



## Nitrous Oxide – More Harm than Good?

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**Introduction.** Nitrous oxide has been used in clinical practice longer than any other anesthetic in use today. In pediatric anesthesia, it continues to be a commonly used adjunct during inhalation inductions. It is also commonly used to “smooth out” emergence despite concerns for diffusion hypoxia, methionine synthase inhibition and bubble expansion. Given the alternatives available in modern anesthesia practice, nitrous oxide offers little if any clinical advantage. This article discusses the contribution of nitrous oxide to greenhouse gas emissions and provides specific practice recommendations that can help to eliminate the use of nitrous oxide.

**Environmental Impact.** Nitrous oxide, like volatile agents, becomes a waste anesthetic gas (WAG) that is vented off facility rooftops, where the emissions to the outdoor environment are currently not controlled. It is important to understand that all the inhaled anesthetics are potent greenhouse gases (GHG) and contribute to climate change, however nitrous oxide is especially deleterious due to its ozone-depleting properties and the fact that it also remains in the atmosphere for **114 years**. The United States is the second-largest emitter of GHG globally and the US health care sector is responsible for 10% of US GHG emissions. In contrast, anesthetic gases contribute only 5% of the carbon footprint for acute care organizations in the United Kingdom.

**Inhalational Agent Comparison.** Global Warming Potential 100 (GWP<sub>100</sub>) is a measure of how much a greenhouse gas contributes to global warming over a 100-year period relative to the same mass of CO<sub>2</sub>. The GWP<sub>100</sub> of N<sub>2</sub>O is **265 times** that of CO<sub>2</sub>. Although its GWP is lower than the volatile agents, its higher MAC means greater quantities of gas must be used relative to other agents at similar fresh gas flows, thereby increasing the environmental impact.

| Tropospheric Lifetime and 100-Year Global Warming Potential (GWP <sub>100</sub> ) of Inhaled Anesthetics |                  |                    |
|--|------------------|--------------------|
| Compound   | Lifetime (years) | GWP <sub>100</sub> |
| Carbon Dioxide   |                  | 1                  |
| Sevoflurane  | 1.1              | 130                |
| Isoflurane   | 3.2              | 510                |
| Desflurane   | 14               | 2540               |
| <b>Nitrous Oxide</b>   | <b>114</b>       | <b>265</b>         |

### **Recommendations to Facilitate the Elimination of N<sub>2</sub>O from Anesthesia Practice**

1. For mask inductions **use only sevoflurane**. Studies have shown a difference of less than 10 seconds to loss of lash reflex when sevoflurane was used without N<sub>2</sub>O during induction, and distraction techniques such as electronic media with or without premedication are extremely effective.
2. Utilize **IV inductions** more often by adjusting premedication practices as well as routinely using a local anesthetic prior to IV placement.
3. Incorporate more IV anesthetics, as well as regional and local techniques to **eliminate the need for N<sub>2</sub>O during maintenance or emergence**.

### **Resources**

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