

REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHD-21-06

MODULATION OF NEURONAL ACTIVITY BY ELECTROMAGNETIC FIELDS

PROJECT DESCRIPTION: The Warfighter Effectiveness Research Center is the research arm of the Department of Behavioral Sciences and Leadership at the United States Air Force Academy, facilitating faculty and cadet research that enhance warfighter effectiveness. The WERC conducts a wide range of research and design projects for operational customers including special operations forces, the Air Force Office of Scientific Research, Air Force Research Laboratory, and Army Research Laboratory. These projects are based in the behavioral sciences and connect to a wide range of disciplines and collaborators across government labs, academia, industry, and military operators in order to generate the most innovative and effective solutions.

The mission of the AFRL's Radio Frequency Research Branch is to better understand the fundamental mechanisms underlying the interaction of non-ionizing electromagnetic (EM) fields with biological systems, including coupling to intracellular molecules and potential impact on the natural cellular processes. Our current research aims to determine how radiofrequency (RF) EM fields interact with microtubules (MTs). Specifically, we intend to assess the response of neuronal MTs to RF EM fields (frequencies in MHz to GHz range) by directly applying tuned RF EM fields to neuronal cells in vitro and in vivo. We will investigate how the tuned RF EM frequencies would positively or negatively modulate MTs' structure and behavior, and potentially affecting neuronal cell activity, processes, and morphogenesis. We will assess changes in MTs dynamics and function, in gene expression and epigenetic patterns, and in intrinsic and evoked synaptic transmission. The study will employ an array of techniques in cellular and molecular biology, genomics, proteomics and bioinformatics, microscopy, and electrophysiology.

ACADEMIC LEVEL: Bachelors, Masters, PhD

DISCIPLINE NEEDED:

- Engineering
 - Bioengineering and Biomedical Engineering
 - Chemical Engineering
- Life Health and Medical Sciences
 - Basic Biomedical Sciences
 - Biochemistry
 - Biology (General)
 - Biophysics
 - Cellular and Molecular Biology
 - Neurosciences
 - Structural Biology

RESEARCH LOCATION: JBSA, Fort Sam Houston, San Antonio, TX

RESEARCH ADVISER: Ibtissam Echchgadda, PhD

Cellular and Structural Biology, University of Texas Health Science Center at San Antonio (UTHSCSA),
2003

Dr. Ibtissam Echchgadda is a Senior Research Biological Scientist for the Air Force Research Laboratory (AFRL), 711 Human Performance Wing, Bioeffects Division, Radio Frequency Research Branch at Fort Sam Houston, TX. She serves as a principal investigator on several projects that focus on understanding the biophysical and biochemical mechanisms that govern radiofrequency electromagnetic fields interaction with biological systems. Dr. Echchgadda has over 20 years of experience in different basic science and applied research. Before joining AFRL, she worked as a defense contractor for General Dynamics and before that, she served as a Research Faculty at the University of Texas Health Science Center San Antonio. Dr. Echchgadda received multiple honorable awards and her work has been published in peer-reviewed journals and at several national and international conferences.