

Project Title: Optimizing Heart and Brain Cooling During Cardiac Arrest

Sponsor: National Heart, Lung and Blood Institute/ BRP

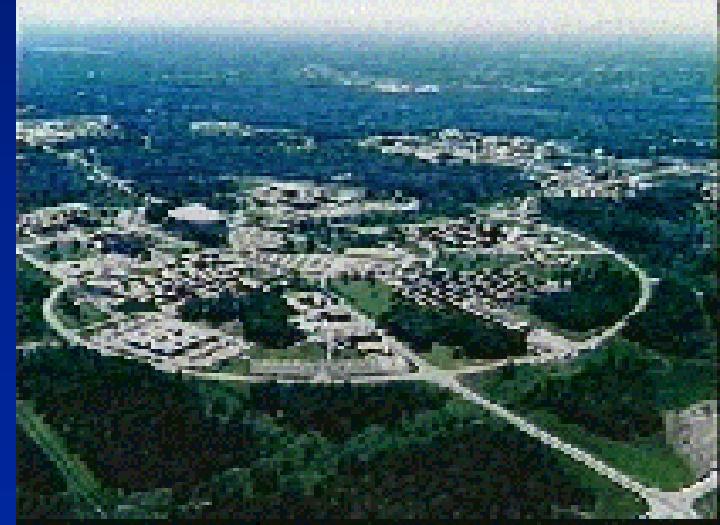
Emergency Resuscitation Center

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 smooth globular |
| --Temperature | °C |
| --Flowability | -0.3 g/cm² |

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



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

