

This ongoing addition to Aspects will highlight a few of the hundreds of research projects SIU School of Medicine faculty are undertaking. For more information about these projects, contact the Office of Research and Faculty Affairs at 217-782-7936.

Kinetic Analysis of the AMPA Receptor after C-terminal Modification

Primary Investigator:
Amy C. Arai, Ph.D.

Most excitatory synaptic transmission between neurons in the brain, which promotes communication, is mediated through AMPA-type glutamate receptors. Even small disturbances in the function of AMPA receptors may have a large impact on our mental activity, including memory formation. A segment of this receptor has recently been found to be severed by calpain, a protein-digesting enzyme. Earlier studies have shown that calpain is activated during ischemic/hypoxic conditions typically associated with heart arrest and stroke. This project will examine using electrophysiological and molecular biological methods to address how the structural modifications caused by calpain influence the function of the AMPA receptor and the properties of the synaptic responses mediated by this receptor.

Age-Related Changes in the GABA System of the Auditory Cortex

Primary Investigator:
Donald M. Caspary, Ph.D.

Dr. Caspary is attempting to determine how brain chemicals and receptors, in one important acoustic processing area, are affected by aging. The experiments compare the age-related changes in the levels of certain brain chemicals and changes in specific receptors located in the brain cells of young and old animals. The experiments are focusing on the brain chemicals and receptors that improve the detection of complex signals such as speech in a noisy environment. The findings could lead to the eventual development of drug therapy for certain kinds of age-related hearing loss.

ADP Ribosylation of a Potent Inducer of Proliferation

Primary Investigator:
Mark L. Francis, M.D.

An unknown protein activates B cells (a type of lymphocyte that circulates in the blood) to recruit other cells in the fight against a foreign invader by making immunoglobulins to bind the invader and assist in the destruction of foreign cells. Sometimes this protein may function abnormally, resulting in cancer (uncontrolled cell growth) immunodeficiencies (inability of immune cells to function) and in autoimmunity (inappropriate activation of immune cells). Dr. Francis found this unknown protein by using cholera toxin, a different protein that attaches a chemical called ADP-ribose to proteins in a process called ADP-ribosylation. He is using the process of ADP-ribosylation to identify and purify the unknown protein to determine how it normally works within the B cells. Ultimately, understanding the function of this protein may allow researchers to manipulate it for disease therapy.

Benzodiazepine Modulation of Long Term Potentiation

Primary Investigator:
M. Steven Evans, M.D.

Benzodiazepines are a class of drugs that affects the central nervous system and are used to treat such conditions as anxiety and insomnia. These drugs have been known to worsen memory. For more than two years, Dr. Evans has been studying one of these drugs, midazolam. He has found that it increases the inhibitory neurotransmitter GABA (gamma aminobutyric acid), which reduces a special kind of brain plasticity. Dr. Evans is attempting to link this finding to memory weakness. In addition, he is studying other benzodiazepines and benzodiazepine inverse agonists with the hope of learning how to make a drug that can improve memory with minimal side effects.

The Effect of Gonadotropins on Apoptosis and Fas/FasL Expression in Ovarian Cancer Cell Lines

Primary Investigator:
Marta A. Crispens, M.D.

Epithelial ovarian cancer, which grows in the lining (epithelium) of the ovaries, is the leading cause of death from gynecologic malignancy in the United States. Women in the advanced stages of the disease have low survival rates. Epidemiological studies have pointed to incessant ovulation as an important risk factor for epithelial ovarian cancer. One hypothesis is that this is an effect of prolonged exposure to high levels of circulating gonadotropins (a group of hormones from the anterior lobe of the pituitary gland that stimulate growth of the ovaries and the secretion of sex hormones). The group is studying whether gonadotropins stimulate the growth of ovarian cancers, either by inhibiting apoptosis (cell death) or by stimulating proliferation. This project is funded internally by SIU School of Medicine through the Central Research Committee.