

**Opportunity Title:** AFRL - Molecular Biosignatures Internship

**Opportunity Reference Code:** AFRL-711HPW-2021-0015

**Organization** U.S. Department of Defense (DOD)

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**How to Apply** Click on *Apply* at the bottom of the opportunity to start your application.

**Description** The U.S. Air Force Research Laboratory (AFRL) has a need to continuously monitor and sense (in real time) molecular biosignatures of airmen in operational and training environments for improved human performance. Maintaining performance could be accomplished through the discovery of novel human stress biosignatures/biomarkers which could then be “transferred technology” for the development of wearable sensing devices.

### What will I be doing?

As an ORISE participant, you will join a community of scientists and researchers in an effort to gain knowledge in areas related to AFRL’s mission and to support basic research of the Air Force Office of Scientific Research (AFOSR) funded project “Operationally Relevant Molecular Biosignatures Discovery & Evaluation: In Vitro Ocular Model”.

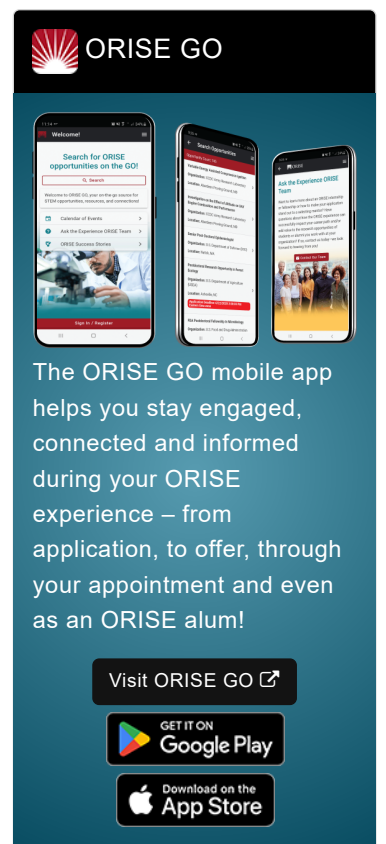
You will participate in the development of an ocular model to accurately recapitulate tear secretion and monitor stress. This model will be used to identify molecular signatures of operationally relevant stress in non-invasive biofluids (tears) to predict physiological state and performance. The proposed basic research aims to develop an *in vitro* ocular cells representative models to produce tear secretion (conjunctiva and lacrimal cells) and identify molecular biosignatures of stress in tears. Initially, characterization of intracellular and extracellular molecular stress response biosignatures will be evaluated using *in vitro* corneal epithelial cell line models to a variety of operationally relevant stressors including fatigue, cognition, hypoxia, hyperoxia, high altitude, anxiety, mood related behavior, and extreme temperature, cold, and contaminants etc.

The project also involves CRISPR/Cas9 gene editing tools to determine the key genes involved in stress and their manipulation.

### Why should I apply?

Under the guidance of a mentor, you will gain hands-on experience to complement your education and support your academic and professional goals. Along the way, you will engage in activities and research in several areas. These include, but are not limited to, conducting research and collecting data with the following objectives:

- Identify operational stress molecular biosignatures specific to different operationally-relevant stress conditions.
- Develop methods to investigate and characterize biosignatures that may be key indicators of physiological stress factors (this will be accomplished through the characterization of unique releases of specific exosomes, alterations in mitochondria, and cytokine release, signaling molecules, and transcription factors in non-invasive bio-fluid).



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### **What is the anticipated start date?**

AFRL is ready to make appointments immediately. Exact start dates will be determined at the time of selection and in coordination with the selected candidate. Applications are reviewed on an ongoing basis and internships will be filled as qualified candidates are identified.

### **What is the appointment length?**

An ORISE appointment period can be a short-term (less than 2 weeks), summer (10-12 weeks), or yearlong appointment. Faculty appointments are generally for 10-12 weeks during the summer, but appointments during the academic year are also available. Appointments may be extended depending on funding availability, project assignment, program rules, and availability of the participant.

### **What are the benefits?**

You will receive a stipend to be determined by AFRL. Stipends are typically based on a participant's academic standing, discipline, experience, and research facility location. Other benefits may include the following:

- Health Insurance Supplement (*Participants are eligible to purchase health insurance through ORISE*)
- Relocation Allowance
- Training and Travel Allowance

### **About AFRL**

AFRL leads the discovery, development and integration of affordable warfighting technologies for America's air, space and cyberspace forces. AFRL is a full-spectrum laboratory, responsible for planning and executing the Air Force's science and technology program. AFRL leads a worldwide government, industry and academic partnership in the discovery, development and delivery of a wide range of revolutionary technologies. The laboratory provides leading edge warfighting capabilities keeping our air, space and cyberspace forces the world's best. The 711 Human Performance Wing advances human performance in air, space and cyberspace through research, education and consultation, accomplished through the synergies created by the wing's two distinct but complementary entities: Airman Systems Directorate and U.S. Air Force School of Aerospace Medicine. For more information about AFRL, visit <https://www.wpafb.af.mil/afrl/>.

### **About ORISE**

This program, administered by Oak Ridge Associated Universities (ORAU) through its contract with the U.S. Department of Energy (DOE) to manage the Oak Ridge Institute for Science and Education (ORISE), was established through an interagency agreement between DOE and DoD. Participants do not enter into an employee/employer relationship with ORISE, ORAU, DoD or any other office or agency. Instead, you will be affiliated with ORISE for the administration of the appointment through the

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ORISE appointment letter and Terms of Appointment. Proof of health insurance is required for participation in this program. Health insurance can be obtained through ORISE. For more information, visit the [ORISE Research Participation Program at the U.S. Department of Defense](#).

**Qualifications** The qualified candidate should currently be pursuing or recently have received a bachelor's, master's, or doctoral degree. Degree must have been received within five years of the appointment start date.

Highly competitive applicants will have education and/or experience in one or more of the following:

- Primary cell isolation from tissue: isolation of cells to be used in 3D cell culture model.
- Visual science and physiology, ocular health, secretory mechanisms.
- Background with: CRISPR/Cas9 gene editing, mitochondrial health (gene profiling, extracellular flux) molecular endpoints (inflammatory markers, oxidative stress factors, lipid peroxidation etc) exosomes and microvesicle characterization, miRNA, cytokines, gene and protein analyses.
- General techniques: in vitro cell culture, sterile technique, PCR, ELISA, light microscopy, confocal laser scanning microscopy, Digital PCR, Electron microscopy experience.
- Data analysis, results interpretation, statistical analysis, and scientific communication.
- Project development, troubleshooting, and presenting.
- Environmental Stressors (hypoxia, heat and cool, particulate, aerosols, etc).



#### Application Requirements

A complete application consists of:

- Zintellect Profile
- Educational and Employment History
- Essay Questions (goals, experiences, and skills relevant to the opportunity)
- Resume (PDF)
- Transcripts/Academic Records - For this opportunity, an unofficial transcript or copy of the student academic records printed by the applicant or by academic advisors from internal institution systems may be submitted. [Click here for detailed information about acceptable transcripts](#).
- One Recommendation

If you have questions, send an email to [AIRFORCE@orise.orau.gov](mailto:AIRFORCE@orise.orau.gov). Please list the reference code of this opportunity [AFRL-711HPW-2021-0015] in the subject line of the email.

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- Eligibility Requirements**
- **Citizenship:** U.S. Citizen Only
  - **Degree:** Bachelor's Degree, Master's Degree, or Doctoral Degree received within the last 60 months or currently pursuing.
  - **Discipline(s):**
    - **Chemistry and Materials Sciences** ([1](#) )
    - **Life Health and Medical Sciences** ([5](#) )