

→ LIVOPAN®

THE LINDE GROUP

Linde

LIVOPAN®

A fresh breath
in pain relief.

Linde: Living healthcare

Rapid and controlled.

LIVOPAN® is a ready-to-use gas mixture consisting of 50% nitrous oxide and 50% oxygen, with well-documented analgesic and sedative effects. It is fast-acting, self-administered and rapidly eliminated from the body once inhalation stops. The effects are predictable and reliable, with minimal side effects. A potent analgesic in its own right, LIVOPAN can also be used as an adjunct to other analgesics.

Rapid onset and offset of action in combination with a high degree of safety make LIVOPAN an attractive alternative in emergencies and other situations where rapid and controlled pain relief is required. Its analgesic and anxiolytic properties play an important role in helping patients overcome the apprehension associated with pain.

Nitrous oxide exhibits classical dose dependent analgesic effects, raising the pain threshold and reducing the level of pain experienced¹⁸. Once the nitrous oxide/oxygen mixture has been administered it starts working within minutes. Residual cognitive and/or psychometric effects disappear rapidly following cessation of administration. The analgesic effect begins within a few minutes and wears off within 5–10 minutes.

Administered with care.

LIVOPAN is administered through an inhalation facemask or mouthpiece with patients' intake of the gas mixture controlled by an on-demand valve or, if needed, a continuous flow valve. An integrated valve ensures patient and user safety, with no change of regulators necessary, no more handling of high filling pressure, and no risk of leakage. Low constant outlet pressure and flow is gauged to the treatment required.

Administered by specially trained paramedics, nurses or midwives, LIVOPAN can help to enable a more effective use of resources. Fast patient recovery is a clear advantage in most diagnostic and therapeutic procedures. The rapid offset minimises post-procedural monitoring and patient stay.

LIVOPAN nitrous oxide/oxygen mixture

Fast onset and offset make nitrous oxide/oxygen mixture ideal for acute pain of relatively short duration. The analgesic effect begins within a few minutes and wears off within 5–10 minutes.

Simple

- Non-invasive
- On demand
- Effective use of care resources



On/Off

Safe

- Minimal cardiovascular or respiratory effects
- Minimal side effects

Comfort when it's most needed.

Rapid onset and offset of action, predictable effects, non-invasiveness and ease of administration have established LIVOPAN's analgesic usefulness from emergency medicine to painful diagnostic as well as therapeutic procedures.



Emergency.

The advantages of LIVOPAN make it suitable for the pre-hospital setting as well as in accident and emergency departments.



Paediatric.

Without adequate relief during a painful procedure, children may experience a pain memory which could worsen the situation for subsequent procedures. This is especially valid for children with chronic diseases. LIVOPAN is beneficial in small children who may or may not be able to rationalise their pain or communicate what they are experiencing.



Obstetrics.

LIVOPAN can be used during early labour to help mothers cope with the pain during contractions and, if required, for uncomfortable examinations. The gas mixture allows, as near as possible, the mother to experience the sensation of a natural birth. Mothers can adjust their intake to suit their own individual pain thresholds.



Painful procedures.

LIVOPAN has been used widely in the treatment of pain and reduction of anxiety during minor interventions, investigations or surgical procedures.

A safe choice.

Nitrous oxide/oxygen mixture is non-cumulative. Apart from minor side effects such as drowsiness and nausea, no serious adverse effects have been reported in studies examining the use of nitrous oxide/oxygen mixtures in adults as well as children^{1,23,24}. It is associated with only minor effects of clinical relevance on the heart,

circulation and breathing, even if the patient is suffering from cardiac disease or has respiratory problems^{19,20}. Studies in connection with acute heart attack have noted the analgesic effect of nitrous oxide without hemodynamic effects or significant side effects^{21,22}.

Linde: Living healthcare

Linde Healthcare is committed to working with healthcare providers and regulatory authorities to continuously promote safe use of medical products and improve patient care. We provide medical gas products, therapies, technical solutions and services to hospitals, clinics, nursing facilities, emergency management services and home healthcare providers around the world. With our long experience and understanding of healthcare realities, you can depend on solutions that are delivered and serviced to the highest possible standards of quality, safety and efficacy.

References.

1. Faddy SC and Garlick SR. A systematic review of the safety of analgesia with 50% nitrous oxide: Can lay responders use analgesic gases in the prehospital setting? *Emerg Med J* 2005; 22:901-908. Review.
2. Luhmann JD, Kennedy RM, Lang Porter F, Miller JP, Jaffe DM. A randomized trial of continuous flow nitrous oxide and midazolam for sedation of young children during laceration repair. *Ann Emerg Med* 2001; 37(1):20-7.
3. Baskett PJF. Nitrous oxide in pre-hospital care. *Acta Anaesthesiol Scand* 1994; 38:775-776.
4. Hennerikus WL, et al. Self-administered nitrous oxide analgesia for pediatric fracture reductions. *J Pediatr Orthop* 1994; 14:538-42.
5. Migita RT, Klein EJ, Garrison MM. Sedation and analgesia for pediatric fracture reduction in the emergency department. A systematic review. *Arch Pediatr Adolesc Med* 2006; 160:46-51.
6. O'Sullivan I, Benger J. Nitrous oxide in emergency medicine. *Emergency Med Journal* 2003; 20:214-7.
7. Castera L, Negre I, Samii K, Buffet C. Patient-administered nitrous oxide/oxygen inhalation provides safe and effective analgesia of percutaneous liver biopsy: a randomized placebo-controlled trial. *Am J Gastroenterology* 2001; 96(5):1553-7.
8. Masood J, Shah N, Lane T, Andrews H, Simpson P, Barua JM. Nitrous oxide (Entonox) inhalation and tolerance of transrectal ultrasound guided prostate biopsy: a double-blind randomized controlled study. *J Urol* 2002; 168(1):116-20.
9. Manikandan R, Srirangam SJ, Brown SC, O'Reilly PH, Collins GN. Nitrous oxide vs periprostatic nerve block with 1% lidocaine during transrectal ultrasound guided biopsy of the prostate: a prospective, randomized, controlled trial. *J Urol.* 2003; 170(5):1881-3
10. Saunders BP; Fukumoto M, Halligan S, Masaki T, Love S, Williams CB. Patient-administered nitrous oxide/oxygen inhalation provides effective sedation and analgesia for colonoscopy. *Gastrointest Endosc* 1994; 40(4): 418-21.
11. Lindblom A, Jansson O, Jeppsson B, Tornebrandt K, Benoni C, Hedenbro JL. Nitrous oxide for colonoscopy discomfort: a randomized double-blind study. *Endoscopy* 1994; 26(3):283-6.
12. Notini-Gudmarsson AK, Dolk A, Jakobsson J, Johansson C. Nitrous oxide: a valuable alternative for pain relief and sedation during routine colonoscopy. *Endoscopy* 1996; 28(3):283-7.
13. Atassi K, Mangiapan G, Fuhrman C, Lasry S, Onody P, Housset B. Pre-fixed equimolar nitrous oxide and oxygen mixture reduces discomfort during flexible bronchoscopy in adult patients. A randomized, controlled, double-blind trial. *CHEST* 2005; 128 (2):863 - 868.
14. Fauroux B. The efficacy of premixed nitrous oxide and oxygen for fiberoptic bronchoscopy in pediatric patients: a randomized, double blind, controlled study. *CHEST* 2004; 125:315-321.
15. Ekblom K, Jakobsson J, Marcus C. Nitrous oxide inhalation is a safe and effective way to facilitate procedures in paediatric outpatient departments. *Arch Dis Child* 2005; 90:1073-6.
16. Vetter TR. A comparison of EMLA® cream versus nitrous oxide for pediatric venous cannulation. *J Clin Anaesth* 1995; 7:486-90.
17. Kronberg JE, Thompson DEA. Is nitrous oxide an effective analgesic for labor? A qualitative systematic review in Evidence Based Obstetric Anaesthesia, ed. by Halpern SH, Douglas MJ; Blackwell 2005, pp. 38-55.
18. Dworkin SF, Chen AC, Schubert MM, Clark DW. Analgesic effects of nitrous oxide with controlled painful stimuli. *J Am Dent Assoc* 1983; 107(4):581-5.
19. Thornton JA. Cardiovascular effects of 50% nitrous oxide and 50% oxygen mixture. *Anaesthesia* 1973; 28:484-9.
20. Wynne J et al. Hemodynamic effects of nitrous oxide administered during cardiac catheterization. *JAMA* 1980; 243:1440-3.
21. Kerr F, Brown MG, Irving JB, Hoskins MR, Ewing DJ, Kirby BJ. A double-blind trial of patient-controlled nitrous oxide/oxygen analgesia in myocardial infarction. *Lancet* 1975; 1(7922):1397-400.
22. Thompson PL, Lown B. Nitrous oxide as an analgesic in acute myocardial infarction. *JAMA* 1976; 235:924-7.
23. Annequin D, Carbajal R, Chauvin P, et al. Fixed 50% nitrous oxide mixtures for painful procedures: a French survey. *Pediatrics* 2000; 105(4):47-58.
24. Gall O, Annequin D, Benoit G, et al. Adverse effects of premixed nitrous oxide and oxygen for procedural sedation in children. *Lancet* 2001; 358:1514-15.
25. Baskett P, Withnell A. Use of Entonox in the ambulance service. *Br J Med* 1970; 2:41-43.
26. Young KD. Pediatric Procedural Pain. *Ann Emerg Med* 2005; 45(2):160-171.
27. Bourgeois C, Kuchler H. Gebrauch von MEOPA für schmerzhafte Eingriffe in der Pädiatrie. *Paediatrica* 2003; 14(2):18-21.
28. Burnweit C et al. Nitrous oxide analgesia for minor pediatric surgical procedures: An effective alternative to conscious sedation? *J Pediatr Surg* 2004; 39:495-499.
29. Rosen MA. Nitrous oxide for relief of labor pain: A systematic review. *Am J Obstet Gynecol* 2002; 186(5 Suppl Nature):S110-26. Review.
30. Sidebottom P, Yentis S. N2O in obstetric and gynaecological practice. *Best Practice & Research Clinical Anaesthesiology* 2001; 15(3):447-457.
31. McGregor DG, Baden JM, Bannister C, et al. Task force on trace anesthetic gases – Information for management in anesthetizing areas and the post-anesthetic care unit (PACU). American Society of Anesthesiologists. 1999, Park Ridge, IL, USA

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