

Gas improves blood flow and organ status during minimally invasive surgery

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As good as laparoscopy is in preventing some of the stresses of open surgery on the body, it does have drawbacks, including reduced blood flow and organ dysfunction. Laparoscopy is a type of surgery in the abdomen done through small incisions.

By adding another gas to the carbon dioxide used to inflate the surgical area during laparoscopy, researchers at Duke University Medical Center have found they can preserve more normal [blood flow](#) during noninvasive surgery.

The gas ethyl nitrite (ENO) helped to open blood vessels and keep blood flowing, which kept organs functioning normally during laparoscopy on pigs. The researchers did not complete any medical procedures on the pigs, which are similar in size and anatomy to humans. They merely created a laparoscopy situation by inflating the belly with carbon dioxide gas mixed with ENO. They then measured changes in heart rate, arterial pressure, cardiac output, organ blood flow, and certain chemical parameters like creatinine, a measure of kidney function, and cortisol, a stress-related hormone.

"We didn't see any downside to using ethyl nitrite during this study of minimally invasive surgery," said senior author James D. Reynolds, Ph.D., an associate professor of anesthesiology and member of the Duke Endosurgery Center. The study was published in the December issue of the journal *CTS: Clinical and Translational Science*.

"ENO has previously been administered to humans with no observed adverse effects, so it should be relatively easy to move this idea into a surgical clinical trial," Reynolds said.

By preserving blood flow and organ status, the use of ENO could improve outcomes and reduce the time of in-hospital recovery, he said. "It is promising news for surgical patients."

During the study, the research team determined that CO₂ inflation produces "acute reductions in nitric oxide (NO) bioactivity," Reynolds said. Nitric oxide is now being recognized as the third vital blood gas in the body, along with oxygen and carbon dioxide. A reduction in its bioactivity can lead to reduced organ blood flow and a rise in markers of acute tissue injury.

"Including an agent like ethyl nitrite restored the NO bioactivity, which is then conveyed by the red blood cells to increase blood flow," Reynolds said. The team tested several different concentrations of ENO (1-300 parts per million) and found 10 ppm to be optimal.

Reynolds, who is also the chair of the Duke Institutional Animal Care and Use Committee, said that in the current study, adding ENO especially helped kidneys stay healthy. ENO kept serum creatinine and blood urea nitrogen concentrations constant, while in the group of animals inflated with [carbon dioxide](#) gas without ENO, both indicators increased, indicating a decline in [kidney function](#).

Source: Duke University Medical Center ([news](#) : [web](#))

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