**Process of red blood cells for preservation and storage using spray drying**

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**OVERVIEW**

**Objective:** To evaluate the feasibility of spray drying red blood cells (RBCs) for long-term preservation and storage.

**Methods:**
- RBCs were exposed to several temperatures. RBC hemolysis was measured using a spectrophotometer.
- RBCs were dried in humidity-controlled containers. Water content was measured using thermo-gravimetric analysis (TGA).

**Results:** RBCs can withstand 50 °C for 10 seconds while maintaining ≥80% viability. RBCs dried under 20% relative humidity (RH) should result in 5 wt% water content.

**EXPERIMENT 1: Determining $T_{in}$**

**Objective:** To determine the maximum solution temperature RBCs can withstand while maintaining 80% viability.

**Methods:**
- RBC solutions at 5 °C brought to 37-65 °C for 10 seconds and returned to 5 °C.
- Percent hemolysis measured using spectrophotometer.

**Results:** Hemolysis was minimal until exposure temperatures exceeded 50 °C. The highest temperature which met the preservation requirement of ≥80% viability was 50 °C to 95% confidence. The spray dryer should be designed so that this is the highest temperature that the RBCs experience.

**EXPERIMENT 2: Determining %RH**

**Objective:** Obtain 5 wt% water in dried RBCs experiencing a range of RH.

**Methods:**
- Salt solutions were prepared in triplicate.
- Drying completed after two weeks.
- RBC moisture content was measured using TGA.

**Results:** 5 wt% water content target may be achieved when spray dryer outlet RH is 20%.

**CONCLUSIONS:** Spray drying is a potentially viable operation for drying RBCs for long-term storage and preservation.

**FUTURE WORK:**
- Construct sealed drying chamber.
- Evaluate flow pattern through different diffuser plate designs; optimize design for plug flow.
- Conduct drying operation with parameters defined by experiments: $T_{in} = 115^\circ C$ and flow ratio of gas to solution of 33,000.
- Evaluate morphology of RBCs after drying.

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