

Summer Student Research Program  
Project Description

**FACULTY SPONSOR'S NAME AND DEGREE:** Ellen Townes-Anderson PhD

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**PROJECT TITLE (200 Characters max):**

*Synaptic Plasticity of Adult Retinal Neurons*

**HYPOTHESIS:**

Although adult neurons from the brain regenerate poorly after injury, stimulation of specific signaling pathways can accelerate growth and may provide avenues for future drug development. We are currently asking the question whether stimulation of cAMP-dependent and RhoA pathways can cause new synapse formation by retinal photoreceptors and allow them to reconnect to second order neurons after transplantation.

**PROJECT DESCRIPTION (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)**

We use a cell culture system of retinal neurons isolated from the adult salamander retina. In these cultures, fully differentiated retinal neurons, including photoreceptors, grow new neurites and form new synapses. We use this system to test signaling systems involved in regeneration and synaptogenesis. The specific project involves using drugs to increase or decrease cAMP and adenylyl cyclase activity. After drug manipulation, growth is monitored over time and then quantified with image analysis of immunostained cells. To study RhoA pathways we will use an in vitro preparation of pig retina. Synaptic plasticity is monitored before and after application of drugs which have therapeutic potential. Here analysis is both morphological and biochemical to look for activated targets in the RhoA pathway. Additionally, the lab is interested in culturing mature glial cells to determine if conditioned medium from astrocytes can promote retinal cell regeneration. Exactly what project(s) one participates in will depend on what experiments look most promising and on the interests and experience of the student.

**SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:**

*Zhang, N. et al. J. Neurosci. 25: 2761-2770, 2005*

*Fontainhas, A.M. and E. Townes-Anderson.. I.O.V.S. 49: 4177-4187, 2008*

**IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS?**

Yes  or No

**(IF YES, PLEASE SUPPLY THE GRANTING AGENCY'S NAME)**

*F.M. Kirby Foundation*

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Project Description

THIS PROJECT IS:  Clinical  Laboratory  Behavioral  Other

THIS PROJECT IS CANCER-RELATED

Please explain Cancer relevance

THIS PROJECT IS HEART, LUNG & BLOOD- RELATED

Please explain Heart, Lung, Blood relevance

THIS PROJECT EMPLOYS RADIOISOTOPES

THIS PROJECT INVOLVES THE USE OF ANIMALS

PENDING  APPROVED  IACUC PROTOCOL  
#06043

THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS

PENDING  APPROVED  IRB PROTOCOL # M

THIS PROJECT IS SUITABLE FOR:

UNDERGRADUATE STUDENTS  ENTERING FRESHMAN   
SOPHOMORES  ALL STUDENTS

THIS PROJECT IS WORK-STUDY: Yes  or No

THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR  
FOR INTERESTED VOLUNTEERS?: Yes  or No

WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?

About issues concerning repair of the central nervous system; about the function of the retina and retinal diseases; about primary cell and tissue culture, immunocytochemistry, image analysis; fluorescence microscopy; and perhaps confocal microscopy and optical tweezers