CPR is successful without mouth-to-mouth, but not without oxygen

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People can survive cardiac arrest if they receive only chest compressions during attempts to revive them - as advised by the current American Heart Association guidelines. But they cannot survive without access to oxygen sometime during the resuscitation effort, research suggests.

Scientists tested different scenarios in an animal study of cardiac arrest. Rats received either 100 percent oxygen, 21 percent oxygen - the equivalent of room air - or no oxygen (100 percent nitrogen) at the same time they received cardiopulmonary resuscitation (CPR).

About 80 percent of the rats survived regardless of the percentage of oxygen they received along with chest compressions. However, in the group receiving no oxygen, only one animal could be resuscitated.

Though these animals received the oxygen via ventilation, people who suffer cardiac arrest in a public setting would more likely obtain some oxygen by gasping during CPR or by receiving some air from a vacuum effect resulting from chest compressions, researchers say.

"The study showed that there is a need for oxygen. How much oxygen is needed remains unknown. There is probably a sweet spot in there somewhere," said Mark Angelos, professor of emergency medicine at Ohio State University and senior author of the study.

"For the first few minutes, it's probably right just to push on the chest. But at some point you probably need to add oxygen, however you can -

maybe mouth-to-mouth or with supplemental oxygen. Where that sweet spot is is not yet clear."

The research is published in a recent issue of the journal *Resuscitation*.

According to the American Heart Association, almost 80 percent of cardiac arrests that take place outside a hospital occur at home and are witnessed by a family member. Yet only 6.4 percent of sudden cardiac arrest victims survive because most witnesses do not know how to perform CPR.

The association is in the midst of a new campaign touting "hands-only" CPR, urging people to call 911 and push "hard and fast" in the center of the chest of a person in cardiac arrest.

Angelos said his research is not intended to counter the current guidelines. Instead, scientists continue to study the intricacies of the resuscitation process in the pursuit of ways to improve the potential for survival after cardiac arrest.

Approximately 30 percent of cardiac arrest patients will survive long enough to be hospitalized. But far fewer are ever discharged from the hospital; most typically die of heart failure or brain damage resulting from an extended loss of oxygen to the brain, said Angelos, also an investigator in Ohio State's Davis Heart and Lung Research Institute.

In the study, Angelos and colleagues imposed six minutes of cardiac arrest on 33 rats before CPR was started. During CPR, animals were ventilated with either 100 percent oxygen or 21 percent oxygen.

A control group of rats received nitrogen, which eliminated oxygen from their lungs. This scenario allowed for lab comparisons, but was not intended to mimic normal conditions because people would likely have

some residual oxygen in their lungs and blood even during cardiac arrest.

CPR was continued until the surviving animals experienced what is called the "return of spontaneous circulation," when the heart pumped blood on its own. All animals receiving oxygen returned to spontaneous circulation at approximately the same time, between about 90 seconds and two minutes after CPR began.

All surviving animals continued to receive the same levels of oxygen that they had received during CPR for two minutes after their hearts started working, and then they were all transferred to 100 percent oxygen for an hour.

"That's pretty typical for a hospitalized cardiac arrest victim, to get a high concentration of oxygen early on," Angelos said.

One rat unexpectedly survived CPR without any oxygen, but died within 72 hours. Among the rats receiving oxygen during CPR, nine of 11 (82 percent) of the rats in the 21-percent oxygen group survived CPR, and 10 of 12 (83 percent) of the rats receiving 100 percent oxygen survived. At the 72-hour mark, those figures had dropped: 77 percent of the room-air rats were still alive, and 80 percent of 100-percent oxygen rats were still living.

Neurological tests showed that five of seven (71 percent) of the room-air rats and three of eight (38 percent) of the rats on 100-percent oxygen during CPR returned to normal brain function at 72 hours. The researchers considered these findings secondary to the initial finding that oxygen was required for success during the initial resuscitation process, Angelos noted.

"In a public setting, presumably we don't have any options. We see that ventilating with room air is just as good as supplemental oxygen," he

said. "However, we also know now that too little or the absence of any ventilation might be harmful, at least over time, due to the lack of oxygen."

Generally, Angelos noted, the concern has been too much ventilation, which lessens the effectiveness of CPR.

Source: The Ohio State University (news : web)