Severe nitrous oxide use disorder presenting with symptoms of cobalamin deficiency in an inpatient detox unit.

Maia H. Hauschild BA, Semya Sevinc MD, Dhruti Patel MD

Department of Psychiatry, University of Miami Miller School of Medicine

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OBJECTIVES

- Propose an integrative work-up and treatment for nitrous oxide use disorder in inpatient settings.
- Provide insight into current trends of nitrous oxide use.

BACKGROUND

- Nitrous Oxide (N2O) is a widely available gas with euphoria-inducing properties.
- The lifetime prevalence of N2O use in the United States was 29.4% in 2014 (1).
- Patients who use nitrous oxide are at high risk of neurological complications from cobalamin (vitamin B12) deficiency by the mechanism described in Figure 1 (2).
- There are no FDA-approved treatment options for nitrous oxide use disorder.

CASE REPORT

- A 28-year-old male with a history of hypertension, ADHD, depression, and polysubstance use disorder presented voluntarily to the psychiatric emergency room requesting **detox from nitrous oxide and crack cocaine.**
- The patient endorsed inhaling **3x3L nitrous oxide tanks daily (Figure 2)** for four months, directly from the canister.
- He also described symptoms consistent with **cobalamin deficiency**, including blurry vision, drowsiness, and tingling in his extremities, for seven days. Serum B12 levels returned within normal range. One month prior, the patient treated the same cluster of symptoms with 2000 mcgs cobalamin injected intramuscularly.
- **Oral naltrexone 50mg daily** was started in the **inpatient psychiatry unit** for cravings. The patient's self-reported cravings for nitrous oxide decreased from an 8/10 to a 6.5-7/10 from the first to second day after initiating naltrexone.
- On the third day of admission the patient was discharged to an **inpatient rehabilitation program.**
- He did not show for his follow-up appointment at the MAT clinic and attempts to contact the patient via phone were unsuccessful.

FIGURES

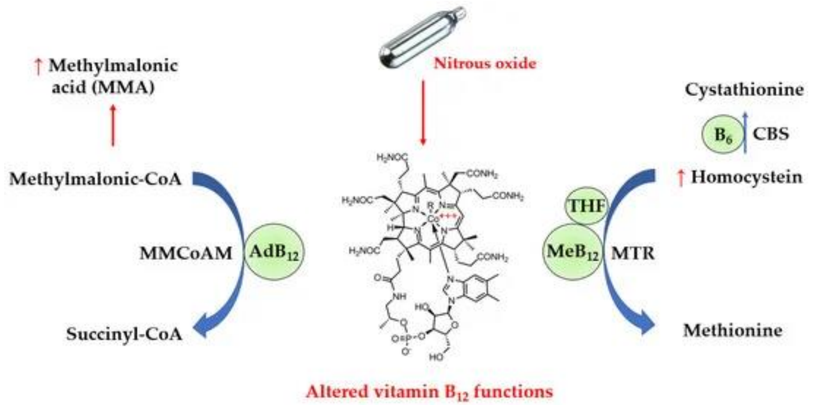

Figure 1. Mechanism of B12 deficiency. Nitrous oxide inactivates vitamin B12 through oxidation of the cobalt atom. Inactivation of B12 prevents catabolism of homocysteine and methylmalonic acid. These processes are essential to the Krebs cycle and DNA methylation. (6)

Figure 2. To-scale comparison of size difference between traditional nitrous oxide canisters (left) and the canister described in this case (right). Both are widely available on culinary websites (7) and Amazon (8).

DISCUSSION

Naltrexone therapy and B12 Supplementation for nitrous oxide use disorder

- One case report highlighted the potential of naltrexone to treat nitrous oxide use in an outpatient setting (3).
- To our knowledge, this is the first case report to describe naltrexone initiated for nitrous oxide dependence in an inpatient setting.
- Current guidelines for treating vitamin B12 deficiency include intramuscular injections for severe deficiency and malabsorption syndromes and oral replacement for patients with mild disease (4).

Shift in consumption trends

- A 2016 survey described 8g whipped cream chargers (Figure 2) as the major source of recreationally used N2O (1).
- This patient's consumption of nitrous oxide directly from 3L tanks (Figure 2) suggests a shift in consumption trends and risk of barotrauma (5).
- The patient reports that larger tanks have "revolutionized use" among his community of users and facilitated his personal transition to daily use

CONCLUSION

- When treating patients with nitrous oxide use disorder, psychiatrists should consider a holistic work-up including screening for Vitamin B12 deficiency, thorough pulmonary and neurological examinations, and offering medically assisted treatment of naltrexone.
- As larger volumes of nitrous oxide canisters become widely available and affordable through e-commerce, further research is needed to describe the efficacy of naltrexone to treat nitrous oxide use disorder

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