# IPRO 304C

## Development of a Portable Method for Preparing Previously Frozen Red Blood Cells for Transfusion

### Objective

The objective of this project is to develop a system for washing multiple units of frozen red blood cells in emergency situations. The key parameters that would be emphasized in the project are:

- Selection of the optimal technology for the washing process.
- Making the system portable by considering parameters like weight, dimensions, and alternative power sources.
- Automation of the system.
- Minimization of wash-solution usage by considering techniques such as recycling.
- Minimization and efficient disposal of biological waste.
- Compliance of the washed blood with the blood transfusion standards such as hematocrit values.

### Basic Organization and Tasks

To accomplish the goals set forth in the project plan, the team divided into three groups which were the standards, membrane, and centrifuge groups. The membrane and centrifuge groups then conducted research to decide which method, centrifugation or membrane separation, would be the most effective to meet the criteria as defined by the standards group.

### Accomplishments

- Successfully modeled the operation of both centrifuge and membrane devices
- Determined that the Haemonetics ACP215 centrifuge device was the optimal centrifugal separation device for this application
- Determined optimal parameters for a membrane based device to be called PUR304C
- Selected off-the-shelf components for assembly of PUR340C
- PUR304C is lighter, faster, and less expensive than the Haemonetics ACP215

### Critical barriers and obstacles

Some of the obstacles encountered were gathering information from manufacturers, locating suitable off-the-shelf components, and relating appropriate design equations for use in blood processes. Although the amount of wash solution used was minimized, no method of recycling or recovery of the wash solution was found.

### Conclusion

IPRO 304C came up with a theoretical design for a portable membrane separation device that produces the same quality of red blood cells for transfusion as the ACP215 at approximately 25% of the cost and 33% of the time.

### Next steps

IPRO 304C suggests that next semester a similar IPRO look into areas of improvement such as designing a wash solution recycle process, increasing the degree of automation in the current process; and achieving further reduction in weight and cost by replacing off-the-shelf components with student-designed components tailored to the requirements of this application.

### Faculty & Advisors

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### Student Members

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