

## Rapid cooling technology could aid surgery patients, heart attack victims

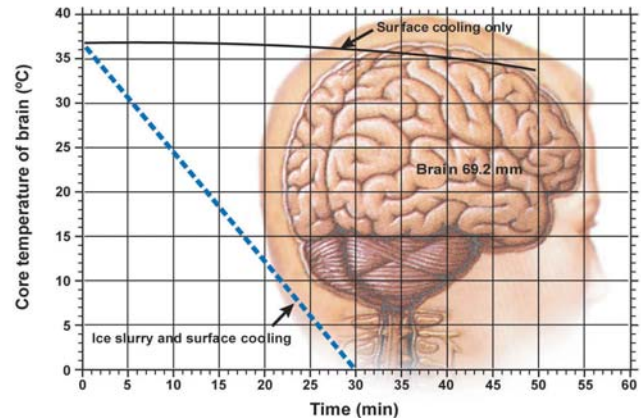
Researchers at the U.S. Department of Energy's Argonne National Laboratory and the University of Chicago have developed a promising new approach to saving stroke and cardiac arrest victims by using a specially engineered ice slurry to cool organs. The technology is also being investigated as a way to improve laparoscopic surgery.

The idea is to rapidly cool the blood of targeted organs with a highly fluid mixture of small, smooth ice particles suspended in saline solution. Quickly lowering organ temperature by 4 to 10 degrees Celsius below the normal 37C introduces cell protective hypothermia, which greatly reduces cell death. For sudden stroke or heart attack, rapid blood cooling could delay the death of heart and brain cells, giving doctors and paramedics more time to revive victims.

In the United States alone, sudden cardiac arrest strikes about 1,000 people a day. For people who suffer cardiac arrest outside the hospital, the survival rate is only 2 to 4 percent. Ten to 12 minutes after an arrest, brain cells start dying rapidly because of lack of blood flow to the brain.

In the procedure, slurry would be delivered through small tubes into the lungs or other organs, such as the stomach, which are used as in-body heat exchangers to cool the surrounding blood. For cardiac arrest, medics would perform chest compressions to circulate the cooled blood, allowing it to reach the brain and preserve brain cells. The biologically compatible ice slurry melts in the body, releasing its cooling to the body internally and becoming a single-phase liquid like hospital medical drip-bag saline solution.

Data show that ice slurry cools the brain by 2 to 5 degrees Celsius in a few minutes — faster than any other method currently available. For example, external cooling by chilling blankets can take 3 to 5 hours. The ice slurry appears to keep the brain cool for an hour.



A combination of ice slurry and surface cooling lowers the brain's temperature much faster than surface cooling alone.

Ice slurry technology could also give surgeons more time to perform minimally invasive laparoscopic surgery, which frequently requires temporarily stopping blood flow to organs, such as kidneys or the liver. Cooling these organs before stopping their blood supply would give surgeons more time to operate before organ cells began to die from lack of oxygen.

Research related to laparoscopic kidney surgery has shown that the ice slurry can be readily delivered by a small tube through existing laparoscopic surgery penetration ports using endoscope viewing to guide coating the external surface of an organ, cooling it 15 degrees C or more in 10 minutes.

Development of this technology is funded by the National Institutes of Health.

A new company, Cold Core Therapeutics, Inc., has been started to commercialize the technology. The company has received stage A venture capital funding.

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