

# Laughing Gas: Permanent Harm for Instant Euphoria?

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✓ Fact Checked

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## STORY AT-A-GLANCE

- › Nitrous oxide is a colorless gas used in several industries, and now gaining popularity as a recreational drug that offers one to two minutes of euphoria
- › The gas inactivates vitamin B12 and exposes nerves to permanent damage that may lead to incontinence, inability to get an erection and/or difficulty or inability walking
- › Although there is no consensus on the definition of heavy use, neurologist Alastair Noyce believes using roughly 10 to 15 canisters more than once a week could meet the criteria and could be enough to cause permanent damage
- › Vitamin B12 is associated with neurological, cardiovascular and mental health; signs of deficiency include numbness and tingling in the hands, legs or feet, mouth sores or ulcers, blurry vision, and fatigue
- › A minor deficiency can be adjusted with an increased intake of vitamin B12-rich foods, but for a more serious deficiency you may need vitamin B12 shots or daily high doses of vitamin B12 supplements using methylcobalamin, which is the naturally occurring form and more absorbable than cyanocobalamin, the form found in most supplements

Nitrous oxide is a colorless gas commonly used by dentists for sedation and pain relief. Recreational use is growing in popularity and, as it is, so are the number of people suffering from significant adverse effects.<sup>1</sup> It is also used to make whipped cream and, in the car industry, to enhance engine performance.

Users describe the feeling of inhaling nitrous oxide as a feeling of floating or euphoria that dissipates within one to two minutes. On the street, nitrous oxide is also called balloons, hippie crack, nos, noz, chargers, laughing gas, buzz bomb, nangs and whippets.<sup>2,3</sup>

The effect is immediate. It can also cause dizziness and severe headache, and can stop you from thinking straight. Some people describe short-lived but intense feelings of paranoia that can be accompanied by auditory distortion and hallucination, which is when you hear and see things that are not there.

Nitrous oxide was first discovered in 1772 by Joseph Priestley and popularized by chemist Humphry Davy as an anesthetic and intoxicant. While some believe nitrous oxide is relatively innocuous as a recreational drug,<sup>4</sup> others have experienced significant nerve damage related to the inactivation of vitamin B12 that it causes in your body.<sup>5</sup>

## **Nitrous Oxide Abuse a Growing Problem**

The U.S., Australia and Europe report nitrous oxide has grown in popularity as a recreational drug.<sup>6</sup> The gas can be purchased in lipstick-size capsules containing 0.2 ounces that are used to fill a balloon from which users inhale the gas. These are called “little crackers” and can have a bad taste. Nitrous oxide can also be purchased in large cylinders producing gas that is tasteless and has a stronger effect.

While The Guardian<sup>7</sup> characterizes the gas used as “widespread ... with relative safety,” Dr. David Nicholl from Sandwell and West Birmingham NHS Trust told Sky News:<sup>8</sup>

*“Maybe once every five or six years, I’ll see a patient who’s had a stroke from taking cocaine. Yet, every week, I’m seeing this in my ward. So, from my point of view, this is actually a bigger problem.”*

The U.K. is seeing a spike in use, which has triggered talks of stricter regulations around the sale and use of nitrous oxide gas. Sky News<sup>9</sup> describes the experience of one 20-year-old young man who now faces life-changing consequences from a nitrous oxide

habit that involved consuming multiple large canisters on nearly a daily basis. MRI scans show spinal cord abnormalities that may be irreversible.

Sky News sent a reporter undercover and found they could easily purchase canisters at shops where residents had seen school-age children inhaling the gas. With each purchase, the undercover investigator received a packet of party balloons (used to inhale the gas) and was not asked what they intended to do with the gas.

Nicholl reports a rising number of outpatient visits and admissions since the large canisters began flooding the market. Emergency calls in London tripled from 2021 to 2022 for incidents relating to nitrous oxide. Harry Sumnall, professor in substance abuse at Liverpool John Moores University, told Sky News<sup>10</sup> there were currently more than 600,000 nitrous oxide users in the U.K.

## **Nitrous Oxide Laughing Gas Linked to Nerve Damage**

Yahoo! News<sup>11</sup> covered the story of Vito Oliveri, who first tried nitrous oxide in his twenties. He used it at parties for about a year and then stopped until 2020 when he moved to Portland. There he was exposed to supersize cylinders that contain 20 pounds of nitrous oxide, which is equal to approximately 1,600 individual canisters.

Oliveri consumed up to 500 0.2-ounce canisters a day for nearly a year. In April 2022, he noticed he couldn't control his legs and struggled to stand still. One month later he needed an electric chair to get around. By June, Oliveri couldn't walk and needed to be hospitalized and treated. He and his fiancé have tried multiple times to quit.

Alastair Noyce, a neurologist at a London Hospital, commented that he has seen patients disabled from using high quantities of nitric oxide, including needing to use a walker or wheelchair, experiencing incontinence or being unable to get an erection. According to Noyce, the severity of symptoms depends on how extensive the nerve damage is, which is caused by nitrous oxide inactivating vitamin B12.

Although it's rare for people who use the drug infrequently to experience nerve damage, Noyce has also seen patients who had nerve damage after only one use. According to

Noyce, there is no consensus on the definition of “heavy use” but using roughly 10 to 15 canisters more than once a week likely qualifies.

Users who develop neurological symptoms require prompt treatment with vitamin B injections. While it is the only known treatment for nitrous oxide nerve damage, it is not always successful. Noyce notes that some try to preventively use vitamin B12 tablets but this doesn't appear to offset the neurological damage.<sup>12</sup>

Nitrous oxide inactivates vitamin B12 in the body. This B vitamin is essential to maintain the myelin sheath,<sup>13</sup> which is a layer around nerves that protects them from damage and affects how quickly signals travel through the nerve cells. Multiple sclerosis is a well-known disease that also damages or destroys myelin.

## **Lockdowns Precipitated Increased Substance Abuse**

Researchers had identified a problem with nitrous oxide abuse well before the COVID-19 pandemic.<sup>14</sup> Identifying toxicity from nitrous oxide abuse is a challenge since the symptoms are often general and may mimic other conditions.

Researchers caution physicians to have a high index of suspicion when patients present with subacute degeneration of the spinal cord.<sup>15</sup>

A 2019 paper<sup>16</sup> discussed the presentation of nine patients, who presented with symptoms of myeloneuropathy and/or low levels of vitamin B12. The patients in this paper all recovered muscle strength within two months after being treated with vitamin B12, but five continued to have persistent sensory deficits.

News headlines worldwide acknowledged the COVID pandemic had fueled a major rise in drug use.<sup>17,18,19</sup> One of the drugs that gained popularity during the COVID lockdowns was nitrous oxide. In one study<sup>20</sup> published in the Journal of Neurology, spinal cord degeneration was present in four out of five the subjects, yet no patient had low vitamin B12 titers.

All five had elevated blood levels of homocysteine and methylmalonic acid, which reflects a functional deficit of vitamin B12. The scientists wrote: “We report an elevated incidence of neurological complications of nitrous oxide abuse occurring during the recent COVID-19 lockdown.”

## **Vitamin B12 Is Vital for Neurological and Heart Health**

Besides being integral to your neurological health, vitamin B12 is also important for your cardiovascular health. A 2021 study<sup>21</sup> assessed the effect of vitamins B6, B9 and B12 on homocysteine levels as it is also related to the risk of stroke, [cardiovascular disorders](#) and vascular death.

The intervention demonstrated a risk reduction of 11% among stroke patients for the three risks, a 13% reduction for stroke and a 17% reduction for vascular death. Vitamins B6 and B12 have also demonstrated properties that protect against peripheral neuropathy. A 2021 study<sup>22</sup> sought to evaluate if B6 and B12 could prevent vincristine-induced peripheral neuropathy which occurs in 40% to 45% of patients receiving this chemotherapeutic agent.

Of the 102 patients enrolled, 81 completed the study during which the researchers found a significant difference in the incidence of peripheral neuropathy between the intervention and placebo groups. Data showed an absolute risk reduction of 30% and a relative risk reduction of 54% in the intervention group.

A 2021 paper<sup>23</sup> published in BioMed Research International proposed that vitamins B1, B6 and B12 are key players in the protection of the neurological system against environmental influences. They suggest these vitamins may help nerve regeneration by supporting the development of cell structures.

## **Vitamin B12 Helps Combat Mental Illness**

It stands to reason that since vitamin B12 helps protect the neurological system, it may also influence mental health. Depression affects 264 million people worldwide<sup>24</sup> and in

2017, roughly 17.3 million U.S. adults experienced at least one major depressive episode.

A 2021 study<sup>25</sup> using data from the Irish Longitudinal Study on Aging found those who had a vitamin B12 deficiency had an increased risk of symptoms of depression. The results showed a link between vitamin B12 deficiency, but not with folate deficiency. The researchers found that even after controlling for factors such as chronic disease, cardiovascular disease, antidepressant use, physical activity and vitamin D status, the results remained significant.<sup>26</sup>

Vitamin B12 is a common deficiency in the elderly population<sup>27</sup> because of the high prevalence of malabsorption. The deficiency is often unrecognized because the symptoms are subtle and nonspecific. Yet, left untreated, the consequences can be serious. There is also a high prevalence rate of depression in the elderly. One 2021 meta-analysis<sup>28</sup> of 42 relevant studies found the average prevalence worldwide was 31.74%, and found a higher prevalence in developing countries.

B12 has also been linked to reduced brain shrinkage. A 2013 study<sup>29</sup> showed that not only do B vitamins slow brain shrinkage, but they specifically slow shrinkage in regions known to be most severely impacted by Alzheimer's disease. Moreover, in those specific areas, the shrinkage is decreased by as much as seven times.

## Signs You May Be Deficient in Vitamin B12

Symptoms of vitamin B12 deficiency often begin gradually and **worsen over time**, culminating in a variety of physical and mental symptoms, including:

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A numb, tingly, "pins and needles" sensation in your hands, legs or feet, which may indicate possible nerve damage

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A red, swollen, "beefy" tongue with fewer papillae "bumps" containing taste buds

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Mouth sores/ulcers

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Blurry or double vision, or shadows in your field of vision, caused by optic nerve damage from a B12 deficiency

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Yellow skin (jaundice), an indication that your red blood cells are degrading, which releases a yellow pigment in the process

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Unstable, wobbly and dizzy feelings, which are signs there may not be enough oxygen in your blood, related to low B12

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Memory loss may be a red flag when it has no other potential cause

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Anemia

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Fatigue and weakness

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In adults, B12 deficiency can take six years to develop, which is how long it takes to deplete normal stores of B12.<sup>30</sup> It's important to be aware of your intake and catch a B12 deficiency early, as impaired brain and nerve development can be very difficult to correct once the damage is done.

The recommended dietary allowance (RDA) of vitamin B12 for adults is 2.4 micrograms (mcg) a day, but there is some controversy over whether this is enough, especially for the elderly.<sup>31</sup> You don't need to worry about overdosing on B12 because it's water-soluble, so your body will simply flush out any excess.

If you have a minor deficiency, increasing B12-rich foods in your diet can help. Vitamin B12 is found almost exclusively in animal tissues, including foods like beef and beef liver, lamb, snapper, venison, salmon, shrimp, scallops, poultry, eggs and dairy products.<sup>32</sup>

Nutritional yeast is high in B12, and is highly recommended for vegetarians and vegans. One one-fourth cup serving contains from 8.3 mcg to 24 mcg of vitamin B12, depending on the brand.<sup>33</sup>

For more serious deficiency you may need weekly shots of vitamin B12 or daily high-dose B12 supplements. The type of B12 supplement that is best is methylcobalamin, which is the naturally occurring form found in food. It is more absorbable, and your body retains it in greater amounts than cyanocobalamin, the form of B12 found in most supplements.<sup>34</sup>

## Sources and References

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- <sup>1, 5, 6, 11</sup> [Yahoo! News, March 18, 2023](#)
- <sup>2</sup> [Frank, Nitrous Oxide](#)
- <sup>3</sup> [Alcohol and Drug Foundation, November 10, 2021](#)
- <sup>4</sup> [The Guardian, November 27, 2021](#)
- <sup>7</sup> [The Guardian, November 27, 2021, last section first paragraph](#)
- <sup>8, 9, 10</sup> [Sky News, March 1, 2023](#)
- <sup>12</sup> [Clinical Toxicology, 2022;60\(7\)](#)
- <sup>13</sup> [Journal of Neurological Sciences, 2005;233\(1-2\)](#)
- <sup>14</sup> [American Journal on Addictions, 2016;25\(5\)](#)
- <sup>15</sup> [Journal of Neurology, 2018;265\(5\)](#)
- <sup>16</sup> [Brain Development, 2019;41\(5\)](#)
- <sup>17</sup> [United Nations, June 24, 2021](#)
- <sup>18</sup> [Senate RPC, March 15, 2022](#)
- <sup>19</sup> [American Psychological Association, March 1, 2021](#)
- <sup>20</sup> [Journal of Neurology, 2022;269\(2\)](#)
- <sup>21</sup> [Cureus, 2021;13\(5\)](#)
- <sup>22</sup> [Pharmaceutics and Pharmacology Research, 2021; doi: 10.31579/2693-7247/080](#)
- <sup>23</sup> [BioMed Research International, 2021; doi: 10.1155/2021/9968228](#)
- <sup>24</sup> [Anxiety and Depression Association of America](#)
- <sup>25</sup> [British Journal of Nutrition, 2021; doi: 10.1017/S0007114521004748](#)
- <sup>26</sup> [Trinity College Dublin, December 14, 2021](#)
- <sup>27</sup> [Hong Kong Medical Journal 2015;21\(2\)](#)
- <sup>28</sup> [Annals of General Psychiatry, 2021;20\(55\)](#)
- <sup>29</sup> [PNAS 2013 Jun 4;110\(23\):9523-8](#)
- <sup>30</sup> [Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline, Table N-1](#)
- <sup>31</sup> [Harvard Medical School April 2015](#)
- <sup>32</sup> [NIH, Vitamin B12](#)
- <sup>33</sup> [NIH, Vitamin B12 Table 2](#)
- <sup>34</sup> [Integrative Medicine, 2017;16\(1\)](#)