Appendix D: Sample Intern Assignments

Working Introduction to Research (Week 2)

Aggregometer is the measured rate of platelet rich plasma (PRP) or in whole blood (WB). The rate measure will help us understand when a surgical patient needs to be given or removed from an anticoagulant (blood thinner) in a short amount of time. This can help prevent patients from bleeding out. If successful, this can be used in surgical rooms, Doctor's offices, or even possibly by a patient as a point of care device.

Currently for the experiment, my mentor and I are using a protocol directly from a previous student researcher named A----. I will be replicating A----'s work, as well as investigating if the experiment may be tested not only on platelet rich plasma (PRP) but also on whole blood (WB).

Based on evidence from previous research, I predict that platelet rich plasma (PRP) will serve as a successful care device. If successful, this will help prevent patients from bleeding out during surgery. I hypothesize that with new methods we will be able to successfully test Aggregometer not only against platelet rich plasma (PRP) but also against Whole Blood (WB).

Abstract for Research Showcase Program (Week 6)

Aggregation Measurement in whole blood and platelet rich plasma using MICELI (MICrofulidic, Electronic, Impedance) Chips
Thrombosis (blood clotting) is a leading cause of death in American[s]; approximately 274 people die every day from it. My research focused on if Aggregometry can be used in surgical rooms, Doctor's offices, or even by a patient. It will determine if patients need to be given or taken off of an anticoagulant (blood thinner). In previous studies, Aggregometry research focused on platelet rich plasma (PRP); we plan to research this and whole blood. The device used was successful at recording impedance of aggregation; however, results showed sharp stir bars had a negative effect on the impedance and the speed of the stir bar. I hypothesize that with new methods we will be able to successfully test Aggregometry not only against PRP but also whole blood.

Thirty-Second Elevator Speech for Showcase (Week 7)

My name is A----- V------ and over the summer I worked in Dr. S-----'s lab. The main focus of his lab is biomedical engineering within the circulatory system. The circulatory system consists of your heart and lungs. For my research, I got to investigate aggregation within platelet rich plasma and whole blood. The reason why this is so important is because strokes or potential thrombosis—also known as blood-clots—are one of the leading causes of death in America today. We plan to develop a patient care device that can detect when a patient is going to have a stroke or a blood clot. This will let us know if a patient needs to be taken off an anticoagulant (blood thinner) or given one within a short amount of time, which can ultimately save the patient's life.

Final Two-Minute Presentation for Showcase (Week 7)

In previous research with aggregation using MICELI Chips, only platelet rich plasma was investigated. We wanted to research whole blood and compare it to platelet rich plasma's effectiveness, since we want to turn this into a patient care device. We want our care device to be easily accessible and as affordable as possible to a wide range of the population. Creating a protocol for whole blood will allow us to able to use whole blood for our care device since patients won't be able to extract their platelet rich plasma from whole blood. This will help make our device more accessible and inexpensive. Our device will also be portable unlike current aggregation systems, which are huge and not portable.

We created our MICELI chips out of PDMS, which is a silicone base. We used a system called Repitaya to record the impedance of our aggregation. We then used a system called Matlab and Putty to record our data.

Our results showed that we will be able to use whole blood instead of platelet rich plasma. Therefore, patients can use their whole blood to find out if they are at a potential to have a stroke or blood clot.

This device will be used like a glucose meter is used for diabetic patients who test their glucose levels to prevent them from going into diabetic shock and even a diabetic coma. This device will determine if patients who are on a lot of anticoagulants (blood thinners) like ibuprofen are going to have a stroke or bleed out from a clot. This will let them know if they need to be given an anticoagulant or need to be taken off one in a matter of seconds, ultimately saving their lives.

Final Anticipated Audience Questions for Showcase (Week 7)

How soon do you expect to see this device in the market?
This research will not be published nor made into a care device for several years since all research takes several years and modifications. We still need to get all kinds of data to present its viability.

Why use ADP as an agonist?
ADP is found in your blood when your blood starts to form a clot.

How do you extract PRP from whole blood?
You put the whole blood into a centrifuge, and then it will separate the platelet rich plasma from the whole blood. Which will allow you will be able to collect the extracted PRP.

What is an anticoagulant?
An anticoagulant is a blood thinner.

What is PRP?
Platelet rich plasma