RH19-1

DEVELOPMENT OF ENHANCED *IN VITRO* MODELS FOR AEROSPACE TOXICOLOGY & HUMAN PERFORMANCE STUDIES

1. Research Title: Development of Enhanced *In Vitro* Models for Aerospace Toxicology & Human Performance
2. Individual Sponsor:
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3. Academic Area/Field and Education Level:
   Bioengineering/Biomedical, Chemical, or Materials Engineering (M.S. or Ph.D.)

4. Objectives: Develop *in vitro* models which incorporate multiple 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 and ensure optimal human performance, there is an urgent need to rapidly and systematically evaluate toxicity and physiological changes associated with aerospace environments. The gold standard of 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/biology is the lack of versatile *in vitro* model systems that allow rapid, quantitative, systematic testing while mimicking the *in vivo* tissue microenvironment. The goal of this work is to develop enhanced *in vitro* models to identify molecular changes that alter human performance and address the toxicity of Air Force relevant materials. Key phases of this project will to develop *in vitro* human derived models to represent the lung and brain that incorporate immune cell function and a three dimensional (3-D) environment. The benefits from this screening technology include lower cost for evaluating the molecular basis for 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 Airmen 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

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