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Laughing gas poisoning

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Objective: Nitrous oxide (N_2O) is colorless, has a light sweet smell and is commonly known as laughing gas. It has been used in dentistry and surgery and as an anaesthetic and analgesic, since 1844. There is rapid increase in the recreational use of N_2O, especially in the dance and festival scene. In the United Kingdom, as of 2014, nitrous oxide was estimated to be used by almost half a million young people. Following one inhalation, mostly from a balloon, a euphoric, pleasant, joyful, empathogenic and sometimes hallucinogenic effect is rapidly induced (within 10 seconds) and disappears within minutes. Side effects of N_2O include transient dizziness, dissociation, disorientation, loss of balance, impaired memory and cognition, and weakness in the legs. Herein we report a case.

Case Report: A 12-year-old girl presented to the emergency department complaining of generalized stiffness, numbness, tingling, difficulty walking, chest tightness and depressive mood. Examination revealed impaired cerebellar function and paresthesia over bilateral limbs. She had been inhaling N_2O daily for more than 1 year. She inhaled the gas through her nose using a nitrous balloon. Each filled balloon could be inhaled for 1-2 minutes. She inhaled all day long. She had temporarily stopped using it for four months and resumed in the past two months. Laboratory tests revealed creatine phosphokinase of 992 IU/L, hemoglobulin of 11.2 g/dL and serum vitamin B_{12} of 127 pg/mL. The result of nerve conduction velocity over upper limbs was normal. She was treated with vitamin B_{12}, but she did not return for follow-up appointments.

Conclusion: Nitrous oxide oxidizes cobalt in vitamin B_{12} from Co^{1+} to Co^{2+}, irreversibly inactivating the vitamin and inhibiting methionine synthesis, leading to functional vitamin B_{12} deficiency. Chronic nitrous oxide toxicity impairs nerve cell myelination. Early signs and symptoms of neurotoxicity include numbness and tingling of the distal extremities and impairment of vibration sensation, which then further progress to acute paralysis of the lower limbs, bizarre behavior and delusions Treatment of nitrous oxide-induced neurotoxicity involves administration of parenteral vitamin B_{12} and oral methionine. Oral administration of methionine may hasten recovery as this provides an immediate source of the product of the methionine synthase reaction.