

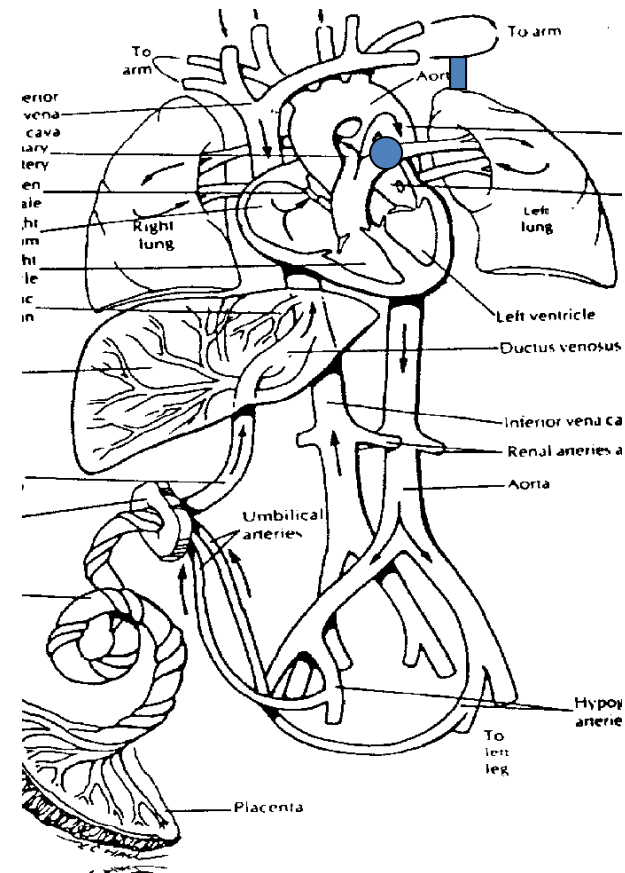
Neonatal Pulmonary Hypertension



Ray Hernandez, Pulmonary Hypertension

Fetal Circulation

- Low systemic pressure
- Shunting of blood
 - Foramen Ovale
 - Ductus Arteriosus
- Decreased blood flow through pulmonary vasculature



Causes of Neonatal Pulmonary Hypertension

Asphyxia

Meconium Aspiration

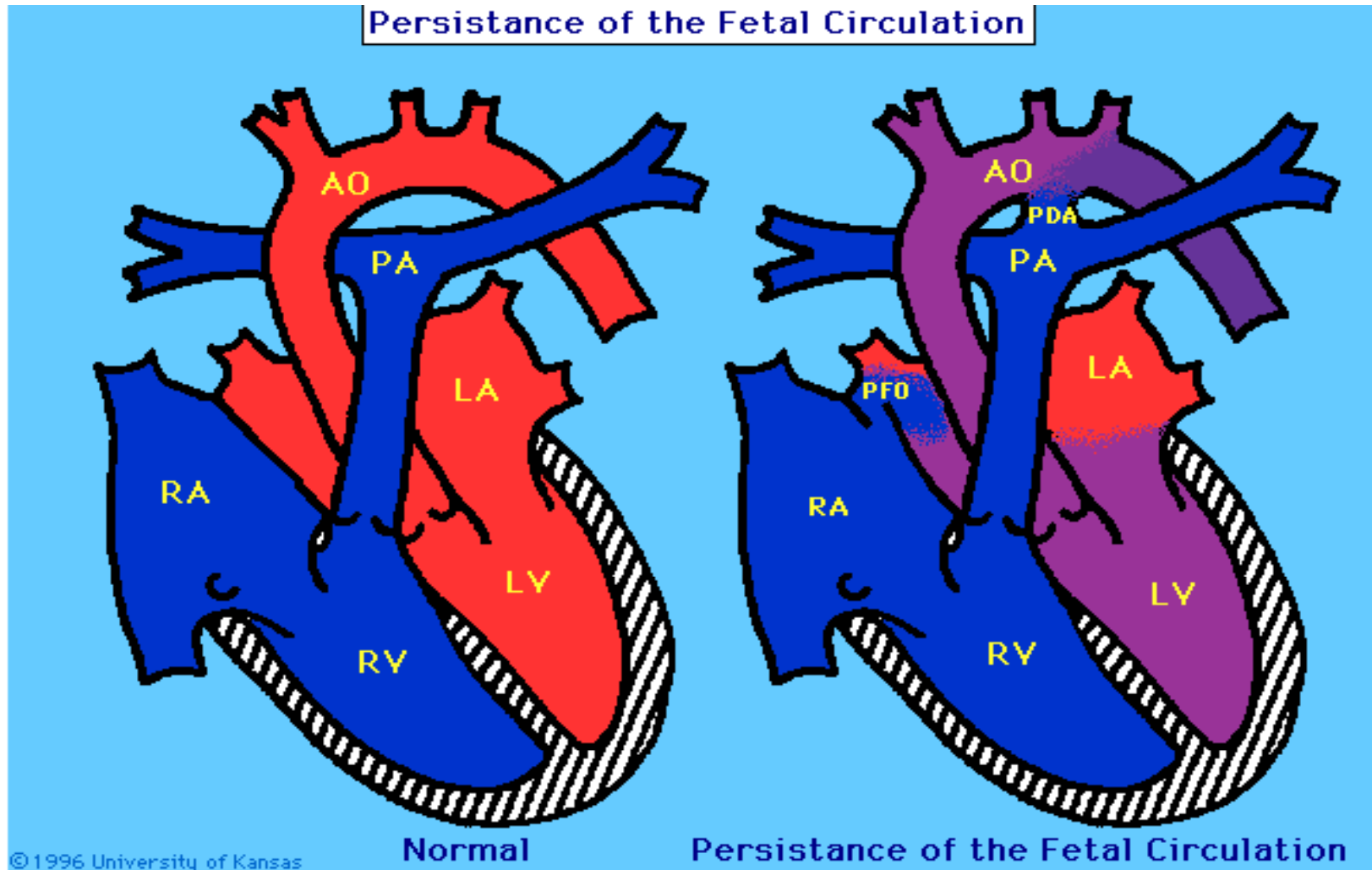
Group B Strep
Pneumonia

Acidosis

- Hypothermia
- Hypoglycemia
- Hypoxemia



Pulmonary Hypertension



R → L Shunt

- Decreased pulmonary blood flow
 - Decreased vascular markings
 - Enlarged heart
 - BS: rales?

Pulmonary Hypertension

Differential Diagnosis

- Congenital Heart Disease - CHD
- Lung Disease
- Pulmonary Hypertension of the Newborn
- PPHN

Diagnostic Tests

O₂ Hyperoxia Challenge Test

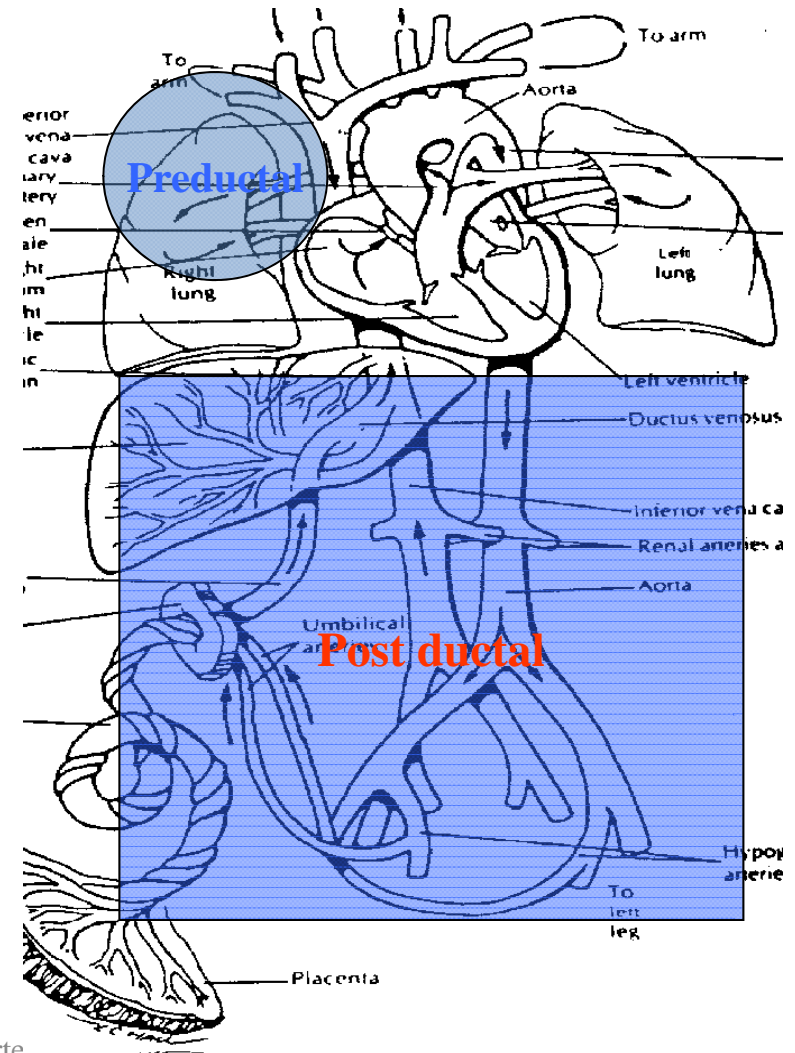
- Simplest to administer
- 100% FiO₂
- PaO₂ change > 100mmHg suggests PPHN or lung disease
- Minimal change in PaO₂ suggests severe PPHN or CHD



Pulmonary Hypertension

Pre / Post Ductal O2 Test

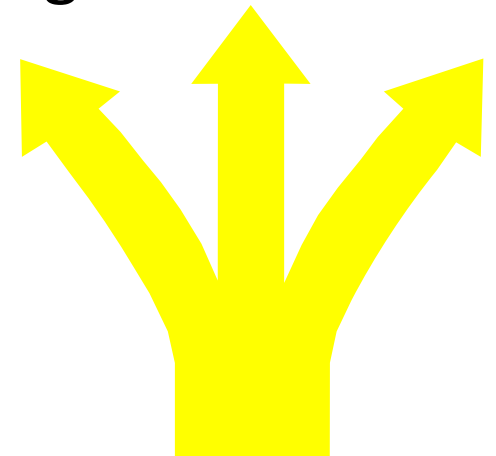
- Preductal (right arm)
- Postductal (torso or either leg)
- Preductal > Postductal suggests PPHN or CHD



Pulmonary Hypertension

Hyperventilation Test

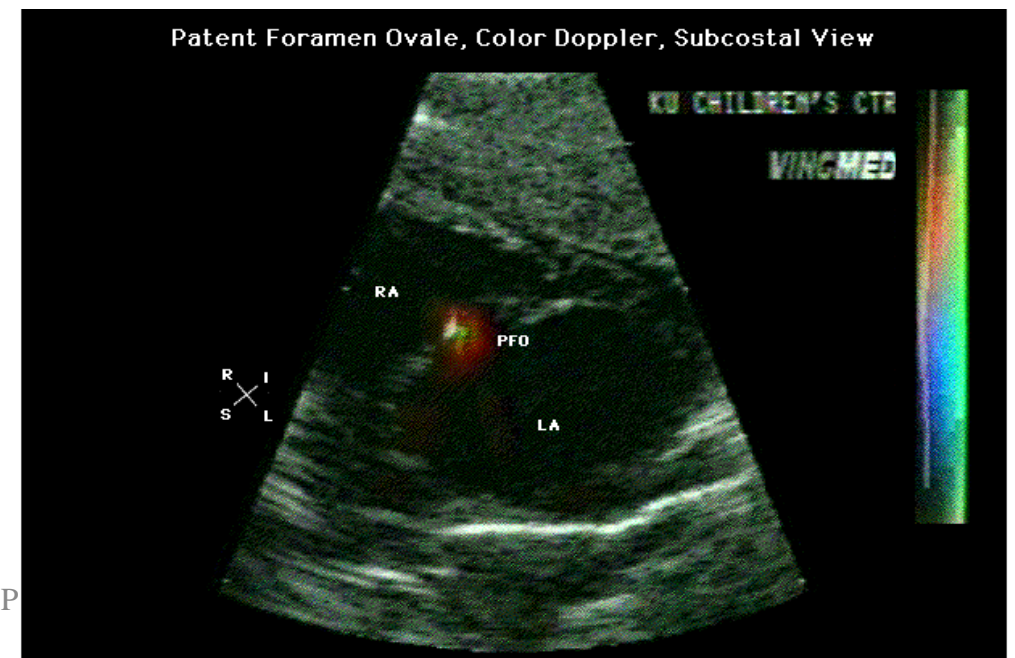
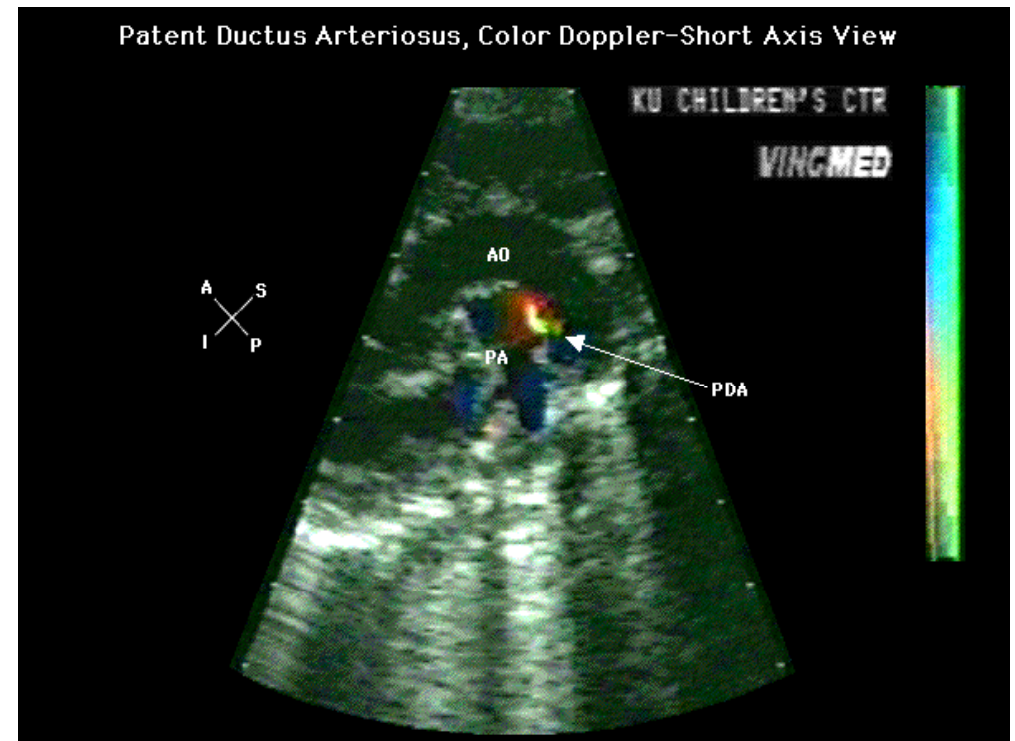
- Most accurate to confirm PPHN
- Hyperventilation to achieve PCO₂ 25-30 torr with pH = > 7.45
- Potent pulmonary vasodilator
- PPHN present if PaO₂ increases > 100mmHg.



Pulmonary Hypertension

Echocardiogram

- Visualize heart and blood flow



Pulmonary Hypertension

Chest X-ray

- Decreased hilar markings
- Increased heart size



Meconium Aspiration

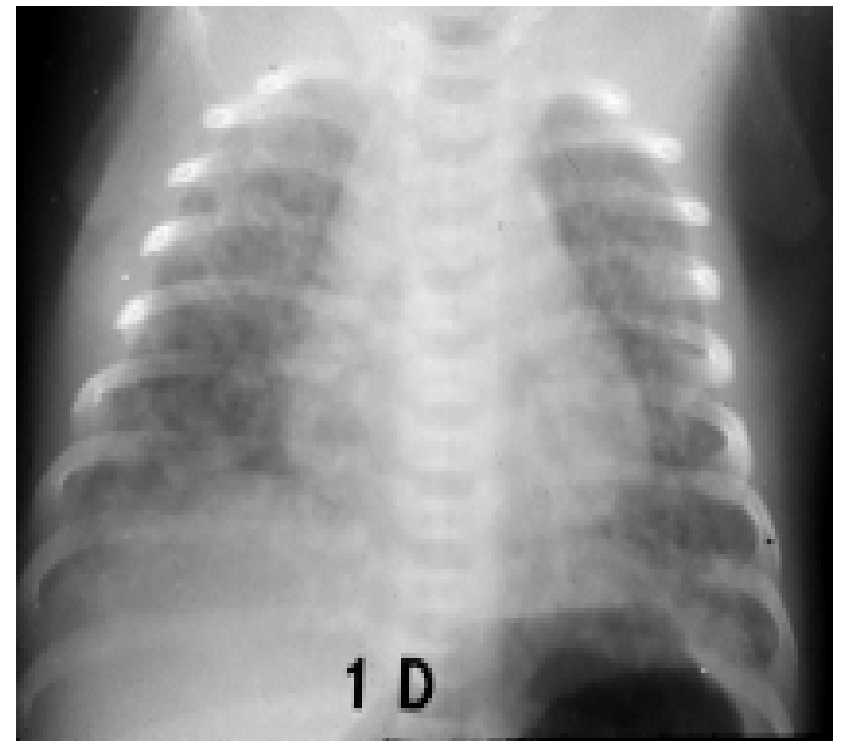
- Term or Post term
- Asphyxia
 - Increased peristalsis with relaxation of sphincter muscle
 - Gasping
- Passage of meconium 9 - 20% of births
- Actual passage into trachea 4 - 10%

Meconium Aspiration

- Air trapping
- Chemical Pneumonitis
- Pulmonary Hypertension

Meconium Aspiration Syndrome (MAS)

- Non-homogeneous, patchy density (atelectasis / hyperaeration)
- Often perihilar congestive streaking



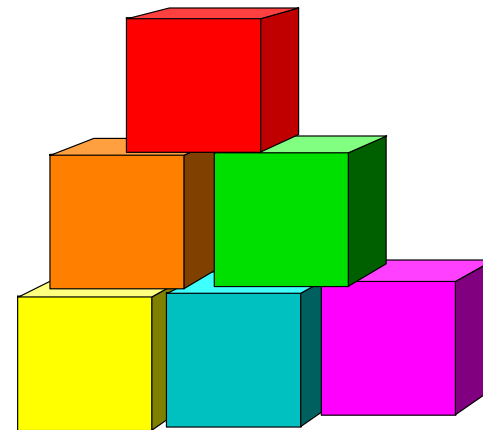
Group B Streptococcus Pneumonia

- Septecemia, respiratory distress, shock, respiratory failure.
- Within 24 hours if not treated
- Can closely mimic RDS course



Treatment PPHN / MAS

- Hyperoxygenation
 - PaO₂ > 100 torr
 - Maintain SaO₂ 100%
- Hyperventilation
 - PaCO₂ 25-30 torr
 - pH 7.45 and greater
- Low PIP's, high RR
- HFV (High Frequency Ventilation)
- Nitric Oxide
- ECMO (extracorporeal membrane oxygenation)



Nitric Oxide

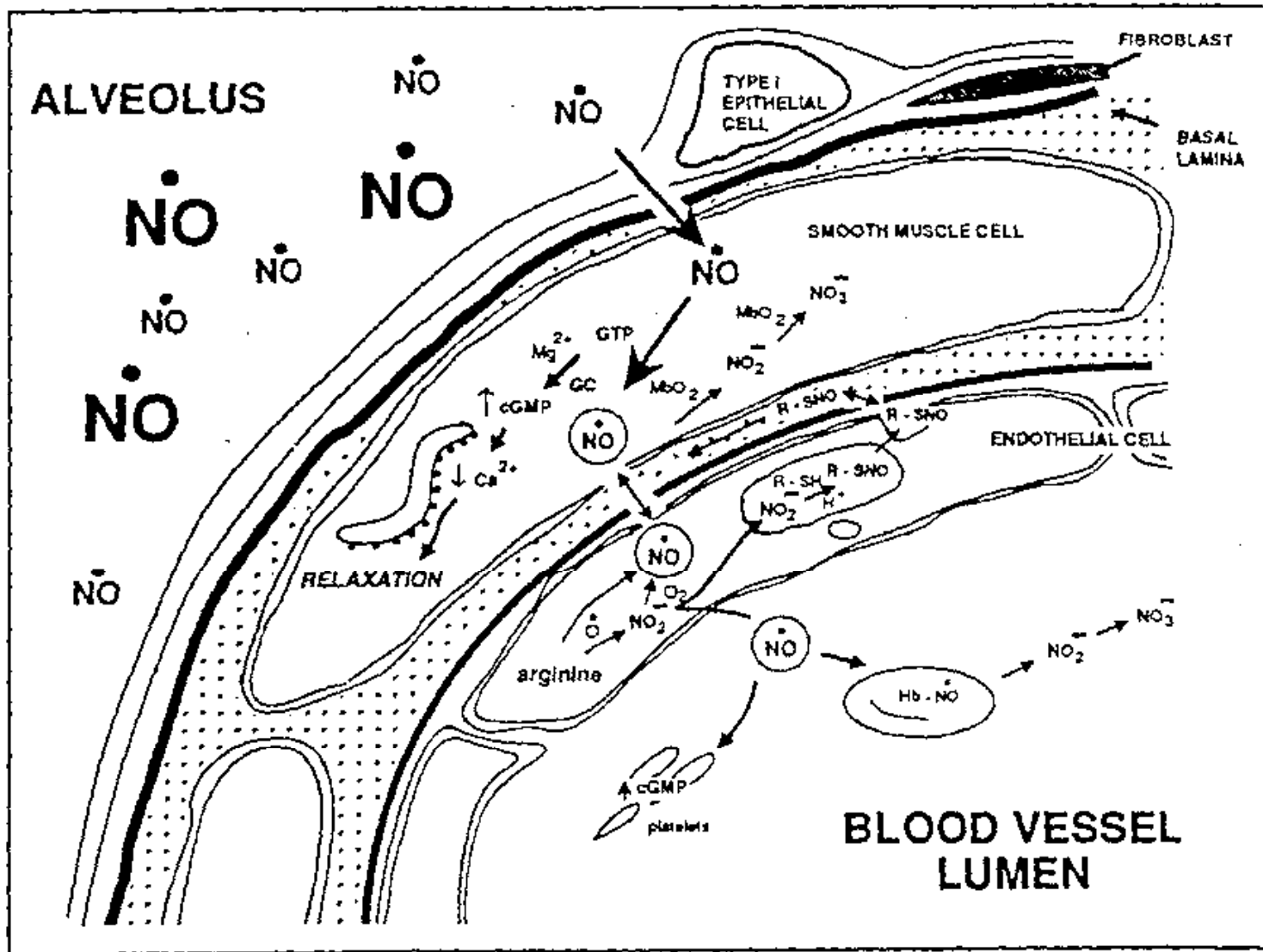
- Approved for use 1999
 - Hypoxemic respiratory failure
 - Decrease PAP in PPHN
- Off label use
 - Decrease PVR during neonatal cardiac surgery
 - Tx hypoxemia, PPHN after lung transplantation
 - Tx of ARDS



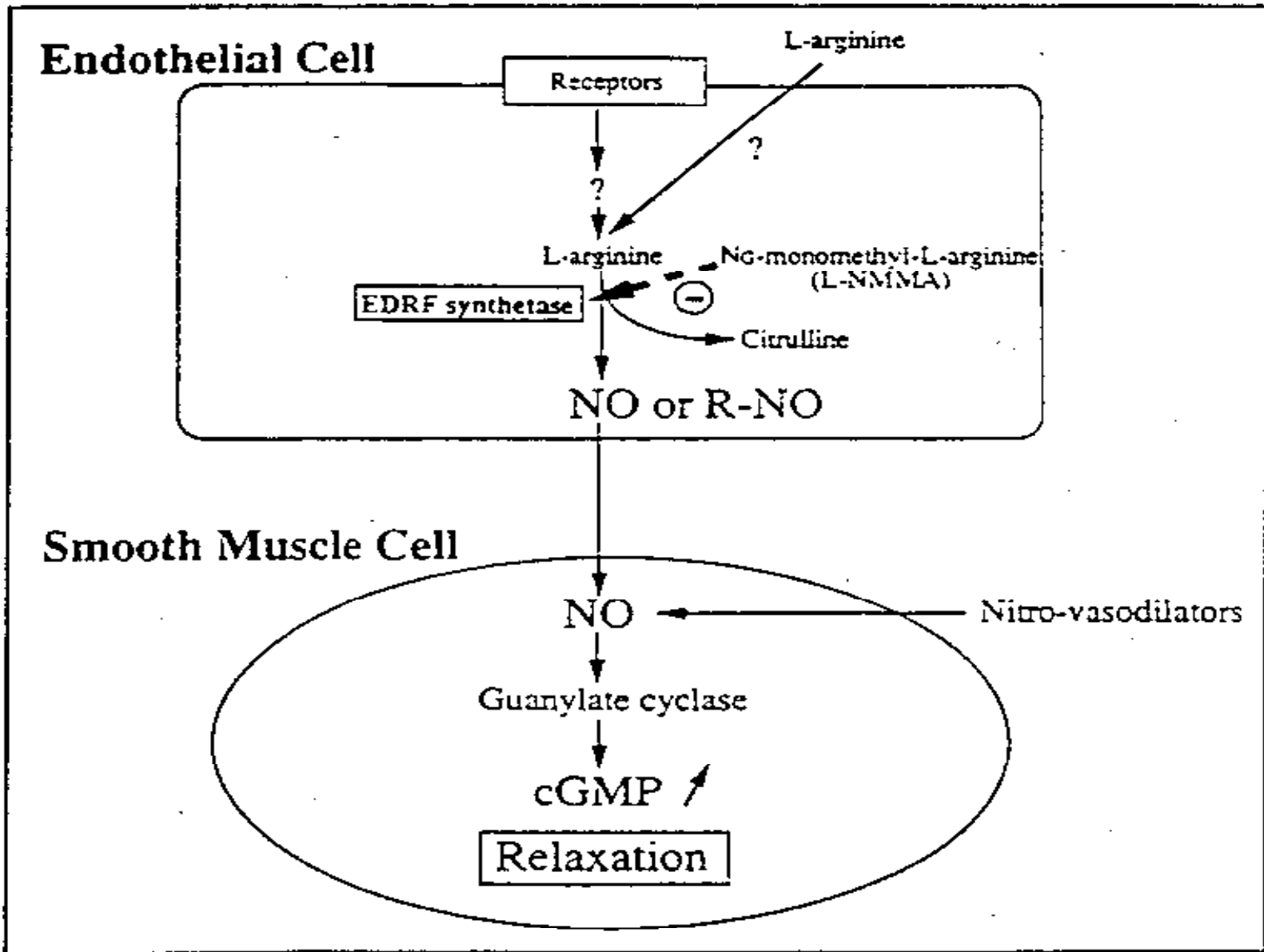
Nitric Oxide

NO is normally produced at about 10 parts per billion (ppb)

- Microselective vasodilatation
- Improved V/Q matching
- Quick onset
- Inactivated once NO binds to hemoglobin



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Nitric Oxide

Studies showing affect of NO delivery

- Pulmonary vasodilatation
 - 2 - 20 ppm
- PAP pressure reduction
 - up to 80 ppm

OSHA

Safe level at 25 ppm for NO and 5 ppm for NO₂

Toxicity of Nitric Oxide

- Direct toxicity
- oxidative product NO₂
- formation of methemoglobin
- Inhibition of platelet aggregation

Short term administration of low concentrations of NO seems safe