

Project Title: Optimizing Heart and Brain Cooling During Cardiac Arrest

Sponsor: National Heart, Lung and Blood Institute/ BRP

Emergency Resuscitation Center

A Bioengineering & Medical Research Partnership

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Development of Ice Slurry Human Coolants and Medical Protocols
For Rapid Induction of Brain/Heart/Organ Cell Protective Hypothermia



Slurry Characteristics

- Water phase (% wt) 50-75%
- Ice phase (% wt) 25-50%
- NaCl (% wt) 0.9%
- Particle size
- Particle shape
- Surface 0.1 mm globular smooth
- Temperature °C
- Flowability -0.3g(φ12)



water $\Delta 1^{\circ}\text{C} = 1\text{cal/g}$
 melt ice = 80 cal/g

Status Year 2

- Developed calorimetry to measure slurry ice content
- Established use of fluorescent micro-spheres to measure regional blood flow partition
- Developed ability to make slurry onsite/on-demand of 42% ice
- Experiments with IV cooling (50 ml/kg) showed slurry (20% ice) cools brain more rapidly/deeper than cold saline and decreases bolus volume necessary to achieve hypothermia (brain delta 4 C)
- Experiments confirmed GI slurry (40% ice) cooling effectiveness using modified gastric tube at 30ml/kg bolus
- Performed confirmatory pilot exp. using intra-peritoneal ice slurry cooling

Possible Administration

- IV
- Naso-gastric tube
- Intra-peritoneal
- Intra-pulmonary (PFC)

Swine Model

- Instrumented
- Temp probes
- CA or NL circulation

