

Summer 2008
NSCI Undergraduate Research Program

MENTOR INFORMATION

NAME	Dr. Matthew J. Smith
PLU Position	Associate Professor and Chair
Department	Biology
List your published (<i>in past 2 years</i>) and pending-publication research papers.	I am working on two papers with Alicia Che, an undergraduate student, who has worked for me the last two summers, but we do not expect to submit them until late spring 2008.
List your grant awards	NIH - AREA
List your pending grant proposals	
<i>Using specific examples</i> , list your plans to include Student-Researchers in your <i>Summer 2008</i> Research.	Student-Researchers will be involved in all aspects of the research as outlined briefly below, except for the euthanization of animals.
<i>Research Title</i>	Role of Estrogen in Gap Junction Expression in Astrocytes
<i>Research Abstract</i>	<p>The goals of this proposal are to further understand the mechanisms by which estrogen modulates brain function. More specifically, we will examine whether estrogen alters gap junction expression in cultured astrocytes.</p> <p>Students will be involved in all aspects of studies that utilize the techniques of immunoblot and RT-PCR to examine changes in protein and mRNA levels in astrocyte cultures treated with estrogen or vehicle.</p>
<i>Research Background</i>	<p>We are now beginning to appreciate that estrogen affects the body in ways that extend beyond its essential actions of regulating gonadotropin and prolactin secretion and modulating sexual behavior. In fact, it influences a number of diverse physiological functions including but not limited to learning and memory, bone and mineral metabolism, urinary continence, and blood pressure and cardiovascular function. Estrogen has also been linked to symptoms of depression and may alter the progression of age-related diseases such as Alzheimer's disease. Thus, my research is beginning to explore other novel mechanisms that may underlie the pleiotropic effects of estrogen.</p> <p>We have now entered a new era of neuroscience, in which ground-breaking discoveries about glia (supportive cells of the nervous system) demand that we take a closer look at understanding the intricate relationships that exist between these cells and neurons. Glia are direct targets for estradiol's action on the nervous system since estrogen receptors are present on glia, and estrogen response elements are present in the promoter region of several glial-specific genes. Thus, I have decided to switch directions in the focus of my research and begin devoting energy to understanding in more detail how estradiol influences glial function. I am particularly interested in the role, if any, estradiol plays in modulating gap junction activity in these cells. It is well known that estradiol modulates gap junction formation in the uterine myometrium during pregnancy by up-regulating connexin 26 and 43 gene expression; however very little is known about its roles in regulating these gap junction proteins in the central nervous system. I have begun collaborating with a colleague at the Medical College of Georgia and we have obtained some promising preliminary data. I hope to begin writing a National Science Foundation Research at Undergraduate Institutions</p>

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	(RUI) grant proposal to be submitted in the summer of 2009.
<i>Research Procedure</i>	Generate and maintain astrocyte cultures using sterile conditions Treat astrocyte cultures with estrogen or vehicle Isolate both protein and mRNA Perform immunoblots to determine changes in protein concentrations Perform RT-PCR to determine changes in mRNA levels
<i>Research Scientific Significance</i>	Menopause heralds the end of reproductive cyclicality in women and the beginning of permanently decreased estrogen concentrations. It has become increasingly important to understand the costs of prolonged exposure to low estrogen levels, since women are now spending a greater proportion of their lives in this hypoestrogenic state since the average lifespan has dramatically increased. The proposed research above will expand our knowledge on the pleiotropic effects of estrogen in brain function.