

# PERSISTENT PULMONARY HYPERTENSION OF THE NEWBORN (**PPHN**)

Kaleidoscope

February 22, 2016

# PPHN

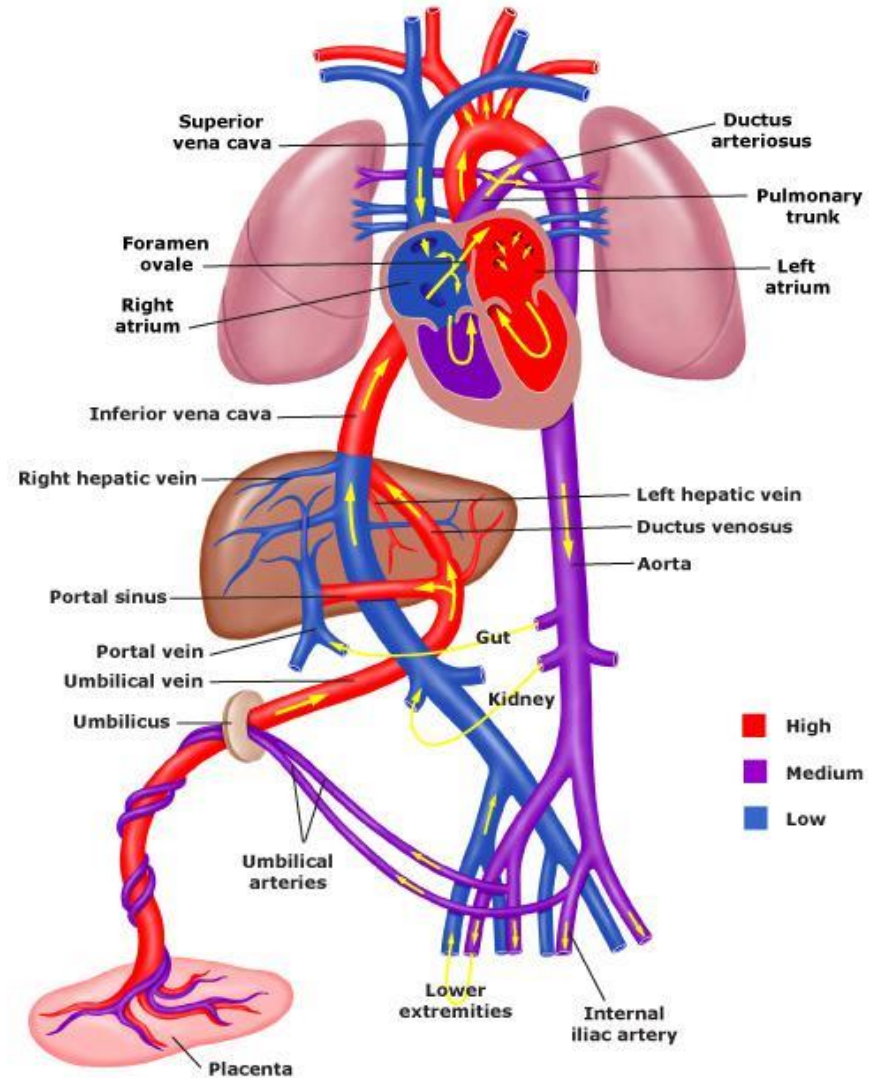
**At the end of this presentation the participant will be able to:**

- 1) Describe transitional physiology of the newborn (**NB**)
- 2) Define persistent pulmonary hypertension of the newborn (**PPHN**)
- 3) Recall perinatal risk factors for **PPHN**
- 4) Distinguish symptoms & conditions associated with **PPHN** in the **NB**
- 5) List therapeutic strategies for **PPHN**

# PHYSIOLOGY

## *Fetal Circulation*

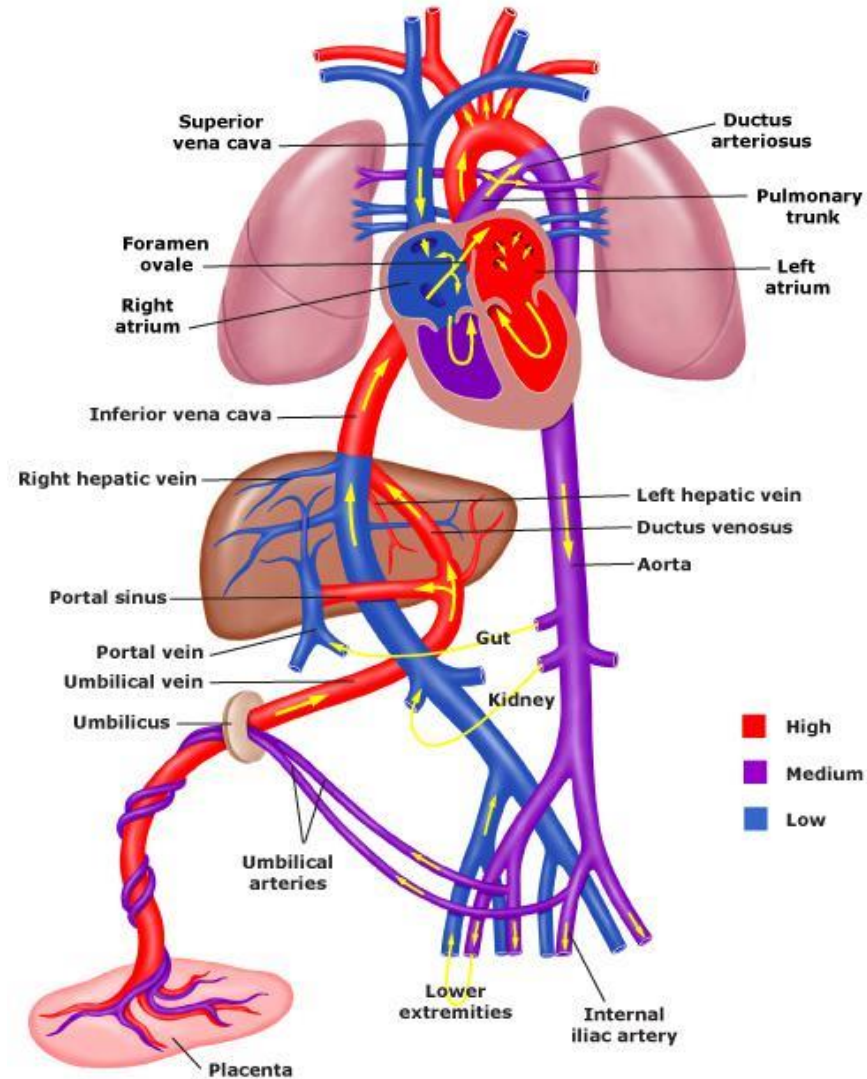
- Placenta
  - Low vascular resistance
- Fetal lungs
  - High vascular resistance



# PHYSIOLOGY

## Changes at Delivery

- Alveolar fluid clearance
- Lung expansion
- Circulatory changes





# PPHN

**PPHN** results from conditions that interfere with the normal postnatal decline in PVR causing the transitional circulation to **'persist'**

- Incidence 1.9 per 1000 live births (0.4-6.8/1000 live births)
- Mortality rate ranging from 4-33%

## **Three (3) Types:**

- Underdevelopment
- Maldevelopment
- Maladaptation

# PPHN

***UNDERDEVELOPMENT*** (pulmonary vasculature is reduced):

- 1) **CDH** (congenital diaphragmatic hernia)
- 2) Fetal **renal abnormalities** with severe **oligo/anhydramnios**
- 3) **IUGR** (intrauterine growth restriction/retardation)



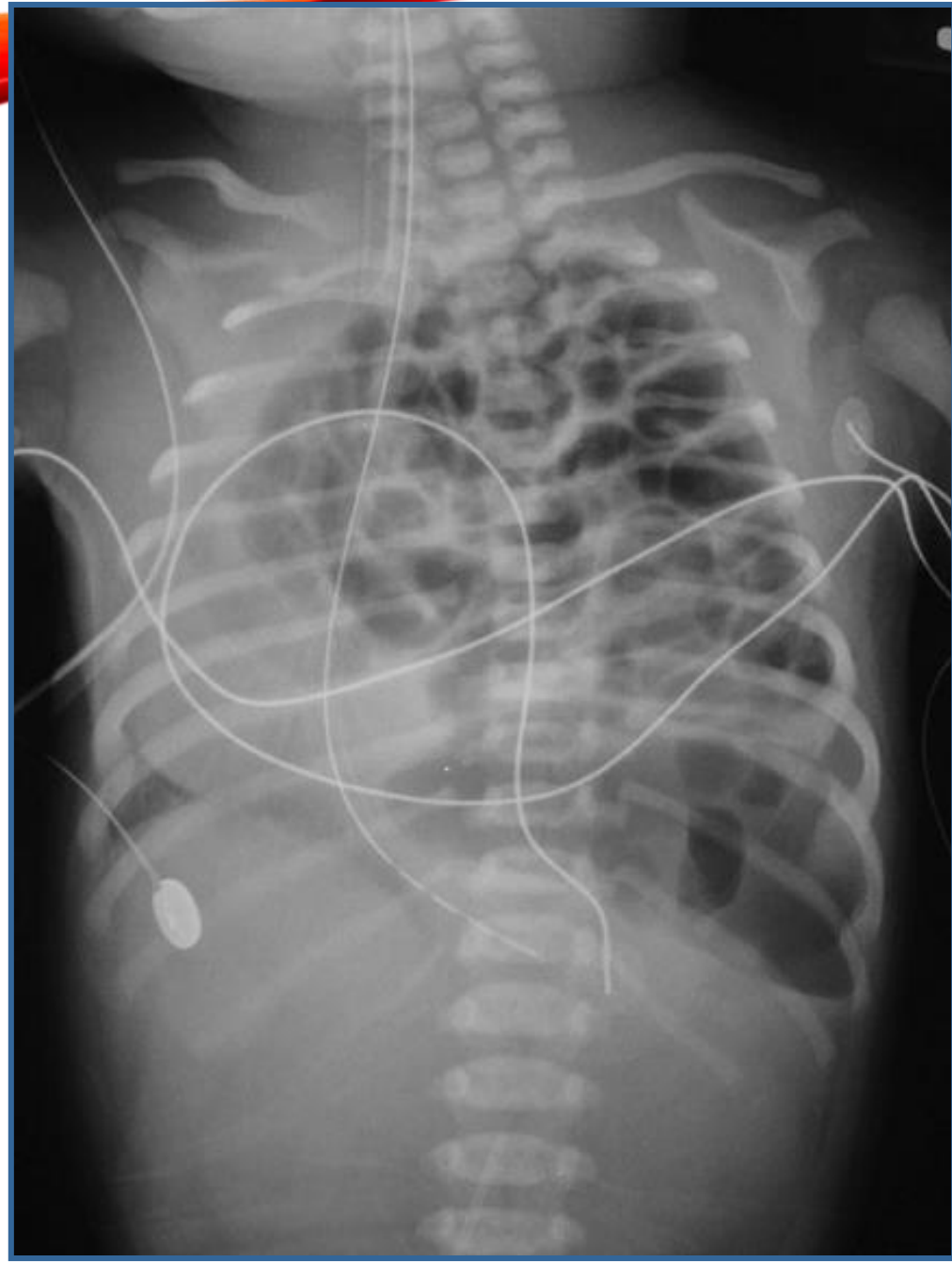
**PPHN**

# **CONGENITAL DIAPHRAGMATIC HERNIA**









# PPHN

**MALDEVELOPMENT** (abnormal pulmonary vasculature-thickened/extended/thin walled vessels):

- 1) Post term deliveries (> 42 weeks GA)
- 2) Meconium stained amniotic fluid-as a marker for fetal distress/problems
- 3) Meconium aspiration syndrome (**MAS**)
- 4) Non-steroidal anti-inflammatory drugs (**NSAIDS**)-  
Indocin/ibuprofen

# PPHN

**MALADAPTATION** (pulmonary vascular bed is normally developed):

- 1) Perinatal depression (low **APGAR** scores)
- 2) Pulmonary parenchymal disease (**TTN**-transient tachypnea of the NB, **HMD**-hyaline membrane disease)
- 3) Bacterial infections (group B streptococcus (**GBS**))

# PPHN

## ***PRENATAL FACTORS:***

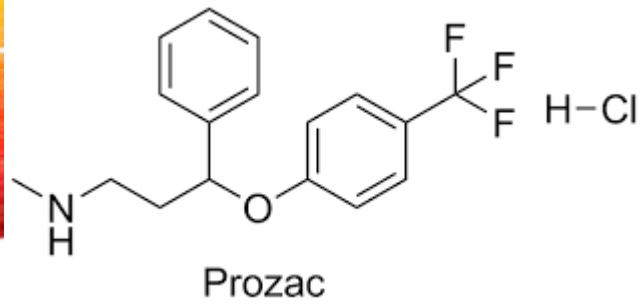
- 1) Signs of intrauterine/perinatal asphyxia
- 2) Fetal heart abnormalities (bradycardia/tachycardia)
- 3) Meconium stained amniotic fluid
- 4) Exposure to SSRIs-in 2<sup>nd</sup> half of pregnancy











**PROZAC**<sup>®</sup>  
fluoxetine hydrochloride

**serzone**<sup>®</sup>  
nefazodone HCl  
50, 100, 150, 200, 250 MG TABLETS

**ZOLOFT**<sup>®</sup>  
(sertraline HCl)

**Cymbalta**<sup>®</sup> DELAYED  
RELEASE  
CAPSULES  
duloxetine HCl

**LUVOX**<sup>®</sup>  
fluvoxamine maleate

**Lexapro**<sup>®</sup>  
escitalopram oxalate

**PAXIL CR**<sup>®</sup>  
PAROXETINE HCl  
CONTROLLED-RELEASE TABLETS

ONCE-DAILY  
VENLAFAXINE HCl  
**EFFEXOR XR**<sup>®</sup> EXTENDED  
RELEASE CAPSULES



Joe Raedle via Getty Images

## **CONCLUSION:**

“The risk of persistent pulmonary hypertension of the newborn seems to be **increased for infants exposed to SSRIs in late pregnancy**, independent of the potential moderator variable examined. A significant relation for exposure to SSRIs in early pregnancy was not evident...”



# PPHN

## ***SYMPTOMS OF PPHN:***

- 1) Cyanosis
- 2) Respiratory distress (tachypnea, retractions, grunting)







# PPHN

## ***LAB TESTS TO DIAGNOSE PPHN:***

- 1) Pulse oximetry screening
- 2) Arterial blood gases (ABGs)
- 3) CXR
- 4) ECHO

# PPHN

## ***DIFFERENTIAL DIAGNOSIS:***

- 1) Cyanotic congenital heart defect
- 2) Parenchymal lung diseases (pneumonia, HMD, TTN)
- 3) Sepsis

# PPHN

## ***THERAPEUTIC STRATEGIES FOR PPHN:***

- 1) Mechanical ventilation/supplemental oxygen-O<sub>2</sub>!!!!
- 2) Circulatory support (vasopressors, i.e. dopamine, epinephrine)
- 3) Volume expanders (normal saline, PRBCs)
- 4) Surfactant (for preterm babies and meconium aspiration syndrome)
- 5) Inhaled nitric oxide gas (iNO)
- 6) Sildenafil
- 7) Extra-corporeal Membrane Oxygenation (ECMO)

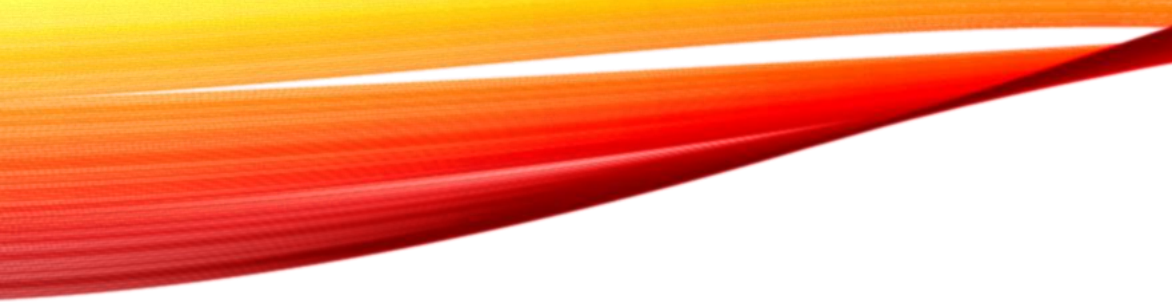
























# PPHN

## **ALTERNATE DEFINITION:**

“...a **final common pathway** of a variety of risk factors and insults that can cause pulmonary underdevelopment, maldevelopment, or poor postnatal adaptation.”

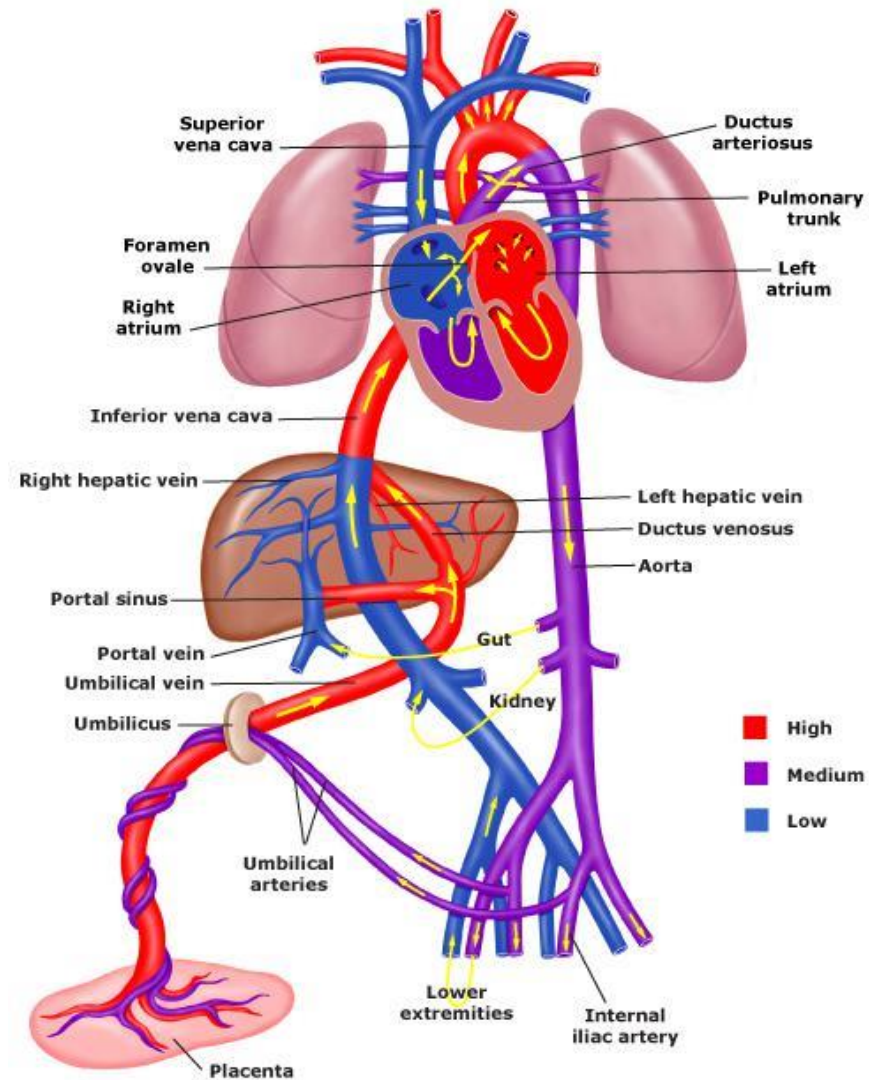




# PHYSIOLOGY

- **Fetal Circulation**

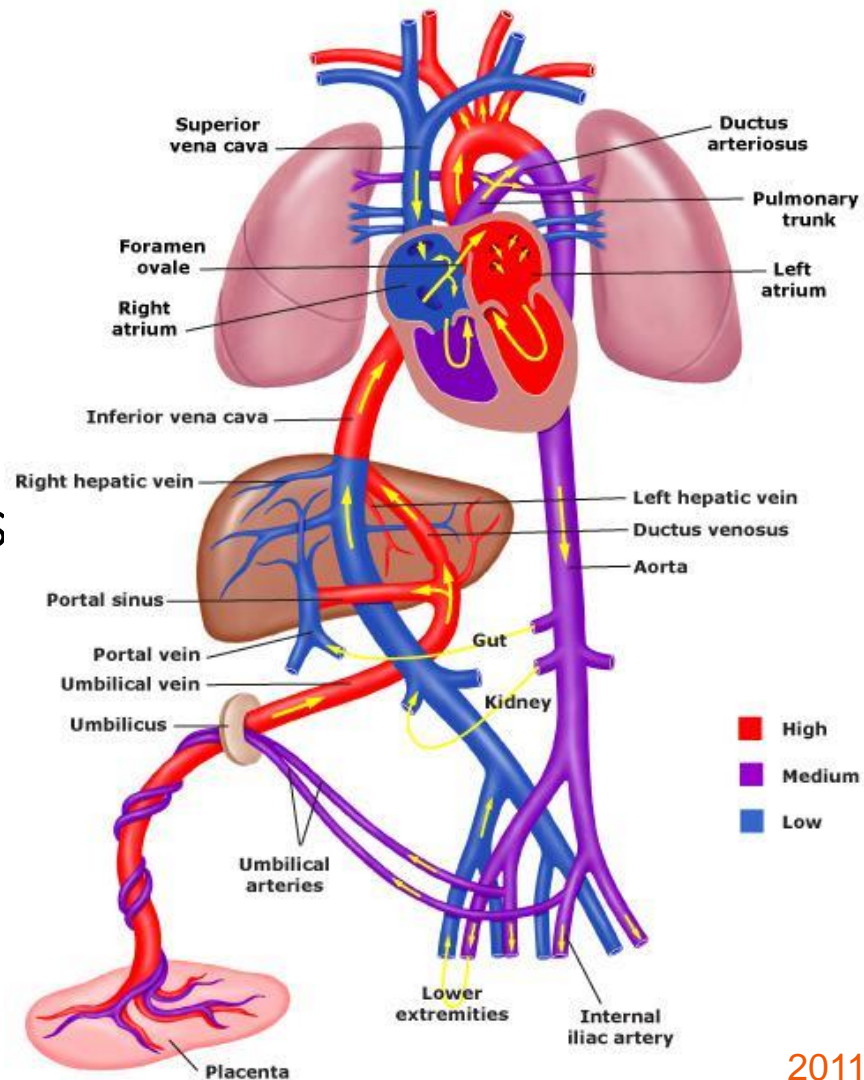
- Right-to-left shunts
  - Foramen ovale
  - Ductus arteriosus



# PHYSIOLOGY

## Fetal Circulation

- From the SVC and IVC...
  - Minimal mixing with oxygenated blood...
  - Right atrium to right ventricle...
  - Shunted through ductus arteriosus...
  - Into distal aorta

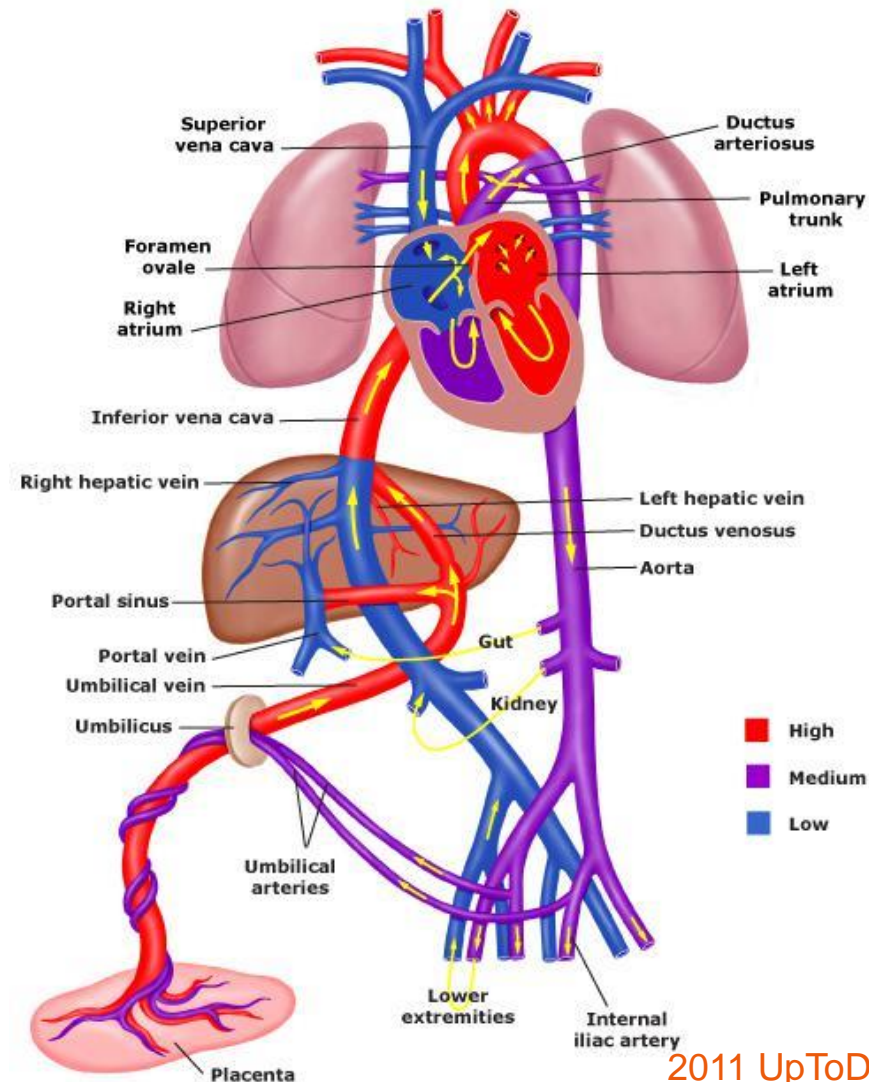




# PHYSIOLOGY

## Fetal Oxygenation

- Adequate tissue oxygenation secondary to:
  - Fetal hemoglobin
  - Decreased fetal oxygen consumption
  - Differential blood flow



# PHYSIOLOGY

## Fetal Circulation

- From the placenta...
  - Oxygenated blood...
  - Ductus venosus into IVC...
  - Right atrium...
  - Shunted thru foramen ovale...
  - Into left atrium

