

# NITROUS OXIDE ABUSE RESULTING IN SUB-ACUTE COMBINED DEGENERATION OF THE SPINAL CORD

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## Background

- Nitrous oxide is a gas indicated for medical use → analgesic and anesthetic agent
- Also used in the food industry as a propellant in whipped cream containers
- Now widely used as a recreational drug
- Users inhale nitrous oxide via a balloon
- It is cheap and easily obtainable<sup>1</sup>
- Most users regard it as an innocuous substance<sup>1</sup>



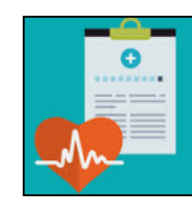
- However, sustained use of nitrous oxide can have significant adverse neurological effects
- Irreversibly binds to and inactivates Vitamin B12

## Case Presentation

- 33yo, single, previously healthy man, in full time employment.
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- Presented to ED - diaphoretic, tremulous
  - No substance use disclosed
  - Brief admission to ED
  - Discharged with a plan for outpatient follow-up of sinus tachycardia
  - Bloods taken during ED admission revealed low Vitamin B12 however no further interventions recommended by ED staff at that time.



- 3 weeks later, referred to mental health services by family
- Insomnia, erratic behavior
- Anxious and distressed.
- His work was affected and he had been on leave for two weeks.



- No history of mental illness
- He drank moderate amounts of alcohol, non-smoker
- Family history of bipolar affective disorder (maternal grandfather)

On the basis of his psychiatric symptoms and family history there were concerns that he was developing a mood disorder .

Admitted to the mental health inpatient unit.

3 month history of heavy nitrous oxide use disclosed  
30-50 canisters/night

Significant ataxia noted

Suspicion of Vitamin B12 deficiency

Relevant investigations carried out

**Macrocytic anemia** with hyper-segmented neutrophils.

**Neurological deficits**, which were in keeping with nitrous oxide toxicity, were noted including:

- Cognitive impairment (MOCA 22/30)
- Ataxia – unsteady, broad based gait
- Brisk limb reflexes, symmetrical, lower > upper
- Impaired proprioception

CT head was normal however MRI confirmed diffuse cord signal abnormality in the dorsal columns.

**MRI**  
Diffuse T2 high signal abnormality on axial imaging of cervical spine



## Management

### In hospital:

- 3 week admission
- Intramuscular B12 injections on alternate days - Different recommendations exist regarding Vitamin B12 substitution treatment<sup>4</sup> - this approach was taken on advice of neurology team.
- Intensive physiotherapy
- Input from occupational therapy
- Recovery was slow initially and prognosis was unclear

### On discharge:

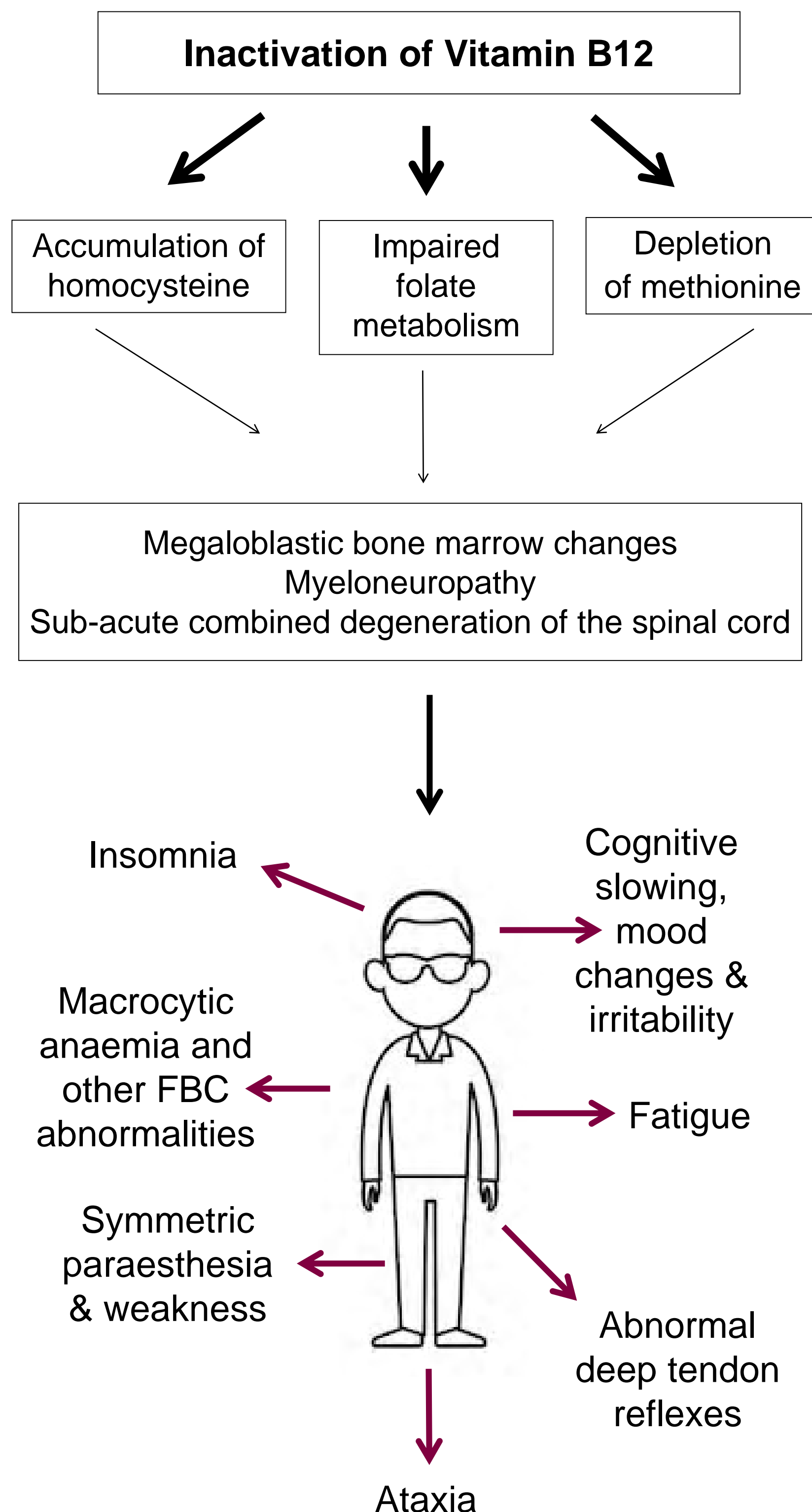
- There was complete resolution of hematological abnormalities
- MOCA 30/30
- Improved gait and balance
- Residual difficulties with fine motor skills

### Post discharge:

- Private psychiatric and psychological treatment follow-up
- Brief follow-up from community OT
- Full neuropsychological testing 3/12 after discharge (including WAIS-IV, WMS-IV, CVLT-II). No significant residual deficit in any of cognitive domains. Patient functioning at his (superior) premorbid level

## Discussion

- It is important for psychiatrists to be aware of the potentially serious effects of heavy nitrous oxide use.
- Patients may develop hematologic or neurologic symptoms
- However they can also develop psychiatric symptoms and the initial presentation may be to mental health services
- Therefore psychiatrists need to be able to appropriately recognize the consequences of nitrous oxide use
- Psychiatrists also have a responsibility to educate patients on the potential adverse outcomes of nitrous oxide use



## References

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