

This paper was published in the prestigious Proceedings of the National Academy of Sciences (PNAS) in 2015. *And it changed our understanding of breathing.*

Breathing used to be thought of as a two-gas system: we inhale oxygen and exhale carbon dioxide. This paper showed that NO is a critical third gas in the system.

Here's how. NO binds to the hemoglobin in a form called SNO-Hb where it is transported within the red blood cells. **Critically**, in areas of hypoxia, the NO is released to open up the blood vessels and increase blood flow and oxygenation.

When the researchers removed this mechanism from mice, they suffered more heart attacks because of the reduced blood flow and oxygen to the heart.

A rather sad result was that the litter size of the mutated mice was significantly reduced due to insufficient blood flow and oxygen to the fetus.

What are the implications for our everyday breathing?

The nasal cavity is a reservoir of NO. Thus, breathing nasally potentially improves whole-body oxygenation by increasing SNO-Hb. There are no studies to prove this yet (measuring SNO apparently is very difficult), but we can speculate that this is another benefit of nose breathing.

What about for breath holds?

If this SNO-Hb is critical in areas of tissue hypoxia, what happens when we purposefully induce hypoxia via IH training? It turns out, the body ramps up the production and storage of NO. But more on that next week...

For now, let us begin thinking of breathing as a 3-gas system.

Yes, we breathe in oxygen and breathe out carbon dioxide. But, nitric oxide plays a crucial role in regulating blood flow and allowing those gases (especially oxygen) to get where they need to go.

In good breath,

Nick