FFPE Sample Dissociation using Nanodroplets

By Suud Ashur – Biology major
Faculty Advisor: Dr. Paul Dayton
Biomedical Engineering Department
Co-mentor: Samantha Pattenden
Research question

My research involves nanodroplets, chromatin and Formalin fixed paraffin-embedded (FFPE) patient biopsy samples:

- **Nanodroplet**: Microscopically-sized droplet containing a specific type of liquid.
- **Chromatin**: A complex containing DNA and proteins that packages DNA to fit into the cell nucleus.
- **FFPE Patient biopsy samples**: Preserved tissue samples generally associated with diseases. In our case, we look at a specific type of disease called Ewing Sarcoma, a pediatric cancer in bones and soft tissues.

Can we take advantage of Nanodroplets to extract and fragment chromatin from formalin fixed, paraffin-embedded (FFPE) patient biopsy samples?

From a scientific perspective, extracting chromatin from FFPE patient biopsy samples requires enzymes that have the potential to degrade some of the chromatin that we need. Generating a method for the extraction of chromatin without degrading it is very desirable and likely to be used as a standard in oncological medicine. In other words, nanodroplets can potentially provide a new method in understanding the mechanisms of Ewing Sarcoma, increasing the chances to find cure for patients with this disease.
Results

• When high-frequency waves were applied to a solution containing FFPE samples and nanodroplets, we found the following results:

1) Chromatin was extracted and fragmented from the samples without degradation.

2) A substantial amount of DNA was recovered from the samples when compared to samples without the addition of nanodroplets.

Thanks to such results, we are in the process of creating a protocol that will allow scientists to go from an FFPE patient biopsy sample directly to its DNA.

• Scientists can use this protocol to learn about any carcinogenic disease that is associated with changes in chromatin structure, thereby advancing the field of oncological medicine.

• Cancer are extremely difficult to cure. However, extracting abnormal chromatin can allow scientists to test molecules that revert these abnormal chromatin to their original form. This increases the chances to find cure from diseases that have abnormal chromatin such as Ewing Sarcoma.