F25.032 Is Raman Spectroscopy Effective in Detecting Preeclampsia?

Overview

Preeclampsia affects 2 to 8% of all pregnancies and is associated with high maternal and neonatal morbidity and mortality (Wu et al., 2018). It is a pregnancy-specific hypertension disorder that can cause heart failure, stroke, cardiovascular disease, and death. Individuals who had preeclampsia are at greater risk for chronic hypertension, diabetes mellitus, stroke, peripheral artery disease, and ischemic heart disease later in life (González et al., 2023). Currently, preeclampsia is diagnosed with blood pressure readings, lab tests, and symptoms. Cases are often missed by providers, sometimes resulting in death. There is no cure for preeclampsia, but medications can be used to reduce the severity of the disorder.

A more effective test is needed to detect preeclampsia earlier so providers can be proactive in treating individuals who are at risk for the disorder. One proposed test is a Raman test, which is based on salvia. The Raman test can be used to detect inflammation by looking at the patterns of Siglecs. The patterns differ based on the disease. There is evidence that this technique can be used to detect heart disease and breast, uterine, and cervical cancer (Chaichi et al., 2018; Zhang et al., 2023).

The purpose of this pilot study is to determine if the Raman test can be used to detect preeclampsia during pregnancy. Samples will be collected from pregnant people throughout pregnancy and compared to blood pressure readings, labs, and diagnoses to determine if the Raman test can be used to accurately predict a preeclampsia diagnosis. This study will be a multi-disciplinary research effort with Dr. Miguel Jose Yacaman's research team (Applied Physics and Materials Science Department).

What the student will DO and LEARN

The student will be involved in most aspects of the research project and will be required to collaborate with the research teams. The student will work with the librarian to learn how to conduct a literature search and will summarize the relevant findings. The student will learn how to finetune the study's methodology and then use the methodology to conduct the study. The student will learn about and then use that knowledge to recruit participants, obtain their consent to participate in the study and collect data from the participants. The student will learn from their team how to analyze samples with Raman Spectroscopy. The student will learn how to analyze the data and assist in developing graphs.

Additional benefits

A benefit is that the student will have the opportunity to participate in a multi-disciplinary study. This may provide the opportunity to learn about a field other than their own and work with students and faculty members outside of their field. Students will learn how to access and use resources at NAU, such as Cline Library and the librarians. The student will most likely get to work on this project from near the start, so they will get to see the entire research process. The student will be able to learn about pregnancy, gestational hypertension, preeclampsia, and Raman testing. Part of this learning process will include the opportunity to work on their research writing.

Additional qualifications

The student must be open to learning new things and occasionally go outside of their comfort zone with support from the advisor. The student should have some knowledge of health and pregnancy or be willing to expand their knowledge of these areas. While the student does not need to have statistical skills, it would be beneficial to be curious about these areas. The ability to work independently at times is helpful.

This position is partially-funded by NAU's LSAMP program, so acceptance to this position is contingent upon LSAMP-eligibility

Time commitment

5 hrs/week for 30 weeks