Treating heart failure with a gas

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At low concentrations, the toxic gas hydrogen sulfide protects the hearts of mice from heart failure, scientists at Emory University School of Medicine have found.

Their findings, presented Nov. 11 at the American Heart Association (AHA) Scientific Sessions conference in New Orleans, suggest that doctors could use hydrogen sulfide to treat humans with heart failure.

Best known for its rotten-egg smell, hydrogen sulfide can pose a deadly threat to miners or sewer workers. However, scientists have recently found that enzymes within the body produce the gas in small, physiological amounts, with multiple beneficial effects such as regulating blood pressure and attenuating inflammation.

David Lefer, PhD, professor of surgery at Emory University School of Medicine, and his team created a model of heart failure in mice by blocking their left coronary arteries either temporarily for an hour or permanently, causing part of their heart muscles to die. Hydrogen sulfide was administered intravenously once a day for a week.

John Calvert, PhD, assistant professor of surgery working with Lefer, presented the findings at the AHA Meeting. "Our results show that hydrogen sulfide can blunt the impact of heart failure on heart function and mortality in a mouse model of heart failure," Calvert says.

Four weeks after artery blockage, mice treated with hydrogen sulfide had an ejection fraction, a measure of heart function, about a third larger

than controls (36 compared to 27 percent). He and his colleagues also found similar effects in mice engineered to make more of an enzyme that generates hydrogen sulfide.

Heart failure, a leading cause of hospitalization for the elderly, describes a situation when the heart muscle cannot pump enough blood to meet the body's needs. Previous injury to the heart muscle from a heart attack, obesity, diabetes or high blood pressure are all contributing factors.

In a separate presentation, Calvert (Monday, Nov. 10) presented experimental data on how hydrogen sulfide works in the heart. The gas appears to stimulate heart muscle cells to produce their own antioxidants and molecules that stave off programmed cell death, a response to the loss of blood flow.

Source: Emory University