NITRIC OXIDE

Trade Name	Nitric Oxide (NO)
Class	Gas; vasodilator.
Mechanism of Action	Relaxation of vascular and bronchial smooth muscle, decreased pulmonary vascular resistance, increased pulmonary blood flow, decreased VQ mismatch.
Indications	Persistent Pulmonary Hypertension of the Newborn (PPHN) Severe hypoxic respiratory failure AND evidence of pulmonary hypertension on ECHO.
Cautions	Caution in preterm infants as the benefits of nitric oxide have not been proven in randomised studies. Consider on a case by case basis Caution with known or suspected bleeding such as Intraventricular Haemorrhage (IVH), GI bleeding, pulmonary haemorrhage or coagulopathy due to the risk of platelet dysfunction from nitric oxide
Contraindications	Neonates with congenital heart disease dependent on right to left shunt Congenital or acquired methaemaglobin reductase deficiency
Supplied As	Gas cylinders
Dilution	In NO delivery system: mixed with air and oxygen.
Dosage	**Term:** start at 20ppm (max 40ppm). Wean as per the Nitric Oxide weaning guideline in the Neonatal Handbook. Do not discontinue nitric oxide abruptly as rebound pulmonary hypertension and worsening oxygenation may result. **Preterm:** start at 5-10ppm; SMO decision only due to paucity of evidence in this patient population and aim to wean as soon as possible. **Note**: The lowest nitric oxide delivery that can be given when weaning is 2-3ppm
Interval	Continuous
Administration	Continuous delivery via “Inovent” system as exhaled gases must be scavenged (ie not liberated into room air).
Compatible With	N/A
Incompatible With	Reacts with oxygen (O_2) to form NO_2, thus needs a special delivery system. Contact between NO and O_2 should be as short as possible to minimise NO_2 formation.

Monitoring	Strict control of delivery and regular assessment of oxygen requirements. Restart NO if deterioration post withdrawal. Nitrogen dioxide (NO_2) should be less than 3ppm[2]. Blood Methaemoglobin level daily on blood gas (ideally $\leq$ 5%).
Stability	Unstable once exposed to oxygen
Storage	Gas cylinders at 15-30^{o}C
Adverse Reactions	Decreased platelet function; Intra-Ventricular Haemorrhage. Methaemoglobinaemia (with resultant cyanosis and tissue hypoxia). Rapid rebound pulmonary vasoconstriction on sudden withdrawal. Peroxynitrite (NO + superoxide) may cause airway irritation; inflammation; surfactant destruction (NO_2) Nitrogen dioxide (NO + O_2) is toxic causing $\downarrow$ alveolar permeability, hypoxia, pulmonary oedema and death.
Metabolism	Binds to Haemoglobin to form (NOHb); this oxidised to Met-Haemoglobin ($HbFe^{3+}$) with production of nitrate (NO_3); thus no effect on systemic vasculature.
Comments	Bagging circuit should be connected to deliver NO. Weaning should be slow as may get rebound deterioration. A scavenging system is fitted to both ventilator and bagging circuits to prevent occupational exposure. Nitric oxide use in preterm babies with PPHN may have short term benefits with better oxygenation but has not shown to reduce rates of BPD, mortality or brain injury
References	1. John Spence Nursery Drug Database web site http://www.cs.nsw.gov.au/rpa/neonatal/ 2. Finer NN. Inhaled nitric oxide in neonates. Arch Dis Child 1997;77:F81-4. 3. Micromedex
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