribute to tissue maintenance and genome stability in cancers and during aging. Depending on the specific project, the work may include molecular cloning, molecular biological techniques (e.g. gel electrophoresis, western blot analyses, PCR), cell culture (including transduction/transfection and FACS), generation of and/or histological/molecular characterization of transgenic mice, and whole genome bioinformatic analyses.
Elizabeth Repasky *Dept. of* ***Immunology*** **www.roswellpark.org /Steven-Pruitt**	Tumor immunology & immunotherapy	Scientific Research	**Defining the impact of environmental stress on the immune system and tumor growth** Members of the laboratory of Dr. Elizabeth Repasky are interested in achieving a better understanding of how cancer affects physiological, immunological and biophysical processes in the body. We are particularly interested in understanding how stress affects the tumor microenvironment, and using this knowledge to develop and test novel therapeutic strategies. Trainees in my laboratory have the opportunity to choose from several related research themes associated with this overall goal. For example, we have discovered how body temperature helps to regulate neutrophil homeostasis, an observation which could be important for increasing marrow function after radiation or chemotherapy. A newer set of projects in the lab involve the study of metabolism, adrenergic stress and energy allocation and their influence on the efficacy of anti-tumor immunity (Kokolus et al., PNAS 2013; Eng et al., Nature Comm., 2015, Bucsek et al., Cancer Research, 2017).

Mentor	Research area(s)	Internship category	Internship description
Mukund Seshadri *Dept. of* ***Oral Medicine/Head and Neck Surgery*** **www.roswellpark.org /Mukund-Seshadri**	Cancer biophysics; Cancer pharmacology and therapeutics; Radiation Oncology; Cancer experimental diagnostics; Cancer prevention and epidemiology	Scientific Research	**Multi-modal Imaging of Cancer** Research in my laboratory is focused on three main areas: (i) understanding the vascular biology of head and neck cancers and exploiting them for therapeutic benefit, (ii) development of safe and effective bio-adjuvant approaches for the prevention of oral cancers and, (iii) the use of advanced imaging methods such as MRI, CT in preclinical models and in patients to study response of head and neck tumors to chemotherapy and radiation. The work is interdisciplinary in nature and draws on concepts from biophysics, cancer biology, pharmacology and molecular biology. Given my clinical background, I feel strongly about pursuing a research program that addresses clinically-relevant questions in the laboratory setting and potentially translates the knowledge gained into meaningful outcomes for patients.
Gal Shafirstein *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /Gal-Shafirstein**	Photodynamic Therapy	Scientific Research	**Treatment Planning and Light Dosimetry in Photodynamic Therapy (PDT)** My research team is focused on the development and implementation of treatment planning and light dosimetry in PDT. My group includes, 2 engineers, 2 research scholars and 2 pre-doctoral student. We do preclinical and clinical studies, and investigate combination therapies.

Mentor	Research area(s)	Internship category	Internship description
Joseph Skitzki *Dept. of* ***Immunology*** **www.roswellpark.org /Joseph-Skitzki**	Tumor immunology & immunotherapy; Surgical Oncology	Scientific Research Clinical Research	**Real-time Monitoring of Anti-cancer Immune Responses** My laboratory focuses on the understanding of how lymphocytes trafficking to sites of tumor during immunotherapy. Recent advances in intravital microscopy are being leveraged for clinical translation. Specific projects in the lab are: 1. To evaluate reagents for human lymphocyte labeling 2. To determine if endogenous lymphocyte activity can be followed over time in mouse models 3. To develop analytical methods for intravital microscopy **Observership in Surgical Oncology** I am a surgical oncologist in the area of soft tissue surgery. My focus is on melanoma and regional therapies for cancer. There are opportunities for an interested student to observe our clinic and OR practice. A melanoma clinical database exists along with corresponding tissue and blood samples which could be a source for a short-term project. The end-goal would be to generate a clinical hypothesis, extract the data and have it presented in a scientific manner (abstract, manuscript, poster)
Joseph Spernyak *Dept. of* ***Cell Stress Biology*** **www.roswellpark.org /Joseph-Spernyak**	Cancer biophysics	Scientific Research	**Development of Novel MR Imaging Agents** Dr. Spernyak, in collaboration with Dr. Janet Morrow (UB Chemistry), is developing novel MR imaging agents with improved safety profiles and that allow for probing tumor microenvironments. An internship in his lab will expose students to a range of scientific disciplines, including chemistry, physics, image processing and computer programming. Course completion in one or more of these fields is recommended but not necessary.
Xinjiang Wang *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Xinjiang-Wang**	Cancer genetics; Cancer pharmacology and therapeutics	Scientific Research	**Development of Novel Targeted Therapies for Leukemia Treatment** The goal of this study is to evaluate the antitumor effect of newly identified small molecule inhibitors for Mdm2-MdmX E3 in leukemia cells. Single or combination treatment will be tested. Cell proliferation and cell death will be analyzed. Cell culture, cell growth assay, Western blotting analysis of target proteins and biochemical events of apoptosis will be performed.

Mentor	Research area(s)	Internship category	Internship description
Eunice Wang *Dept. of* ***Medicine*** **www.roswellpark.org /Eunice-Wang**	Cancer pharmacology and therapeutics; Medical Oncology; Cancer molecular and cellular biology; Tumor immunology & immunotherapy	Scientific Research	**Novel Biological Therapies for Acute Leukemia** Our research focuses on the preclinical assessment and development of novel therapeutic strategies for acute leukemia. We are specifically interested in how interactions between tumor cells and other elements of the host marrow microenvironment contribute to cancer cell survival and therapeutic resistance. Current projects in the lab are focused on optimizing immunotherapy for acute myeloid leukemia and evaluation of antibody drug conjugates targeting CD33 and CD123 expressed on leukemia cells. Students will gain experience in sterile cell culture, proliferation assays, colony formation assays using primary leukemia patient samples, flow cytometry, and bioluminescent mouse models. The goal of our translational laboratory research is to identify immunotherapeutic and biological agents for translation into early stage clinical trials.
Binnian Wei *Dept. of* ***Cancer Prevention and Population Sciences*** **www.roswellpark.org /Binnian-Wei**	marijuana and tobacco specific - biomarker measurement; Cancer biostatistics; Cancer prevention and epidemiology	Scientific Research	**Developing and Optimizing Automated Sample Preparation Methods for Measuring Tobacco- and Marijuana-Specific Biomarkers in Human Samples** Qualified candidates will work with the scientists in our lab to develop and optimize high throughput automated methods that use cutting-edge liquid-handling workstation for quantifying tobacco and marijuana specific biomarkers, i.e. nicotine, cannabinoids and their metabolites in human samples.
Yue Wu *Dept. of* ***Urology*** **www.roswellpark.org /Yue-Wu**	Cancer molecular and cellular biology; Cancer molecular epidemiology; Cancer pharmacology and therapeutics; Cancer prevention and epidemiology; Cancer bioinformatics; Cancer genetics; Urology; Medical Oncology	Scientific Research	**Understanding Progression of Prostate Cancer to Castration Re-Current Disease** My research interest is in microenvironment of cancer - how cancer cells, endothelial cells and stromal cells interact with each other, and how the interactions affect cancer cell growth. Prostate cancer models are used primarily in my lab. The ultimate goal is to delineate mechanisms that drive progression of androgen-stimulated prostate cancer to castration-resistant prostate cancer, and to identify novel modalities to prevent or treat castration resistant prostate cancer.

Mentor	Research area(s)	Internship category	Internship description
Yuesheng Zhang *Dept. of* ***Pharmacology and Therapeutics*** **www.roswellpark.org /Yuesheng-Zhang**	Cancer pharmacology and therapeutics	Scientific Research	**Targeting ErbB receptor tyrosine kinases in cancer** Cell membrane-bound ErbB receptor tyrosine kinases, particularly ErbB1 and ErbB2, are major oncogenic drivers and cancer therapeutic targets. We have recently found that a novel human protein targets both ErbB1 and ErbB2 and are doing research to better understand its antitumor activity.
Jianmin Zhang *Dept. of* ***Cancer Genetics*** **www.roswellpark.org /Jianmin-Zhang**	Cancer genetics; Cancer molecular and cellular biology	Scientific Research	**Dysregulation of Hippo pathway signaling in breast cancer** Using molecular, cellular and biochemical approaches as well as the 3-D cell culture system and mouse models, we are intensively investigating the roles of EMT and the Hippo signaling pathway in the initiation and progression of solid carcinomas, e.g., breast cancer.