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The role of gas analysis in nitrous oxide safety

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Yolanda Garcia, customer service representative at QED Environmental Systems Ltd, discusses how facilities managers can help monitor the presence of nitrous oxide (N_2O) in medical settings, amid a growing number of high-profile regulatory breaches across the UK.

Nitrous oxide has a long history in the medical sector, with its first use being documented as early as 1844. Since then, the compound has become one of the most widely-available forms of anaesthesia and analgesia, and can be commonly found in maternity wards, operating theatres and dental surgeries alike.

In hospitals, the gas is most commonly blended with oxygen in a 2:1 ratio to form a safe, yet effective general anaesthetic colloquially referred to as ‘gas and air’. In the UK, this is commonly traded under the names Nitronox and Entonox among others, with each featuring a differing ratio of N_2O to O_2.

Risks of long-term exposure

Though nitrous oxide is perfectly safe in specified doses, as the saying goes, too much of anything can be a bad thing. Effects of prolonged exposure include anaemia and vitamin B-12 deficiency, with the latter able to cause nerve damage in severe cases[1]. Naturally, this is cause for concern in environments where the gas is commonly delivered and may linger in the air, such as maternity wards.

This concern is redoubled when factoring in the working patterns of medical staff. By its very nature, shift work presents a risk of prolonged exposure, with nurses and midwives commonly working up to 12 hours at a time. Should the amount of N_2O in the air exceed safe levels over an extended period, staff and patients may be placed at risk of an N_2O overdose.

Symptoms of this can vary, though all pose a threat to general wellbeing. Symptoms include irritation of the eyes, nose and throat, heart palpitations, seizures, difficulty breathing, numbness in extremities, and even psychosis and hallucinations[2].

Nitrous oxide breaches

When taking into account the risks associated with long-term exposure to N_2O, it is clear that its administration must be closely monitored. However, there appears to be a growing trend of concentrations of the gas exceeding legal limits in hospital wards across the UK.

For instance, nitrous oxide levels as high as 5000 parts per million (ppm) – 50 times over the legal limit – were recently recorded at Watford General Hospital's maternity suite[3]. Meanwhile, Basildon University Hospital suspended the use of gas and air in late 2022 after some staff were exposed to high levels of the gas[4].

The scale of this issue resulted in the Health and Safety Executive (HSE) receiving 11 notifications between August 2018 and December 2022 from seven NHS trusts and one private facility in relation to the gas.

The role of gas analysis

Here, hospital facility managers appear to be stuck between a rock and a hard place – while the uses and benefits of nitrous oxide are apparent, so too are the risks associated with long-term exposure. However, this is not to say that the gas cannot be utilised both safely and effectively.

One potential solution here could be to introduce gas analysis technology into hospital wards to closely monitor the amount of N_2O present in the air. QED Environmental Systems' G200 N_2O gas analyser, for instance, is tailored for use in medical settings, including operating theatres, dental practices, veterinary clinics, X-ray departments and maternity wards, and is capable of quickly and accurately assessing the presence of N_2O in the environment.

In this instance, the delivery of Entonox or Nitronox can be rapidly suspended should ambient levels approach or exceed the legal limit. It can then be re-enabled once levels return to an acceptable concentration, allowing the gas to be used without inviting long-term health risks.

Closing thoughts

For any facilities manager concerned about the presence of nitrous oxide on site, seeking expert consultation is an excellent starting point to broach this issue. By seeking advice from a gas analysis expert, facility managers can identify the best solution for the specific needs of their facility.

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[1] https://www.healthline.com/health/nitrous-oxide-side-effects#longterm-effects

[2] https://www.healthline.com/health/nitrous-oxide-side-effects#overdose

[3] https://www.bbc.co.uk/news/uk-england-beds-bucks-herts-64554571

[4] https://www.bbc.co.uk/news/uk-england-essex-63826226