



Research Assignment - 2009

Title of research assignment

Interactions that Regulate the Cellular Response to DNA Damage

Principal Investigator **Penny Beuning**

Title **Assistant Professor**

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Research abstract

The objective of this research is to understand how cells respond to DNA damage. DNA damage is ubiquitous and can arise from many sources, including from ultraviolet light and reactive oxygen species. In all organisms there are redundant pathways to identify and remove DNA damage. However, DNA damage can evade repair pathways and block or stall the process of copying DNA that is required for cell division (DNA replication). Disrupted DNA replication can lead to mutagenesis and can be lethal to a cell. A specialized family of DNA polymerases with the ability to copy damaged DNA contributes to DNA damage tolerance. Notably, these polymerases do not repair DNA, but rather allow DNA replication to continue in the presence of DNA damage. These specialized polymerases are characterized by their low fidelity on undamaged DNA. Most organisms have between two and four specialized DNA polymerases. These polymerases may be an important force in bacterial evolution due to their ability to generate point mutations. Furthermore, humans with defects in DNA pol eta, which copies DNA containing lesions that result from UV light, are predisposed to skin cancer. The goal of this project is to understand how dynamic interactions between "normal" DNA polymerases, specialized DNA polymerases, and other DNA replication proteins contribute to DNA damage tolerance. This will be accomplished using biochemical assays, biophysical methods, and molecular biology techniques.

Research activities/experience

Participants will gain an understanding of modern problems and techniques in biochemistry and biotechnology research. Participants will gain experience in experimental design including the use of appropriate controls. Research experiences include site-directed mutagenesis, molecular cloning, protein purification, biochemical assays, and

characterization of cellular responses to DNA damaging agents and mutagens.

Expectations of RET

Participants are expected to have or be willing to develop excellent laboratory technique. Participants will be fully active members of the laboratory group, including attending group meetings, discussing research results, and reading and discussing the primary literature. Participants will be expected to demonstrate creativity and critical thinking in designing experiments and analyzing results. Schedule is flexible; attendance at weekly group meetings is strongly encouraged.

Special skills or interests that would help a RET participant with this assignment (i.e., an interest in physics, experience with specific laboratory equipment, etc.)

Experience with sterile technique helpful but not required. Experience handling proteins and nucleic acids helpful.

Lab safety/issues unique to this laboratory. A general Lab Safety Overview will be presented by Environment Health and Safety to both RET and YSP participants prior to the beginning of lab assignments.

Autoclave safety, biohazard and recombinant DNA, radiation awareness training

Suggested literature to be reviewed prior to beginning this research assignment.

Relevant literature will be provided prior to start of project.

Research/Lab Summer Hours	9:00 a.m. – 6:00 p.m.	<input type="checkbox"/> Monday through Thursday		
		<input checked="" type="checkbox"/> Monday through Friday		
Scheduled Research/Lab Meetings	3:00 p.m. – 4:30 p.m.	<input type="checkbox"/> Daily	<input type="checkbox"/> Wednesday	<input type="checkbox"/> To be determined
		<input type="checkbox"/> Monday	<input type="checkbox"/> Thursday	
		<input checked="" type="checkbox"/> Tuesday	<input type="checkbox"/> Friday	

Lab/research project URL

www.dna.neu.edu

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