Caffeine reduces oxidative stress, improves oxygen-induced lung injury

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A new study finds that caffeine may protect the lungs from damage caused by prolonged oxygen therapy, such as oxygen supplementation given to premature babies. The article is the first of its kind to study the positive effects of caffeine on the lungs' minute tissue structures. It is published ahead of print in the *American Journal of Physiology*—Lung Cellular and Molecular Physiology.

Long-term oxygen therapy increases oxidative stress in the endoplasmic reticulum (ER), a network of membranes involved in protein building. The increase in ER stress leads to inflammation and problems with the formation of too few blood vessels and air sacs in the lungs. Researchers from the Medical College of Wisconsin studied two groups of rat pups

that were exposed to more than 90 percent oxygen to simulate the type of oxygen therapy commonly used with premature newborns. One group was treated with caffeine injections ("caffeine"), and one was not ("high-oxygen"). The two groups were compared to a control group of pups that were exposed to normal room air only.

The number of blood vessels present in the lungs of the high-oxygen group was significantly lower than that of the control and caffeine groups. "Caffeine improved the blood vessel count in the [high-oxygen]-exposed group," wrote the research team. They also found more new air sacs and less inflammation and markers of oxidative stress in the rat pups treated with caffeine. "The [stress] responses were all attenuated by caffeine." The researchers also found that the ER in the cells lining the blood vessels in the lungs was wider than usual in the high-oxygen group. This structural change, not seen in the caffeine group, is another indicator of increased ER stress.

Researchers describe the way in which caffeine minimizes the ER stress response in rats as a "groundbreaking observation." It's hopeful that caffeine treatment can reduce stress and protect the blood vessels and air sacs of premature infants who rely on oxygen in their earliest days.

More information: Ru-Jeng Teng et al. Attenuation of Endoplasmic Reticulum Stress by Caffeine Ameliorates Hyperoxia-Induced Lung Injury, *American Journal of Physiology - Lung Cellular and Molecular Physiology* (2017). DOI: 10.1152/ajplung.00405.2016