Background – FocalCool’s tri-lumen cooling catheter is designed to locally cool area of heart at risk during a heart attack.

- Blood travels through blood lumen, exchanging heat with coolant lumens that carry cold saline fluid.
- Blood is reperfused to area using a balloon angioplasty catheter—inserted in blood lumen.

Problem – Balloon angioplasty catheter reduces flow area in blood lumen, creating potential for high shear stress on blood.

- Hemolysis – Fragmentation of red blood cells; release of hemoglobin into body.
- **Objective** – Determine shear stresses within blood lumen and associated effect on blood cells.

- **Current Status** – Preliminary studies have been completed, calculations show need for further, in-depth investigation
  - CFD analysis (e.g., COMSOL)
  - Physical experimentation

- **Overall Goals**
  - CFD Analysis – develop a predictive model of velocity/pressure/shear stress profiles within blood lumen of catheter
    - Parameters to vary – lumen/balloon catheter geometry, flow rate, temperature
  - Physical Experimentation -- design, fabricate, and assemble testing station for catheters
    - Quantify the amount of blood damage within blood lumen
Anticipated Clinic Process

- Definition of Problem (Blood Damage from Shear Stresses)
- Literature Review
  - Fluid properties of blood, blood shear stress thresholds, etc.
  - Designs for experimental measurements (measure flow rate, pressure, overall blood damage)
- Definition of Solution
  - Parameters to vary (temp of blood, flow rate, catheter geometry, etc)
- Modeling and Experimentation – summarize results

Benefits

- Collaboration
  - Side-by-Side work with R&D company developing new and emerging medical device technologies
- Significance
  - Contribution to help solving MAJOR issue – blood damage means modifications to medical device

What we’re looking for:

- Background in CFD modeling and/or data acquisition controls
- Interests in biochemistry, biofluid mechanics
- Excellent technical/hands-on skills
- Leadership, enthusiasm, motivation, dedication