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## Anesthetic gases guidelines for workplace exposures uk

SUBSTANCE NAME:Nitrous oxideSynonyms:Dinitrogen monoxideLaughing gasCAS Number:10024-97-2Exposure Standard:TWA: 25 ppm (similar or equal to: 45 mg/m3)STEL: - ppm - mg/m3Documentation notice: NationalOccupational Health and Safety Commission documentation available for thesevalues. For this standard considerations, such as, economic, social ortechological implications, or sampling and analytical limitations, havealso been taken into account.No standard should be applied without reference to the Guidance Note on theInterpretation of Exposure Standards for Atmospheric Contaminants in theOccupational Environment [NOHSC:3008(1995)], and to therelated documentation.1. IDENTITYCAS Registry Number:10024-97-2Synonyms:Laughing gasNitrogen oxideDinitrogen monoxideHyponitrous acidanhydrideFactitious airMolecula Formula:N2O2. CHEMICAL AND PHYSICAL PROPERTIESNitrous oxide is a colourless, non-flammable gas at room temperature witha slightly sweet odour. Its physical and chemical properties include:Molecular weight:44.02Melting point:-90.81°CBoiling point:-88.5°CSpecific gravity:1.226 (at NTP)Solubility:Soluble in water,alcohol, ether and oils. Freely soluble in sulphuric acid.3. MAJOR INDUSTRIAL USES Nitrous oxide is used mainly as an anaesthetic for both major and minorsurgery, either alone or in combination with other anaesthetics such ashalothane.4. HEALTH EFFECTSThe health effects of nitrous oxide have been reviewed (1,2,3) . The American Conference of Governmental Industrial Hygienists (ACGIH) has reviewed (1) the anaesthetic, haematological, carcinogenicand foetotoxic effects of the gas. In this review, the ACGIH has also taken into consideration the findings of several retrospective epidemiologicalstudies carried out in the late 1970's, which indicated an increased risk ofspontaneous abortions in operating room nurses and anaesthetists. Theyconsider there is a similarity of effects between epidemiological and animalstudies and recommends a threshold limit value (TLV) of 50ppm for nitrousoxide. This level was set to "prevent embryofetal toxicity in humans(resulting in an increased risk of spontaneous abortion) and significantdecrements in human psychomotor and cognitive functions or other adversehealth effects in exposed personnel" (1) However, the methodology and the interpretation of findings of theepidemiological studies considered by the ACGIH, have beenquestioned by some other reviewers (4,5,6) .Spence (6) has conducted a prospective studyin the U.K. from 1977-86 and reported from the unpublished data that therewas a relationship between child birth weight and women anaesthetists orsurgeons working in operating theatres, but "at the moment there is noobvious relationship between hours worked or speciality and miscarriage".This observation can be attributed to the improved study methodology andthe changing exposure pattern associated with the introduction of scavengingsystems which has led to lower exposure to anaesthetic gases in operatingtheatres. The possible interaction effect of nitrous oxide withother anaesthetic gases requires careful consideration. The US NationalInstitute for Occupational Safety and Health (NIOSH) has recommended (2) an exposure standard of 25ppm for nitrousoxide, based on the findings of the study of Bruce & Bach (7) such that decrements in performance,cognition, audiovisual ability and dexterity have been observed in humanvolunteers at an nitrous oxide exposure level of 50ppm. The decrementsincreased when a mixture of 50ppm nitrous oxide and 1ppm halothane was used.5. OCCUPATIONAL EXPOSURE Crea & Grygorciewicz (8) surveyed 40hospitals, 25 dental surgeries and 26 veterinary surgeries, where the airconcentrations of halothane and nitrous oxide, alone or in combination, weremeasured in the breathing zone of the anaesthetists and surgeons usinginfrared monitoring technique. With properly maintained anaesthetic gasdispensing equipment and scavenging systems in operation, the concentrationsof nitrous oxide gas in the hospital operating theatres could be kept be1ow25ppm. In dental surgeries where relative analgesia was used with ascavenging mask, the average concentrations of nitrous oxide during theoperation were slightly higher, ranging from 30-40ppm, but lowerconcentrations were also recorded. Similar but slightly higherresults were also reported by Rajhans et al (9) and Gardner (10) , using personaldosimetry.6. RECOMMENDATION FOR EXPOSURE STANDARD To revent neurobehavioural effects to most workers, the ExposureStandards Working Group recommends a time-weighted average exposure standardof 25ppm for nitrous oxide. This level should also provide a safety marginfor preventing other health effects such as embryofoetal toxicity. TheWorking Group also recognises that occupational exposure to nitrous oxide canbe kept below this level if active scavenging equipment is used andmaintained properly.REFERENCES 1. American Conference of Governmental Industrial Hygienists, Documentation of The Threshold Limit Values and Biological Exposure Indices, 5th ed., Cincinnati, Ohio, 1986 2. National Institute for Occupational Safety and Health (NIOSH). Criteria for a Recommended Standard...Occupational Exposure to Waste Anesthetic Gases and Vapors, DHEW(NIOSH) Publication No.77-140, Washington DC, March, 1977 3. National Board of Occupational Safety and Health, Consensus Report for Nitrous Oxide, Scientific Basis for Swedish Occupational Standards, III, p.36-42, Solna, 1982 4. de Silva PE, "The reproductive hazards of exposure to anaesthetic gases", Australian Institute of Occupational Hygiene Annual Conference, Melbourne, 1982 5. Tannebaum TN & Goldberg RJ, "Exposure to anaesthetic gases and reproductive outcome", J Occup Med, 27, 659-668, 1985 6. Spence AA, "Environmental pollution by inhalation anaesthetics", Br J Anaesth, 59, 96-103, 1987 7. Bruce DL & Bach MJ, "Effects of trace anaesthetic gases on behavioural performance of volunteers", Br J Anaesth, 48, 871-875, 1976U 8. Crea J & Grygorciewicz, A Survey of Waste Anaesthetic Gases inHospital Operating Theatres, Dental and Veterinary Surgeries, SouthAustralian Health Commission, Adelaide, June 1988 9. Rajhans GS et al, "Hygiene aspects of occupational exposure to waste anaestheticgases in Ontario hospitals", Ann Occup Hyg, 33, 27-44, 1989 10. Gardner RJ, "Inhalation anaesthetics - exposure and control: astatistical comparison of personal exposures in operating theatres with andwithout gas scavenging", Ann Occup Hyg, 33, 159-173, 1989Footnotes: Documentation notice:Entries carrying a notice for National Occupational Health and SafetyCommission documentation indicate that these substances have been reviewed indetail by the Exposure Standards Expert Working Group and that documentationsupporting the adopted national values is available in the NationalCommission's Documentation of the Exposure Standards[NOHSC:10003(1995)]. This website uses cookies. By continuing to use this website you are giving consent to cookies being used. For information on cookies and how you can disable them visit our Privacy and Cookie Policy. Got it, thanks! Tallent et al. evaluated the ISO-Gard mask for reducing recovery room staff exposure to sevoflurane and desflurane 1, and suggested that the equipment was needed as their measured levels of inhalational agent exceeded two parts per million (ppm). The American National Institute of Occupational Safety and Health (NIOSH) limit of 2 ppm for exposure to halogenated anaesthetic agents was based on the lowest levels that could be detected using sampling and analysis techniques in 1977, rather than any established safe level of exposure 2. In 1996, the UK Health and Safety Commission Advisory Committee on Toxic Substances identified an occupational exposure standard for Isoflurane of 50 ppm over an 8-h time-weighted average at which there is no significant risk to health 3. This remains the current of current workplace exposure limit in the latest Control of Substances Hazardous to Health (COSHH) guidance (there are no limits currently available for newer agents) 4. The detected values in Tallent's study never reached 50 ppm, even in the control group. However, the principle of 'as low as reasonably practicable' should still be adhered to and steps taken to reduce the workplace concentrations of these anaesthetic agents. An alternative solution would be to ensure adequate ventilation within the recovery room to achieve at least the recommended minimum of 15 air changes per hour 5. Over the long-term, this is likely to be more cost-efficient and produces less medical waste than the ISO-Gard mask. 1Tallent R, Corcoran J, Sebastian J, Evaluation of a novel waste anaesthetic gas scavenger device for use during recovery from anaesthesia. Anaesthesia 2018; 73: 59- 64. 2 National Institute for Occupational Safety and Health, Division of criteria documentation and standards development. Occupational exposure to waste anaesthetic gases and vapors, Publication No.77-140. US Government. Print Office, 1977. 3 Health Services Advisory Committee. Anaesthetic agents: controlling exposure under COSHH. Sudbury: HSE Books, 1995. 4 Health and Safety Executive. EH40/2005 workplace exposure limits: containing the list of workplace exposure limits for use with the control of substances hazardous to health regulations (as amended). Norwich: HSE Books, 2011. 5 Department of Health. Heating and ventilation systems: health technical memorandum 03-01: specialised ventilation for healthcare premises. Appendix 2. London: Stationery Office, 2007. Nitrous Oxide (N2O) is a colourless, non-flammable gas that was first discovered in 1772, by English scientist Joseph Priestley. Humphry Davy recognised its analgesic properties in 1799; the euphoric effects of inhaling it led to it being colloquially referred to as 'laughing gas'. Its low tissue solubility, low cost and minimal cardiorespiratory complications have all contributed to the popularity of the gas in medicine. It is, by far, the most commonly used general anaesthetic in history. However, studies have found harmful effects to be associated with Nitrous Oxide exposure. Many anaesthetists question its continued routine use in medicine. Nitrous Oxide for Labour Analgesia Entonox gas (nitrous oxide combined with oxygen) is a common pain relief option for women in labour. The gas helps to manage pain throughout the body without resulting in a loss of sensitivity or muscle movement. Oxygen levels are to be monitored continuously whilst a person is receiving N2O. Compared with an injectable opioid, Nitrous Oxide provides a similar amount of pain relief. However, it does not carry the same side effects for the newborn. One of the concerns with the use of nitrous oxide for labour analgesia is the amount of gas that is exhaled by the patient into the surroundings. Care providers must therefore take safety precautions to monitor and reduce exposure. Controlling Exposure to Nitrous Oxide during Anaesthesia Because of a diverse range of concerns, the use of Nitrous Oxide as an anaesthetic is declining in Western countries. However, its popularity as a recreational drug is increasing. Workers exposed to Nitrous Oxide could suffer harmful effects. Over-exposure to the gas during the administration of anaesthesia can lead to decreased mental performance, audio-visual ability, and manual dexterity. Research also indicates that adverse reproductive effects may be a result of chronic Nitrous Oxide exposure Control measures must, therefore, be put in place to greatly reduce exposure where possible. The design for operating theatres, for example, where the gas is administered, should consider air exchange requirements and the use of scavenging equipment to maintain a safe working environment. Contraindications of Nitrous Oxide Despite generally being considered safe, there are many situations where the use of Nitrous Oxide is contra-indicated. The gas can cause a rise in intra-cranial pressure. Therefore, the gas should never be administered when a patient has suffered head injury or if a pre-existing condition denotes air trapped in the body. The continuous use of N2O must be accompanied by close clinical supervision and haematological monitoring, as it can lead to vitamin B12 deficiency in susceptible patients. Pre-operative assessments must always be undertaken to determine any underlying conditions. This does not, however, eliminate the risk of using Nitrous Oxide entirely. Monitoring Nitrous Oxide Exposure At Workplace Exposure, we work with care providers to help them to keep their workplace safe for staff and patients. We provide keyturn solutions to monitor exposure with no disruption to patient care. Please get in touch on 0800 689 4386 or email us at enquiries@workplaceexposure.co.uk and we will be delighted to help. Other Services Many other hazards exist in Hospitals and Workplace Exposure offers a wide range of other Occupational Hygiene monitoring services, below is a list of the services we offer: COSHH Air Monitoring Nitrous oxide monitoring in operating theatres, recovery rooms, burn treatment units and maternity wards Anaesthetic gases in theatres, (e.g. sevoflurane, desflurane, isoflurane) Ozone levels in print rooms. Wood dust in joiner workshops. Xylene and ethanol exposure in Histology. Total inhalable dust levels within linen rooms. Propan-2-ol, xylene and ethanol exposure in Cytology. Inhalable and respirable dust within plaster clinics including Respirable Crystalline Silica (RCS). Exposure to acetic acid, ethanol, propylene glycol and other substances in Endoscopy equipment cleaning. Solder fumes (colophony), methyl methacrylate, inhalable dust, respirable dust and respirable crystalline silica in Maxillo-facial units. Chlorine dioxide monitoring from preparation of disinfectant used throughout the hospital from Maternity to Endoscopy. Example disinfectants are difficil-s and tristel. Subtilisin monitoring from Endoscopy Ethanol and propan-2-ol monitoring from Pharmacy preparation areas. Microbiological sampling for Moulds, bacteria, yeasts and fungi Indoor Air Quality Surveys Temperature Humidity Air Flow Carbon monoxide Carbon dioxide Lighting Surveys We're here to help Our expert team have experience working with a variety of different businesses to ensure they offer a safe, compliant working environment. Our professional solutions and advice help to ensure your business meets compliance standards and is operating to best practice. If you need help in carrying out a COSHH air monitoring survey to help select the correct PPE, or your workplace noise assessment, we're here to help. Our approach Get in touch with Workplace Exposure. Either give us a call on 0800 689 4386, or fill in our enquiry form to discuss your monitoring or consultancy requirements. We'll then provide you with a no-obligation proposal, we can often give an initial idea of fees whilst we discuss your needs. Once you've accepted our proposal we can then schedule the work. Following our site visit we'll provide you with a comprehensive report giving you advice, recommendations and control measures where appropriate. Implement the outcomes for compliance and a happier healthier workplace.

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