Summer Student Research Program
Project Description

FACULTY SPONSOR’S NAME AND DEGREE: Andrew L. Harris, Ph.D.

PHONE: (973) 972-1620

DEPARTMENT AND INTERNAL MAILING ADDRESS:
Department of Pharmacology & Physiology, NJMS; MSB I-649

E-MAIL: aharris@umdnj.edu

PROJECT TITLE: Roles of Gap Junctions in Tumor Biology

HYPOTHESIS: The propagation of miRNAs though gap junction channels plays crucial roles in tumor invasiveness and metastasis.

PROJECT DESCRIPTION
Gap junctions form intercellular pathways through which cytoplasmic signaling molecules pass directly from cell to cell. They are ubiquitous, and important in almost every aspect of signal transduction, physiology, development and disease. Connexin channels are increasingly recognized as therapeutic targets in cancer and other diseases, and have particularly dynamic roles in tumor invasiveness and metastasis.

Micro RNA (miRNA) are short RNA molecules that exert powerful effects on gene expression. Their central roles in cancer biology are well-recognized in the various stages of tumor progression, including invasiveness and metastasis, as well resistance to chemotherapy.

It has been recently shown that miRNA and related “silencing” RNA (siRNA) can pass through gap junction channels and thereby transmit their powerful effects from one cell to another. This motivates our hypothesis that the intercellular transfer of miRNAs between and to/from tumor cells can have defining effects on cancer cell proliferation, apoptosis, invasiveness, metastasis and chemosensitivity. This project will explore an heretofore unrecognized mechanism by which tumor progression may be manipulated for therapeutic effect.

We will explore this idea in two systems: Control of invasive phenotype in glioblastoma (a common type of brain cancer), and control of apoptosis/proliferation in breast cancer metastasis. These studies will be carried out in cell culture systems validated for study of these processes. The project will involve Dr. Harris and other NJMS faculty with relevant expertise.

The overall interest of the Harris lab is exploration of the properties of connexin channels that are important for human disease. We use biophysical, biochemical and genetic approaches. Genetically altered connexins - particularly point mutants known to cause human disease or have altered permeability properties - are utilized in these investigations to reveal and modulate the roles of connexin channels in physiological and pathological processes. The specifics of the project described above may change somewhat by the beginning of the summer, but it will be fundamentally similar.

The successful applicant for this position will have relevant previous research laboratory experience and be genuinely interested in the project and what can learned from the experience.
Summer Student Research Program
Project Description

SPONSOR’S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:

In prep, close to submission:
Hong, X.T., Tao, L. and Harris, A.L. Opposite effects of gap junction intercellular communication on cisplatin toxicity in normal and tumor testicular cells.

Comprehensive monograph:

IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS?
Yes □ or No ☑ (not yet, pending)

THIS PROJECT IS: □Clinical ☑Laboratory □Behavioral □Other

THIS PROJECT EMPLOYS RADIOISOTOPES □no

THIS PROJECT INVOLVES THE USE OF ANIMALS □no

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS □no

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?
As with any research project, the student will learn about research design - how to design experiments to obtain the desired information, how to troubleshoot and solve technical problems, rigorous interpretation of data, etc. Technically, the studies will involve biochemical and cell culture techniques, immunofluorescence and perhaps flow cytometry. The student will gain an understanding of the nature and consequences of the intercellular signaling mediated by gap junctions in biomedical issues. The student will work independently on this project, with ongoing interactions with the sponsor and other lab members.