Currently, my undergraduate research experience (SRS) takes place in the Mayo Clinic Oncology Research Laboratories, located in the Gonda Building of Peace Plaza Campus. The primary area of research my team and I focus on includes the understanding of pathology (total progression/life cycle) of pancreatic cancer. Our aim is to develop a catalog of precursor signs that will work as a programmable data base used to more accurately assess the condition of one’s pancreas, and to provide an accurate cancer diagnosis much earlier than currently possible.

My current lab is headed by our Principal Investigator (PI) Dr. Martin-Fernandez Zapico. My current Immediate Supervisor is Dr. Brooke Trader. My co-lab partner is UMR’s very own, Brian Chang.

Research has been a fundamental part of my aspiration for following medicine. Particularly in the way that I see research as the primary force pushing scientific exploration, forward; as the basis for all knowledge we have today, and as the epic to all things we will come to know tomorrow. Taking part in the research of Dr. Zapico’s lab provides me with an excellent opportunity to gain valuable in lab experience. In addition, I have the opportunity to really see if the world, schedule, and pace of research is right for me, before having to make a commitment to research, when applying to Grad-School.

When developing a better way to diagnose pancreatic cancer, my co-lab partner and I use the known function of these inscription factors, which are used to more accurately assess the condition of one’s pancreas, and to provide an accurate cancer diagnosis much earlier than currently possible.

As I currently serve as a laboratory member for my second year, I am happy to say that I hold strong in my aspirations to continue my current lab partnership well into the end of my undergraduate career. Depending on where med school takes me, I may have to end my time here at Mayo. But for now, I am excited to say I am still a part of the team!
Nuclear imaging; Discovering the Connections Between Nuclear Volume and the Diagnosis of Early-stage Subtyping in the Morphology of Pancreatic Cancer

Jake Christopher Atencio \(^1\), Brooke Tader \(^2\), Martin Fernandez-Zapico \(^2\)

Background
- Pancreatic cancer has a mortality rate of 93% within the first five years of diagnosis \(^1\).
- Early detection of pancreatic subtyping can improve the rate of early intervention, leading to a decrease in pancreatic related fatalities \(^2\).
- Variations to nuclear size and shape have been observed in cancerous cells \(^3\).
- Proton microscopy in nuclear imaging, along with nuclear staining allows for quantification of nuclear volume.

Aim:
We aim to develop a better understanding of pancreatic cancer subtyping and morphology in order to improve early diagnosis rates; provided through the phenotypic classification of nuclear size.

Methods

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<tr>
<th>Cancer model system</th>
<th>Data collection</th>
<th>Data analysis</th>
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<td>Mouse models</td>
<td>Nuclei volume</td>
<td>These quantifications are then processed into graphs in further analysis of the data.</td>
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Results

Figures 1 and 2: Fluorescent color staining “highlighting” the nuclei of each cell.

These fluorescent images are uploaded onto the quantification software (Fiji) where the volumetric value of each nuclei is measured using microscopic imaging that includes three dynamics: An X, Y, and Z oriented plane; allowing for an accurate three-dimensional analysis of the nuclei itself. The software provides a layout of each individual quantification of each nuclei. An average can be calculated of these volumes, and is displayed typically using a paragraph that has been broken into its subcategories of “knockout groups”

Conclusions & Future Directions
- This software is used to identify certain fluorescently colored stains of nuclei that are “tagged for certain genetic factors” or “Knockouts”
- Observations of nuclear size can help us determine patterns in nuclear morphology as they are related to cellular subtyping.

References
- Bio-render Images LLC.
- Department of Oncology and Medical Pathology; Mayo Clinic - Rochester Campus
- Principal Investigator (PI) Dr. Martin Fernandez Zapico.
- Immediate Supervisors Dr. Luis Flores, and Graduate Student Brooke Trader.

What Is My Role In The lab?
- My primary role include quantification and processing of data. This includes utilizing the tools of nuclear images, combined with a computer mapping formatting known as FIJI, allowing us to quantify nuclear volume/size.