Room Air Appears To Do Less Brain Damage Than Pure Oxygen

BALTIMORE, MD -- Sept. 18, 1998 -- When a person's heart stops, standard resuscitation includes treatment with 100 percent oxygen. Now researchers at the University of Maryland School of Medicine and George Washington University School of Medicine and Health Sciences report that regular air -- which is 21 percent oxygen -- may be a better choice in some cases, helping prevent neurological damage that can occur after the brain is deprived of oxygen.

A study conducted by Gary Fiskum, PhD, University of Maryland professor of anesthesiology and Robert Rosenthal, MD, professor of emergency medicine at George Washington, is the first research to look at chemical changes in the brain during restoration of blood flow after cardiac arrest and the neurological damage that can follow.

They reported their findings in the August issue of the medical journal *Stroke*.

Much of the brain damage that occurs after the heart stops pumping is what doctors call reperfusion injury. That means it occurs while the blood flow is being restored to the brain. Fiskum said it is caused by the toxic effects of free radicals, which are by-products of the process of oxidation.

Fiskum and Rosenthal compared levels of oxidation of brain lipids -- fatty acids and fat-like substances that maintain vital metabolic functions -- in animal models resuscitated after 10 minutes of cardiac arrest. In those given 100 percent oxygen, free-radical levels were significantly higher than in those resuscitated using the oxygen ratio found in room air.

When neurological deficits were measured, the animals resuscitated with 21 percent oxygen showed less brain damage than those resuscitated with 100 percent oxygen, the researchers report.

"It was reasonable to expect that pure oxygen would be good for a brain that has been deprived of oxygen," Fiskum said. "But we found that was not necessarily the case. After oxygen levels reached normal levels in the blood, continuing to administer pure oxygen actually was damaging the metabolic mechanism in the brain."

Further studies are needed to understand the precise mechanisms of oxidative injury to the brain, Fiskum said. That understanding could help medical science develop more effective therapies to improve neurological outcomes after heart attacks, strokes and head injuries, he explained.

Meanwhile, the researchers said the neurological and neurochemical results of their study raise questions about the appropriateness of current resuscitation guidelines that call for pure oxygen for undefined lengths of time during and after cardiac arrest.

"We are not saying to stop using 100 percent oxygen and to start using only room air," Fiskum explained. "We are saying to monitor oxygen levels in the blood more closely and not to use pure oxygen if the oxygen level already is at or above normal."