

NEONATAL PATHOLOGY

Raj Kapur

HANDOUT

LECTURE

TEST

CASE 1: (3-week-old infant)

A 900-gram male infant was delivered precipitously at an estimated gestational age of 28 weeks. He had respiratory distress, but was stabilized by intubation and positive-pressure ventilation.

CASE 1

1. The baby is
 - a. low birth weight.
 - b. small for gestational age.
 - c. appropriate for gestational age.
 - d. very low birth weight.
 - e. premature.

TERMINOLOGY

Birth weight (regardless of gestational age)
Low birth weight (1500 - 2500 g)
Very low birth weight (< 1500 g)

Appropriate for gestational age (AGA) vs.
Small for gestational age (SGA)

Intrauterine growth restriction (IUGR) =
small for gestational age

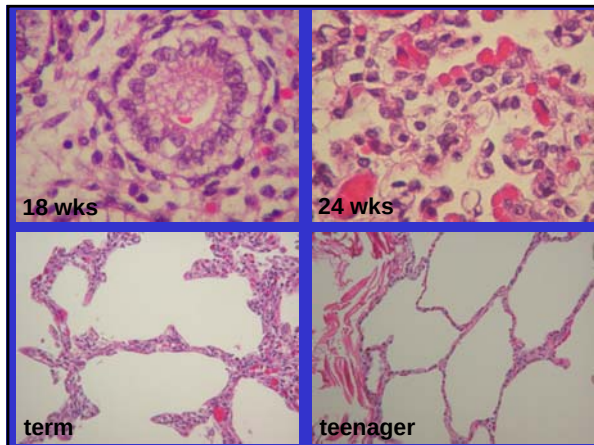
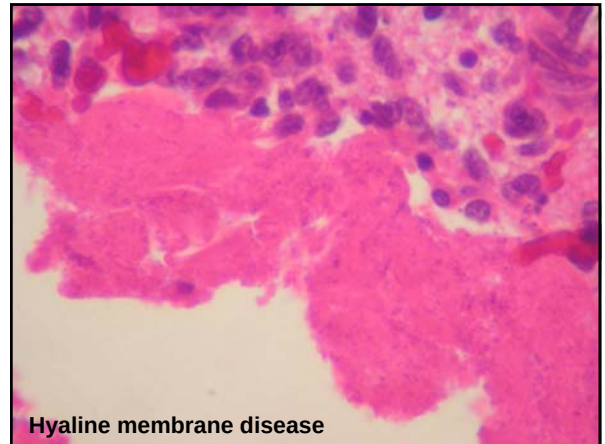
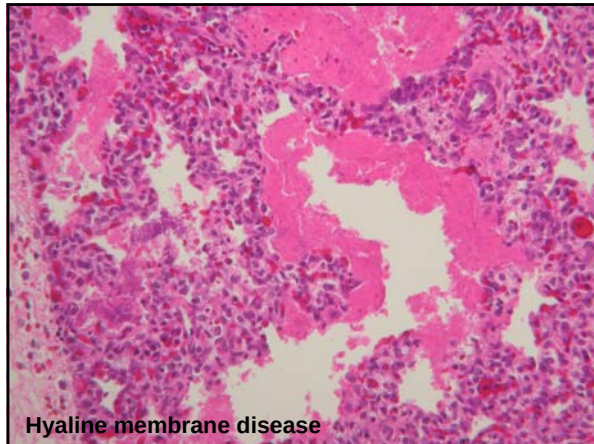
CASE 1

1. The baby is
 - a. low birth weight.
 - b. small for gestational age.
 - c. appropriate for gestational age.
 - d. very low birth weight.
 - e. premature.

CASE 1

2. Because he was so premature, he is at increased risk to develop
 - a. hyaline membrane disease.
 - b. bronchopulmonary dysplasia.
 - c. intracerebral hemorrhage.
 - d. periventricular leukomalacia.
 - e. necrotizing enterocolitis.

Answer: All of the above



Complications of Prematurity: Periventricular Leukomalacia

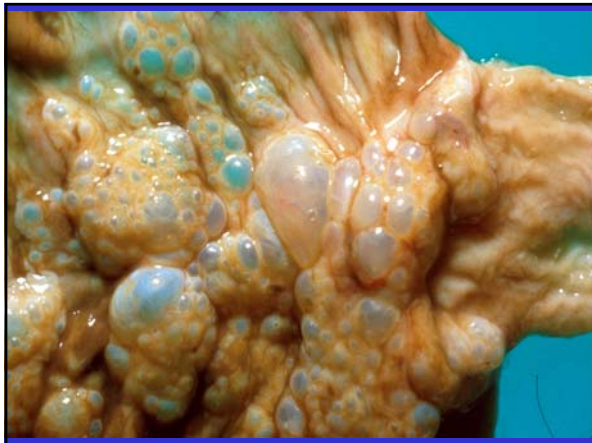


30 wk premature infant

Persistent abdominal
distension

Sudden unanticipated
decompensation on day 22
of life, discolored abdomen

Death within hours



CASE 2: (12-day-old)

A 1200-gram infant
was delivered at an
estimated gestational
age of 37.5 weeks.



CASE 2

1. The baby is
 - a. growth restricted.
 - b. small for gestational age.
 - c. low birth weight.
 - d. very low birth weight.
 - e. premature.

CASE 2

1. The baby is
 - a. growth restricted.
 - b. small for gestational age.
 - c. low birth weight.
 - d. very low birth weight.
 - e. premature.

What restricts fetal growth?

Insufficient metabolites

- maternal supply
- villous exchange
- fetal circulation

Primary metabolic disorder



SOURCES OF PLACENTAL ISCHEMIA



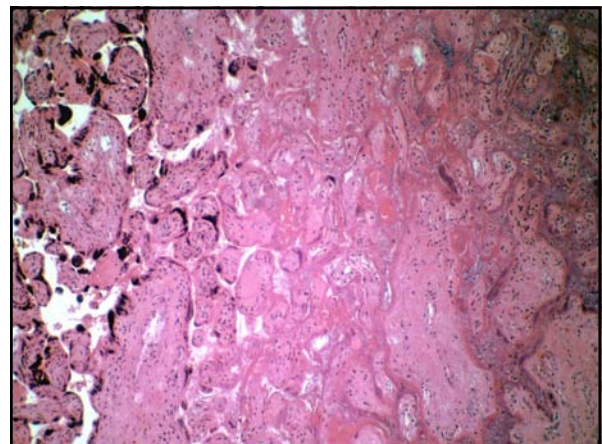
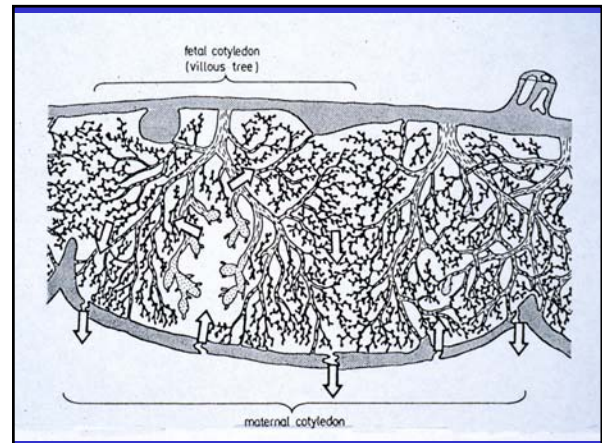
- maternal hypotension / hypoxia
- maternal hypertension
- maternal vascular disease
- placental abruption

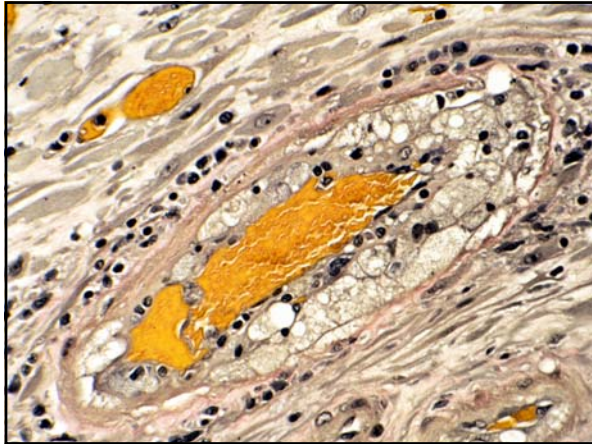
What restricts fetal growth?

Insufficient metabolites

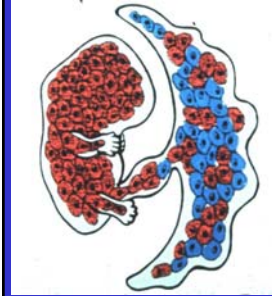
- maternal supply (hypertension, vascular disease)
- villous exchange (placental aneuploidy?)
- fetal circulation (twin-twin transfusion, fetal infection)

Primary metabolic disorder (insulin receptor defect, fetal aneuploidy?, fetal infection)





Causes of Intrauterine Growth Restriction Confined Placental Mosaicism



Discordance between the chromosomal compositions of a fetus and its placenta.

Complications:
Fetal demise
Intrauterine growth restriction
Uniparental disomy in fetus

CASE 3

A 4200-gram infant is delivered by C-section for failure to progress and fetal distress. At birth the infant is hypoglycemic and has a cardiac murmur. The mother received no prenatal care and presented to the emergency room in labor at an estimated gestational age of 38 weeks, based on her last menstrual period.

CASE 3

1. From the history provided, the baby is
 - a. hydropic.
 - b. macrosomic.
 - c. diabetic.
 - d. suffering from a viral infection.

CASE 3

1. From the history provided, the baby is
 - a. hydropic.
 - b. macrosomic.
 - c. diabetic.
 - d. suffering from a viral infection.

What causes a fetus to be too big?

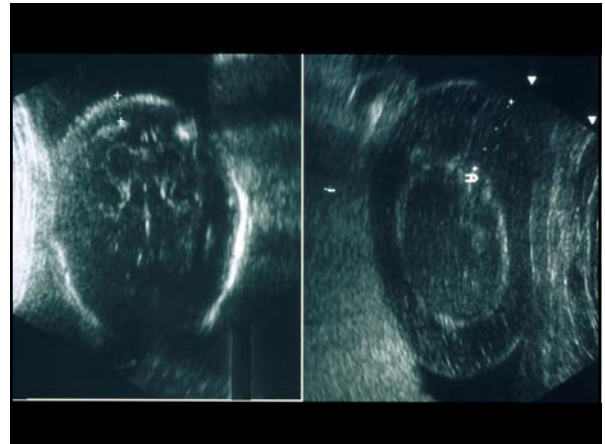
fetal growth factors
- insulin (**maternal diabetes**)
- insulin-like growth factor
(**Beckwith-Wiedemann S.?**)

fluid accumulation / edema

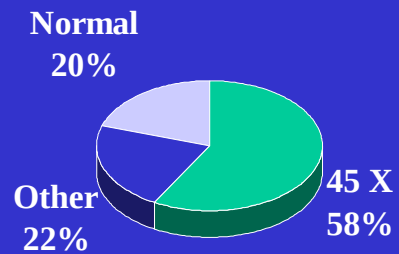


HYDROPS = EDEMA

Mild ← → Severe
 Nuchal Thickening (may be reversible) Anasarca



Cytogenetic Findings with Large Nuchal Cystic Hygroma



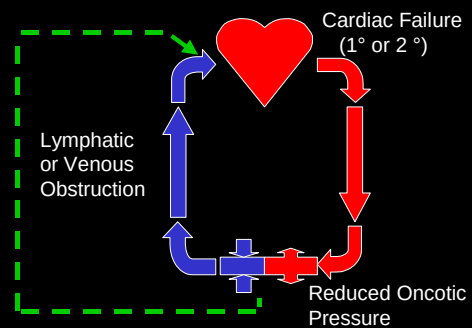
Cohen et al. (1989) *Obstet Gynecol Surv* 44:481-90

Etiologies of Fetal Hydrops



Machin GA (1989) *Am J Med Genet* 34:366 (1414 cases)

The Plumber's Approach to Fetal Hydrops



Pathogenesis of Hydrops Fetalis

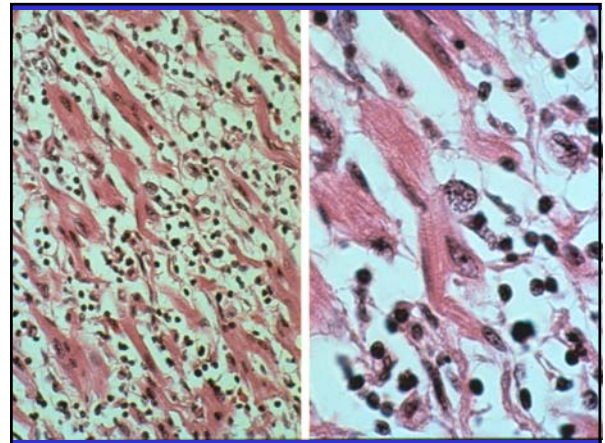
GENERAL MECHANISM ← PROXIMATE CAUSE ← SPECIFIC ETIOLOGY

1. INCREASED VENOUS PRESSURE
2. DEFECTIVE VASCULAR OR LYMPHATIC INTEGRITY
3. DECREASED ONCOTIC PRESSURE



Pathogenesis of Hydrops Fetalis

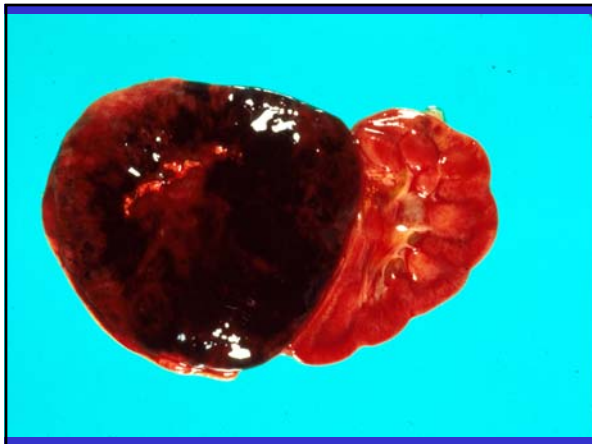
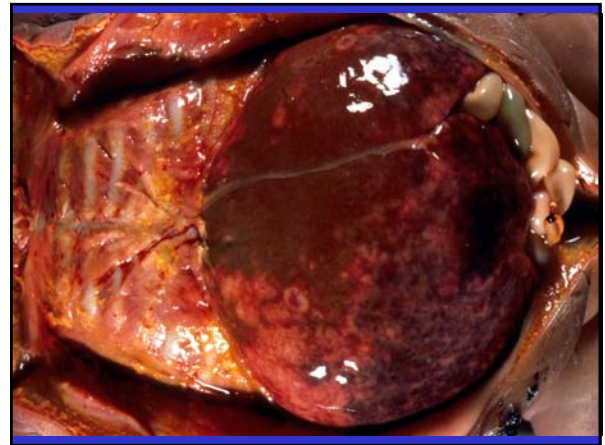
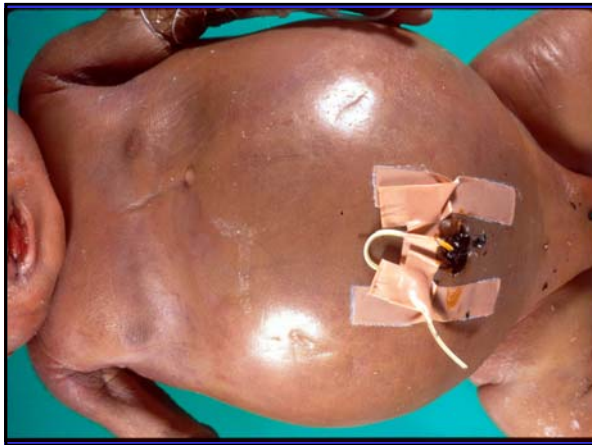
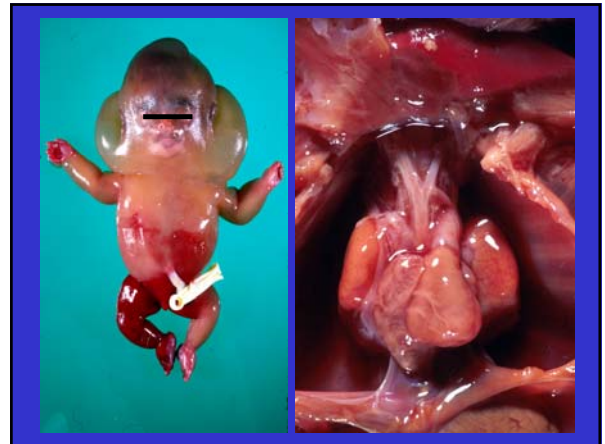
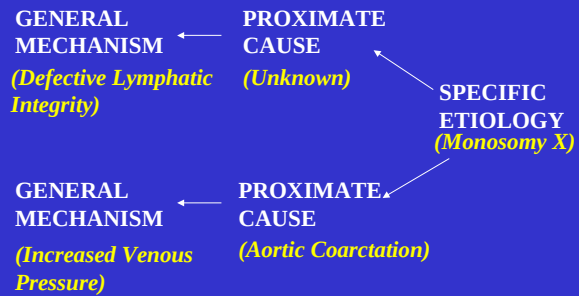
GENERAL MECHANISM	PROXIMATE CAUSE	SPECIFIC ETIOLOGY
Increased venous pressure	Primary cardiac failure	Cardiomyopathy Heart malform. Myocarditis Arrhythmias & Others
	Secondary cardiac failure	Anemia Hypervolemia AV shunt Hypoxia & Others



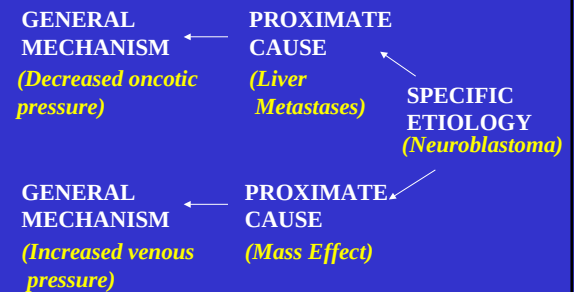
Pathogenesis of Hydrops Fetalis

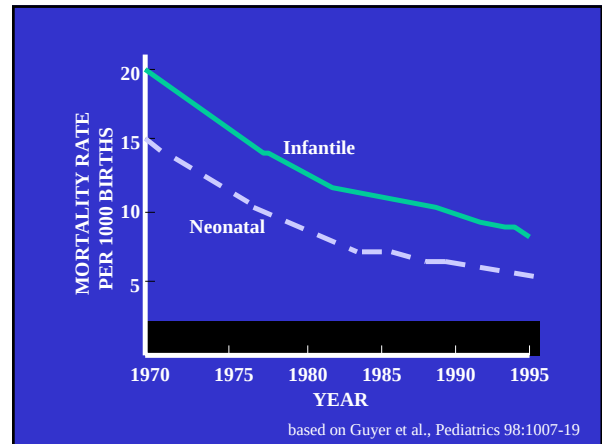
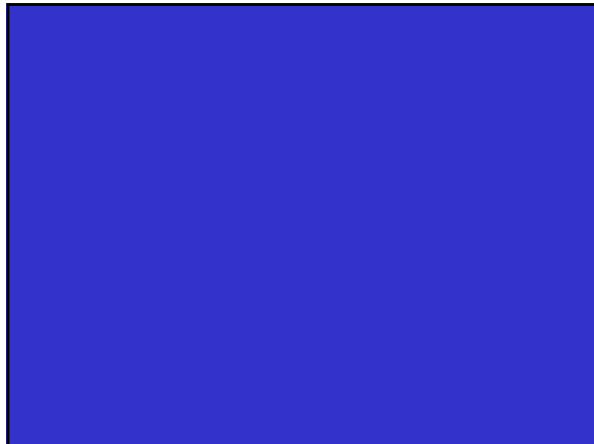
GENERAL MECHANISM	PROXIMATE CAUSE	SPECIFIC ETIOLOGY
Defective vascular or lymphatic integrity	Unknown	? chromosomal disorders
Decreased oncotic pressure	Proteinuria	Glomerulopathy

Pathogenesis of Hydrops Fetalis



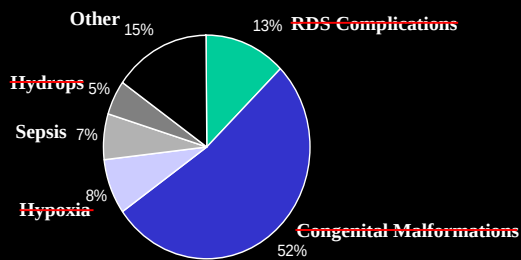
Pathogenesis of Hydrops Fetalis





Causes of Neonatal Mortality (1982-91)

(Maine Medical Center; birth weight > 1000 gm)



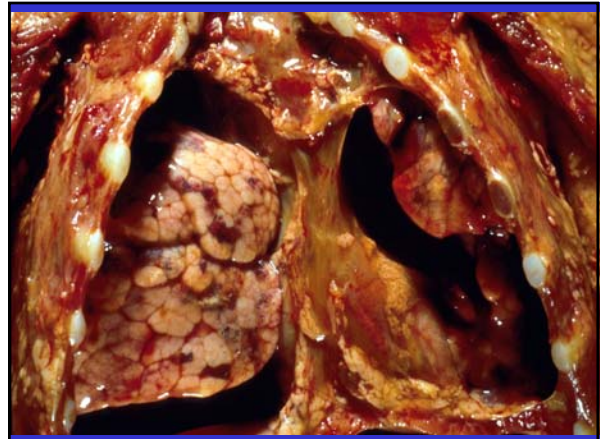
CASE 4: 1-day-old infant

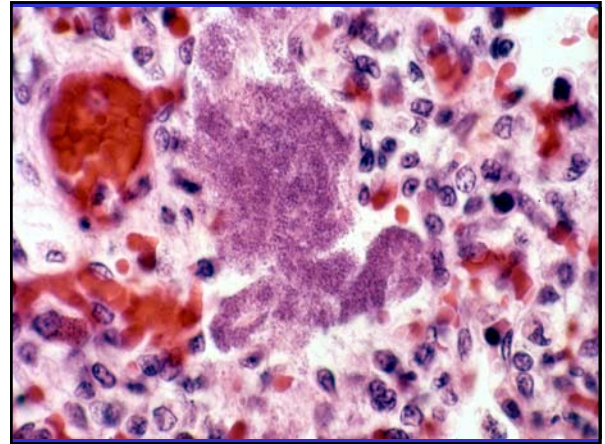
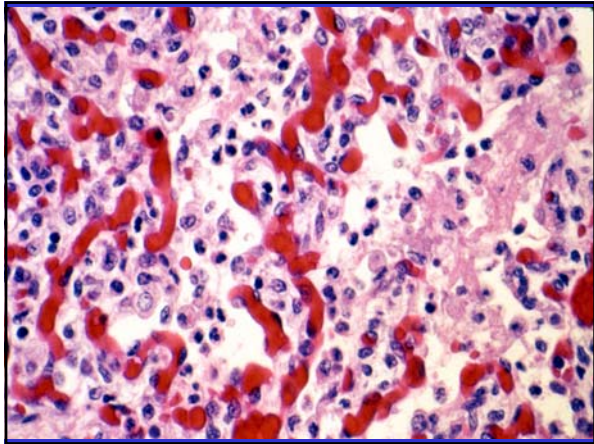
An infant was delivered at 34 weeks after spontaneous premature rupture of membranes. The mother was asymptomatic. The baby was fine initially, but developed respiratory distress and fever one hour after birth. She was intubated, but her condition deteriorated rapidly and she died in less than 24 hours.

CASE 4

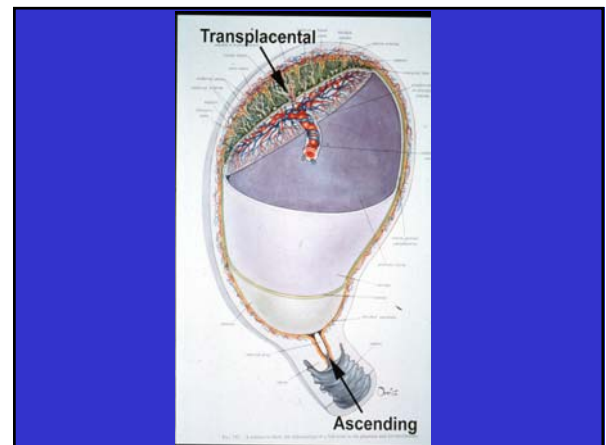
1. What causes an apparently normal newborn to deteriorate so quickly?
 - a. Congenital heart disease
 - b. Congenital infection
 - c. Metabolic disorder

Answer: Any of the above



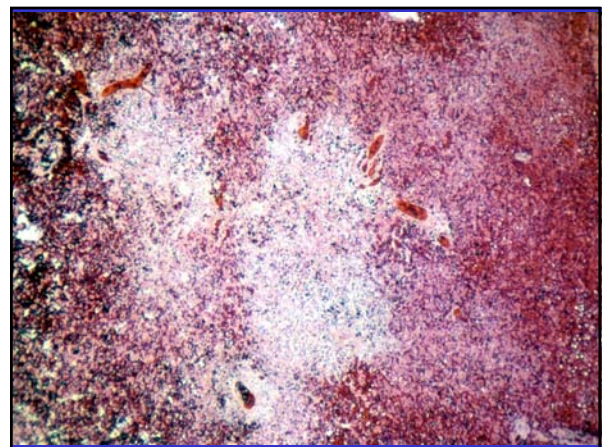
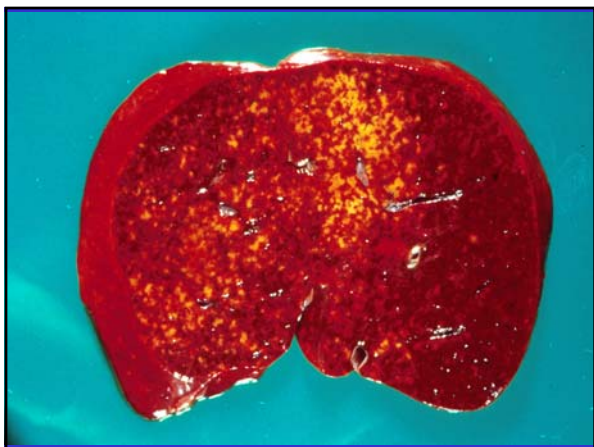
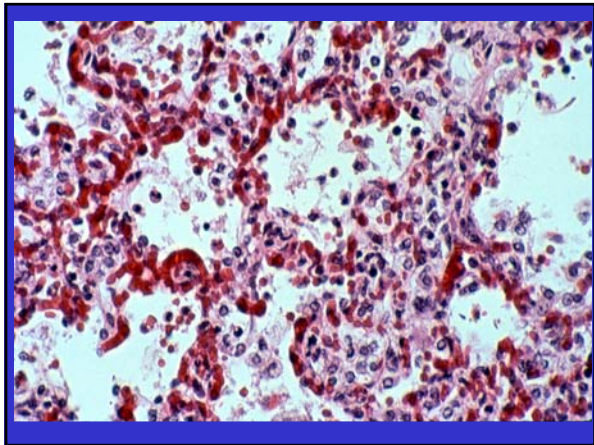
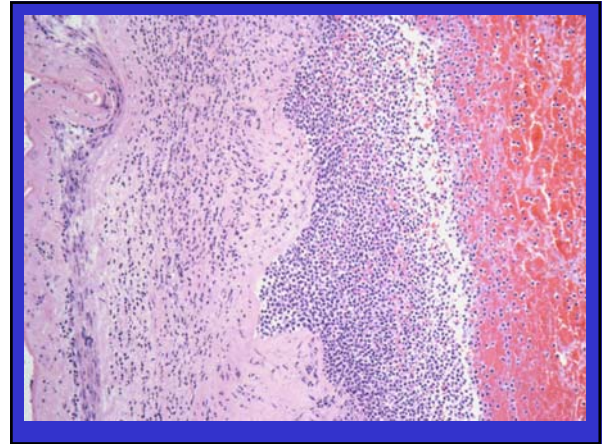
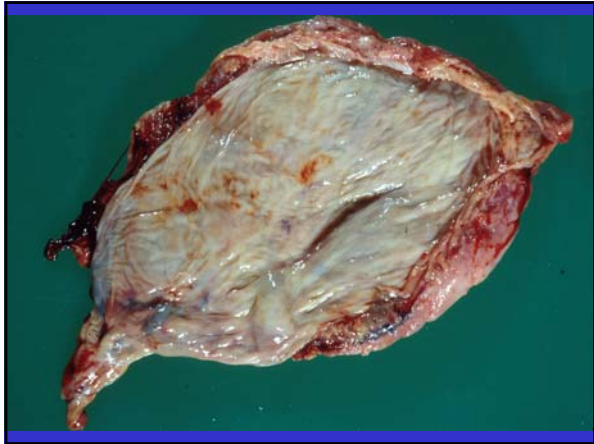


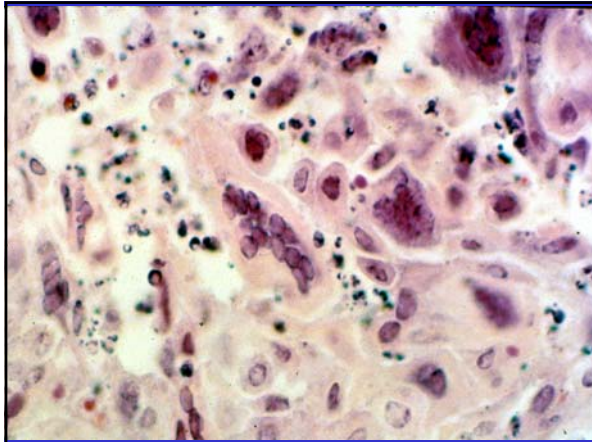
ORGANISM	
Route: transplacental versus ascending	Outcome:
Transmission:	
Fetal disease:	Pathology:



GROUP B STREPTOCOCCI	
Route: transplacental versus ascending	Outcome:
Transmission: risk of fetal infection if mother is infected	
Fetal disease: risk of fetal disease if fetus is infected	Pathology:

GROUP B STREPTOCOCCI	
Route: "ascending" (20-30% carrier rate)	Outcome: Early (< 7 d; 80%) pneumonia, sepsis, meningitis, shock Late (7 d - 3 mos, 20%) meningitis
Transmission 1° Infection: 30-70% 2° Infection: same	
Fetal disease: 1-2% of infected fetuses	Pathology: Non-specific pneumonitis, meningitis, chorioamnionitis Organisms in gram stain / culture





HERPES SIMPLEX

Route: "ascending"
(rarely transplacental)

Transmission
1° Infection: 33 - 50%
Reactivation: <1 - 5%

Fetal disease: Common
(not obvious at birth)

Outcome:
Localized (skin-20%,
CNS-30%)
Disseminated (50%,
TORCH syndrome)

Pathology:
Intranuclear inclusions
Multinucleate cells
Tzanck smear

TORCH SYNDROME

Intrauterine growth
restriction

Hepatosplenomegaly with
jaundice

Hemolytic anemia +/-
hydrops

CNS abnormalities:
microcephaly
hydrocephalus
intracranial calcifications
meningoencephalitis

Pneumonitis

Thrombocytopenia with petechia

Extramedullary hematopoiesis
("blueberry muffin" baby)

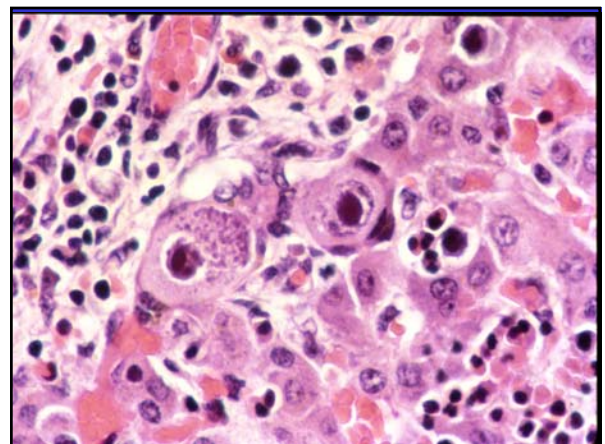
"Celery-stalk" bone lesions

Eye abnormalities:
chorioretinitis
keratoconjunctivitis
cataracts
glaucoma

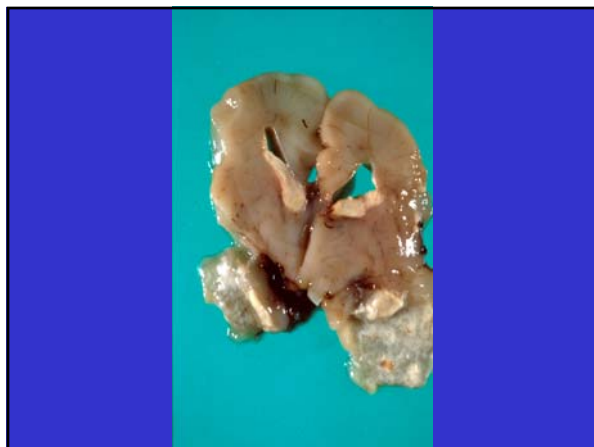
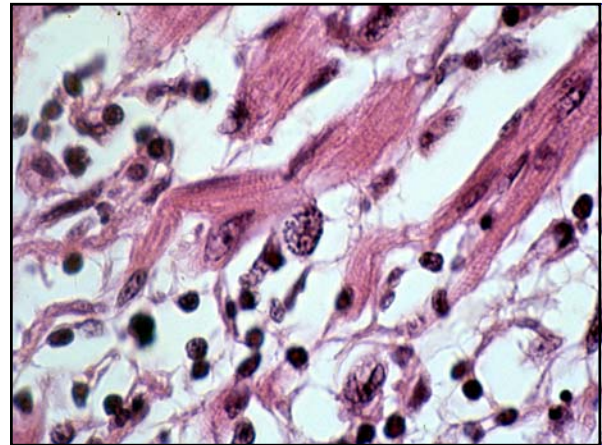
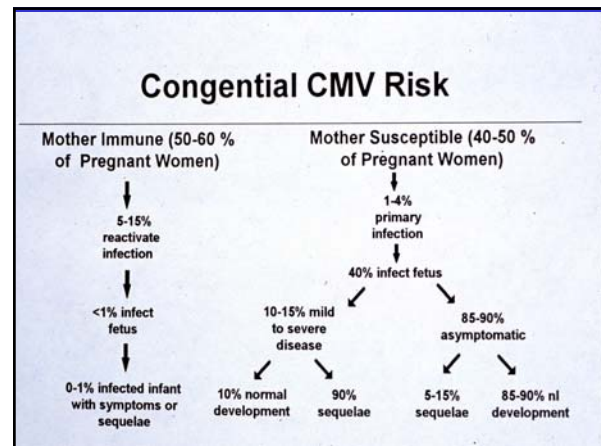
Myocarditis

CASE 5: 2-day-old infant

An infant was delivered at term after an uncomplicated pregnancy. The mother was asymptomatic. At birth, the baby was edematous, had multiple skin lesions, and severe respiratory distress. Cranial ultrasound examination revealed multiple calcifications. He developed multiorgan failure and died despite aggressive therapy.

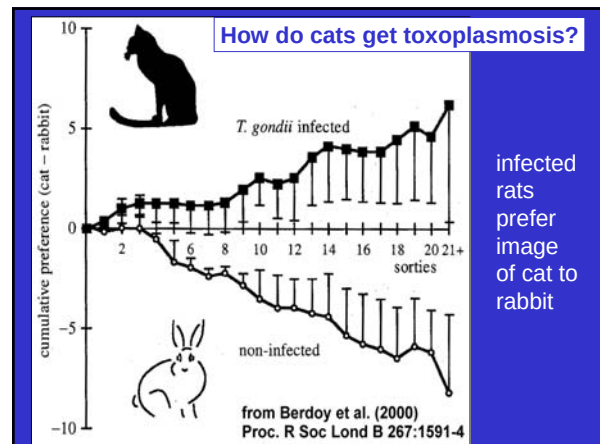


CYTOMEGALOVIRUS	
Route: Transplacental	Outcome (w/ fetal symptoms): Normal (10%) Sequelae (90%) TORCH syndrome
Transmission 1° Infection: 40% 2° Infection: <1%	
Fetal disease: 10 - 15%	Pathology: Intranuclear and cytoplasmic inclusions CNS calcifications



TOXOPLASMA GONDII

Route: Transplacental	Outcome: Spont. abortion Severe neonatal onset Delayed neurological TORCH syndrome
Transmission 1° Infection: 33 - 66% Reactivation: Never	
Fetal disease: Common (particularly with infection before 6 mos)	Pathology: chorioretinitis, hydrocephalus, CNS calcifications, myocarditis



Rubella Virus

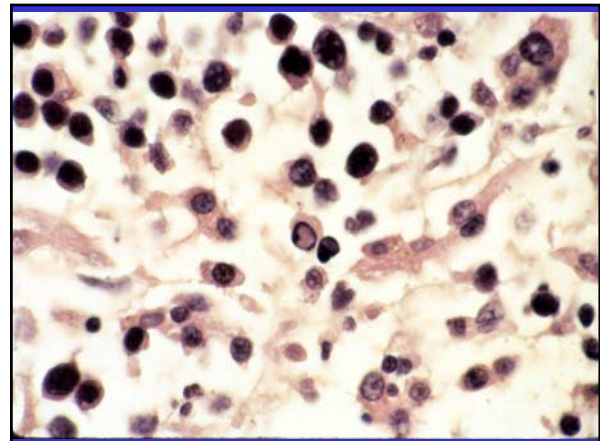
Route: Transplacental	Outcome: Spont. abortion Severe neonatal onset Delayed neurological TORCH syndrome
Transmission 1° Infection: High 2° Infection: Never	
Fetal disease: Common (particularly with infection before 3 mos)	Pathology: patent ductus arteriosus, cataracts, deafness

TREPONEMA PALLIDUM

Route: Transplacental	Outcome: Stillbirth Disseminated neonatal TORCH syndrome
Transmission 1° Infection: ~ 100% 2° Infection: ~ 100%	
Fetal disease: Common (particularly after 5th mos.)	Pathology: Spirochetes (Silver stain) Plasma cell infiltrates Saddle-nose, saber-shins, Hutchinson's teeth

PARVOVIRUS B19

Route: Transplacental	Outcome: Severe anemia and hydrops
Transmission 1° Infection: > 50% 2° Infection: Never	
Fetal disease: 25-33%	Pathology: Intranuclear inclusions in erythroid precursors Cardiomyopathy



Human Immunodeficiency Virus

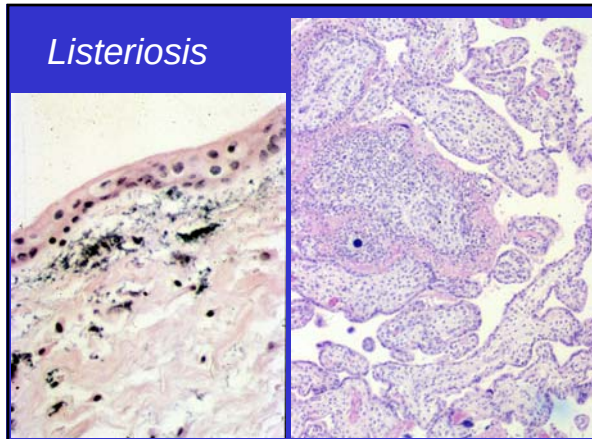
Route: Perinatal >> Transplacental or Lactational	Outcome: Late manifestations of AIDS
Transmission 1° Infection: 10-40%	
Fetal disease: No symptoms until after birth	Pathology: AIDS

Listeria Monocytogenes

Route: Transplacental> ascending (unpasteurized dairy products)	Outcome: Intrauterine death OR Meningoencephalitis, septicemia, endocarditis
Transmission 1° or 2° Infection: Frequent	Neonatal fatality rate = 50% (early worse than late)
Fetal disease: Common	Pathology: Purulent abscesses (some granulomatous) with gram positive coccobacilli



Listeriosis



Listeriosis

