

## DEVELOPMENT OF ENHANCED *IN VITRO* MODELS TO SUPPORT HIGH-THROUGHPUT SCREENING FOR AEROSPACE TOXICOLOGY

1. **Research Title:** Development of Enhanced In Vitro Models to Support High-Throughput Screening for Aerospace Toxicology
2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:**
  - Bioengineering, Chemical Engineering (working toward M.S. or Ph.D.)
4. **Objectives:** Develop in vitro models which incorporate multi cell types and 3D growth environments in order to improve the in vitro cell model correlations with in vivo studies
5. **Description:** In order to protect DoD personnel, there is an urgent need to rapidly and systematically evaluate toxicity and physiological changes associated with aerospace environments. The gold standard of toxicity evaluation is a suite of in vivo animal experiments, which are costly, time consuming, and do not always directly correlate to the human response; establishment of faster, more relevant methods could yield higher predictive power to provide accurate, long term benefits. Currently, the literature has demonstrated that one of the critical challenges facing predictive toxicology is the lack of versatile in vitro model systems that allow rapid, quantitative, systematic testing while mimicking the in vivo tissue microenvironment. The key phases of this project will to develop an in vitro lung model to mimic inhalation exposure, as well as models for the skin, brain, and liver to determine the effects of dermal exposure and systemic distribution. In order to improve the in vitro cell model correlations with in vivo studies, co-cultures will be developed that incorporate immune cell function and are grown in a three dimensional (3-D) environment. The benefits from this screening technology include lower cost for evaluating physiological and toxicological changes, more rapid screening, and the capability to assess a larger number of experimental conditions, all of which provide greater protection for personnel working in different operational environments.
6. **Research Classification/Restrictions:** This research is considered Unclassified
7. **Eligible Research Institutions:** Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati