

James & Esther King Biomedical Research Program

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Bridge
(1-year project)*

Project Title: RNA Quality Control Against Oxidative Damage

Project Summary: Every puff of tobacco smoke contains millions of reactive molecules that can damage essential components of cells. This damage is strongly implicated as a major cause of tobacco-related diseases, e.g. a number of cancers and degenerative diseases. It has been well known that damage to DNA and protein is detrimental to cells. RNA is the molecule that carries information from the DNA and directs the synthesis of each protein in the cell. Chemically, RNA is similar to DNA. We have just begun to realize that agents that damage DNA would also damage RNA, and damage to RNA can be even more severe than damage to DNA. RNA damage by tobacco smoke presents a challenging problem for cells. RNA damage and failure to remove damaged RNA would cause dysfunction of cells and organs, which may provide a plausible explanation for a variety of related diseases. However, little is known about the consequence of RNA damage, or how it is removed. This study will examine how cells eliminate damaged RNA molecules that are generated by reactive oxygen species, a group of chemicals that are present in large quantity in tobacco smoke. Study of damaged RNA may lead to the development of new markers for diagnoses of tobacco related diseases. We will identify genes and proteins that are used to remove damaged RNA. These genes and proteins may play important roles in protecting cells against tobacco smoke damage, and may be new molecular targets for prevention and treatment of tobacco-related diseases.