Ill - appeared neonate
Sepsis , TORCH

Five days old preterm neonate presented with reluctant to feed & irritability of two days duration.
Prenatally there was ruptured membrane since 36 hr.
On exam. baby looks irritable with poor activity, weak primitive reflexes & body temp. 35.8Ċ ,body wt 1.850 kg.

Risk factors for vertically acquired bacterial sepsis

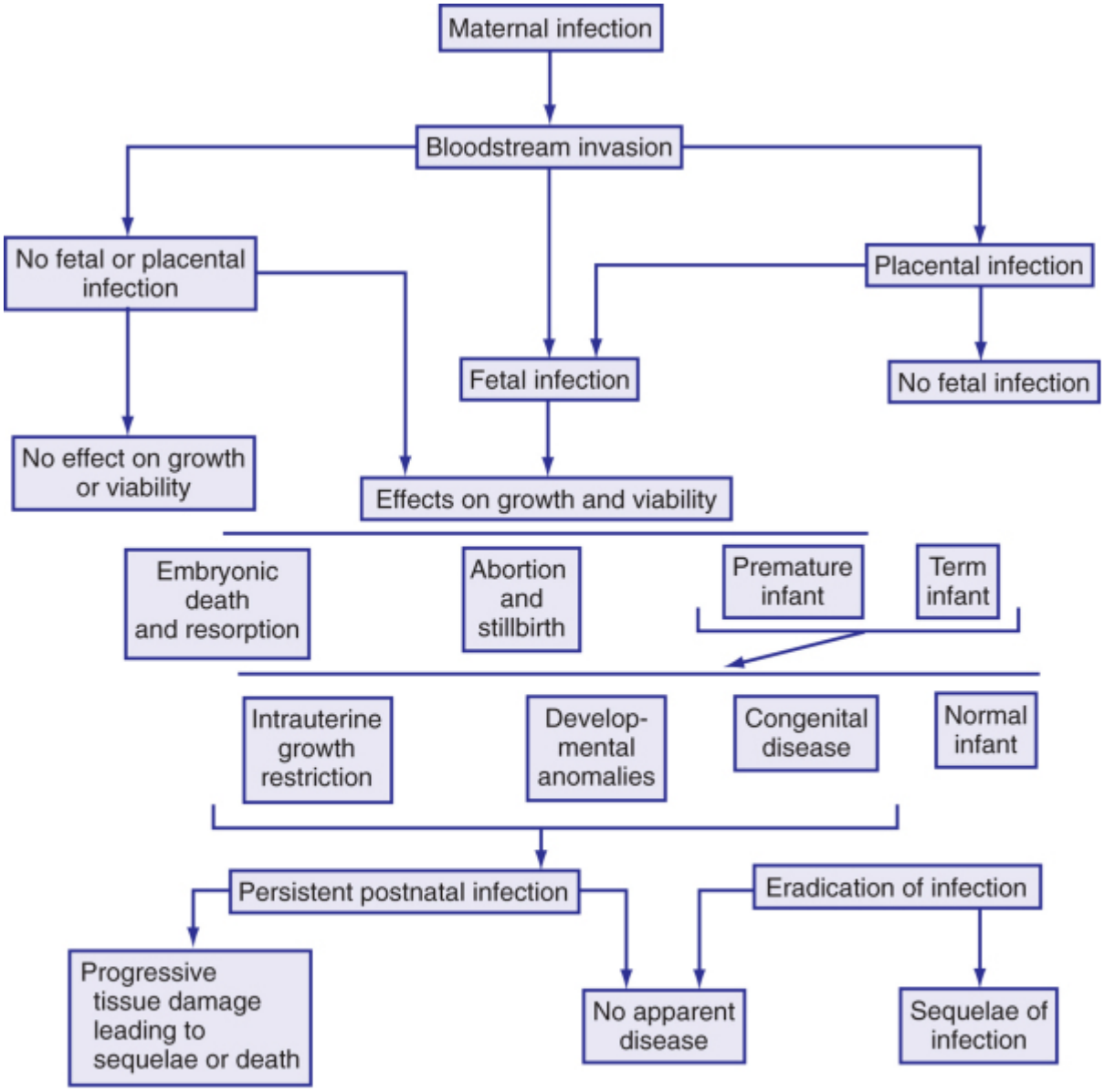
- Preterm rupture of membranes
- Prolonged rupture of membranes (>12–24 h)
- Maternal fever (>38°C or other signs of chorioamnionitis, e.g. WBC > 15 × 10^9/l)
- Maternal colonization with GBS
- Fetal tachycardia
- Lack of intrapartum antibiotics in the presence of above risk factors
- Foul-smelling amniotic fluid
- Preterm birth/low birthweight
- Twin pregnancy
- Low Apgar scores

Risk factors for nosocomial sepsis

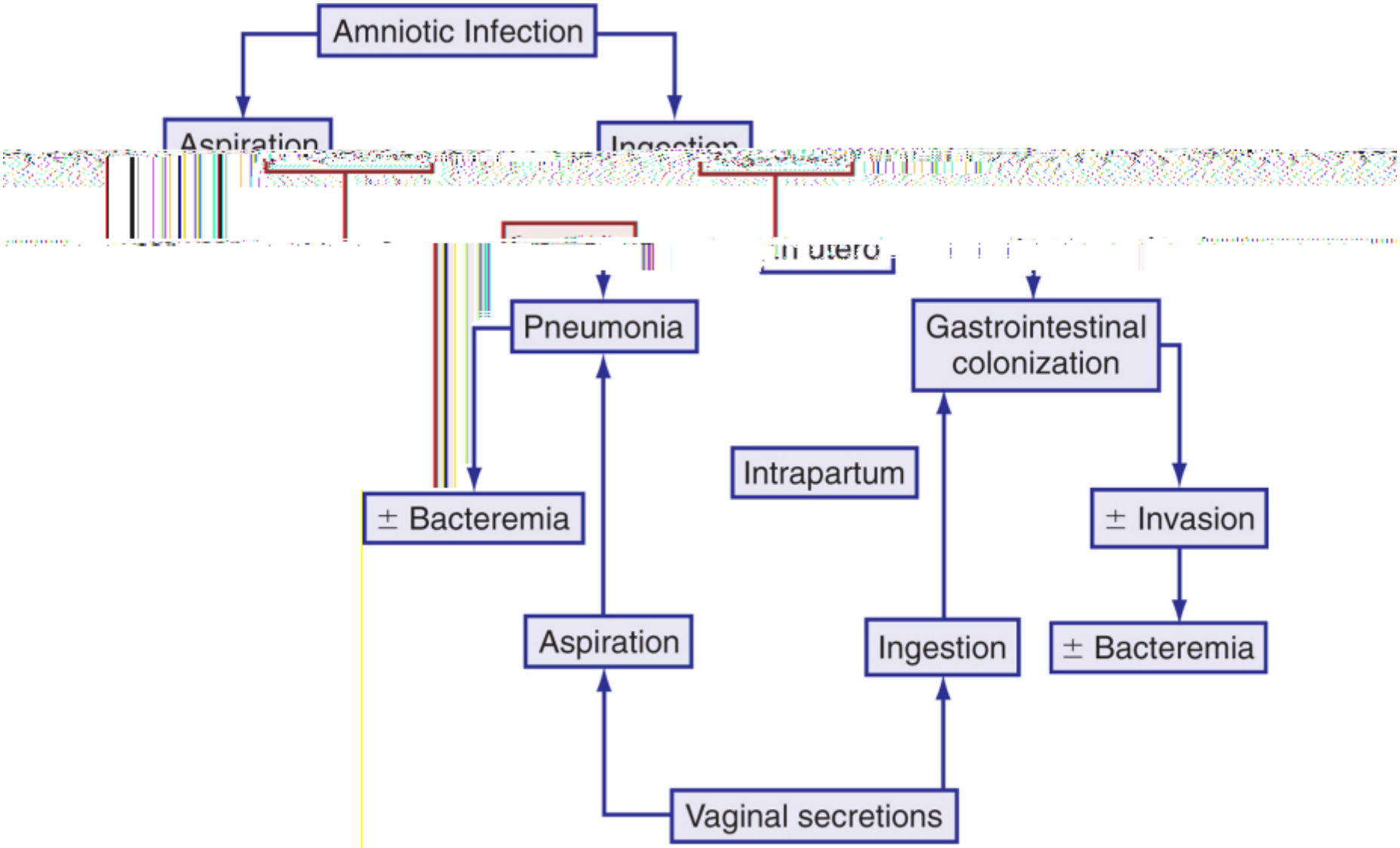
- Prematurity/low birthweight
- SGA infants
- Neutropenia
- Indwelling catheters
- TPN
- Surgery

Neonatal infections (NNI)

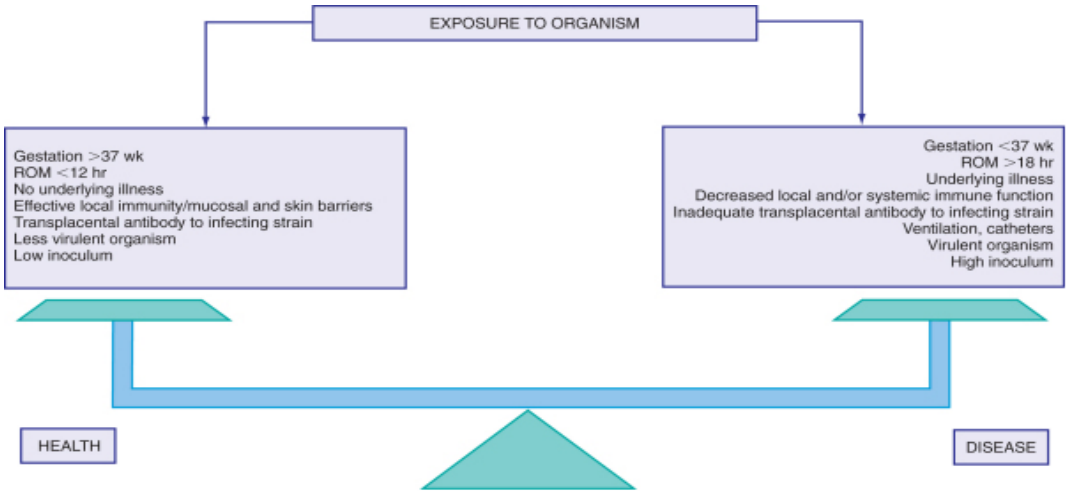
(1) Infectious agents can be transmitted from the mother to the fetus or NN by diverse modes.
(2) NN are less capable of responding to infection because of 1 or more immunologic deficiencies.
(3) Coexisting conditions complicate the Dx & Mx of NNI.
(4) The C P of NNI vary & include subclinical infection, mild to severe manifestations of focal or systemic infection, & rarely, cong. syndromes resulting from in utero infection.
(5) Maternal infection that is the source of transplacental fetal infection is undiagnosed during pregnancy because the mother was either asymptomatic or had nonspecific S &S*.
(6) Etiologic agents infect the NN , including bacteria, viruses, fungi, protozoa, & mycoplasmas.
(7) Immature, (VLBW) NN have improved survival but remain in the hospital for a long time in an environment that puts them at risk for acquired infections.



Pathogenesis of hematogenous transplacental infections



Pathways of ascending or intrapartum infection



Factors influencing the balance between health and disease in neonates exposed to a potential pathogen.

BACTERIA	EARLY ONSET	LATE ONSET, MATERNAL ORIGIN	LATE ONSET, NOSOCOMIAL	LATE ONSET, COMMUNITY
GRAM POSITIVE				
Clostridia	+		+	
Enterococci	+		++	
Group B streptococcus	+++	+	+	+
Listeria monocytogenes	+	+		
Other streptococci	++			+
Staphylococcus aureus	+		++	+
Staphylococcus, coagulase negative	+		+++	
Streptococcus pneumoniae	+			++
Viridans streptococcus	+		++	
GRAM NEGATIVE				
Bacteroides	+		+	
Campylobacter	+			
Citrobacter			+	+
Enterobacter			+	
Escherichia coli	+++		+	++
Haemophilus influenzae	+			+
Klebsiella			+	
Neisseria gonorrhoeae	+			
Neisseria meningitidis	+		+	
Proteus			+	
Pseudomonas			+	
Salmonella		+		+
Serratia			+	
OTHERS				
Treponema pallidum	+	+		
Mycobacterium tuberculosis		+		

TRANSPLACENTAL	PERINATAL	POSTNATAL
CMV	Anerobic bacteria	Adenvirus
HSV	Chlamydia	Candida spp.
Mycobacterium Tuberculosis	Enteric Bacteria	Coagulase Neg. Staphyloccoci
Rubella virus	GBS	CMV
T. Pallidum	H. influenzae	Echovirus
VZV	HSV	Enteric bacteria
	L. monocytogenes	Influenza virus ,A, B
	Mycoplasma	Parainfluenza
		Pseudomonas
		RSV ,staphylococcus Aureus
		Mycobacterium Tuberculosis

Etiologic Agents of Neonatal Pneumonia According to Timing of Acquisition

Neonatal Infection by Age of Onset

CHARACTERISTICS	EARLY ONSET	LATE ONSET	LATE, LATE (NOSOCOMIAL) ONSET
Age at onset	Birth to 7 days usually <72 hr	7 to 30 days	>30 days
Maternal obstetric complications	Common	Uncommon	Varies
Prematurity	Frequent	Varies	Usual
Organism source	Maternal genital tract	Maternal genital tract/environment	Environment/community
Manifestation	Multisystem	Multisystem or focal	Multisystem or focal
Site	Normal nursery, NICU, community	NICU, community	NICU, community

Clinical features of neonatal sepsis

Fever or temperature instability or hypothermia
Poor feeding
Vomiting
Apnea and bradycardia
Respiratory distress
Abdominal distension
Jaundice
Neutropenia
Hypo-/hyperglycaemia
Shock
Irritability
Seizures
Lethargy, drowsiness
In meningitis:
Tense or bulging fontanelle
Head retraction (opisthotonos)

The acronym *TORCH* refers to toxoplasmosis, other agents (syphilis, etc.), rubella, CMV, and HSV. the TORCH battery of serologic tests has a poor diagnostic yield, and appropriate specific diagnostic studies should be selected for each etiologic agent under consideration.

CMV & HSV require culture or (PCR) methods, whereas syphilis, toxoplasmosis, & rubella are diagnosed by *specific serologic methods*

Clinical Manifestations of Transplacental Infections

MANIFESTATION	PATHOGEN
Intrauterine Growth Restriction	CMV, Plasmodium, rubella, toxoplasmosis, Treponema pallidum, VZV
Congenital Anatomic Defects	
Cataracts	**Rubella**
Heart defects	**Rubella**
Hydrocephalus	HSV, lymphocytic choriomeningitis virus, rubella, toxoplasmosis
Intracranial calcification	**CMV, HIV, toxoplasmosis,**
Limb hypoplasia	VZV
Microcephaly	**CMV, HSV, rubella, toxoplasmosis**
Microphthalmos	**CMV, rubella, toxoplasmosis**
Neonatal Organ Involvement	
Anemia	CMV, parvovirus, Plasmodium, rubella, toxoplasmosis, T. pallidum
Carditis	Coxsackieviruses, rubella,
Encephalitis	CMV, enteroviruses, HSV, rubella, toxoplasmosis, T. cruzi, T. pallidum
Hepatitis	CMV, enteroviruses, HSV
Hepatosplenomegaly	**CMV, enteroviruses, HIV, HSV, Plasmodium, rubella, T. pallidum**
Hydrops	Parvovirus, T. pallidum, toxoplasmosis
Lymphadenopathy	CMV, HIV, rubella, toxoplasmosis, T. pallidum
Osteitis	Rubella, T. pallidum
Petechiae, purpura	**CMV, enteroviruses, rubella,**
Pneumonitis	CMV, enteroviruses, HSV, measles, rubella, toxoplasmosis, T. pallidum, VZV
Retinitis	CMV, HSV, lymphocytic choriomeningitis virus, rubella, toxoplasmosis, T. pallidum, West Nile virus
Rhinitis	Enteroviruses, T. pallidum
Skin lesions	Entroviruses, HSV, measles, rubella, T. pallidum, VZV
Thrombocytopenia	CMV, enteroviruses, HIV, HSV, rubella, toxoplasmosis, T. pallidum

Late Sequelae

Convulsions -CMV, enteroviruses, rubella, toxoplasmosis

Deafness -CMV, rubella, toxoplasmosis

Dental/skeletal -Rubella, *T. pallidum*

Endocrinopathies -Rubella, toxoplasmosis

Eye pathology -HSV, rubella, toxoplasmosis, *T. pallidum.* VZV

Hepatitis -Hepatitis B

Mental retardation -CMV, HIV, HSV, rubella, toxoplasmosis, VZV

Nephrotic syndrome -*Plasmodium, T. pallidum*

Evaluation of pts thought to have a congenital infection

*isolate the organism by culture (for rubella, CMV, HSV, gonorrhea, & *M. tuberculosis*),
*identify the Ag of the pathogen (for hepatitis B & *C. trachomatis*).
* identify the pathogen's genome with PCR &to identify specific fetal production of Ab (IgM or ↑ titer of IgG for *Toxoplasma,* syphilis, parvovirus, HIV,

Evidence of Infection

Culture from a normally sterile site (blood, CSF, other)

Demonstration of a M.O in tissue or fluid

Ag detection (urine, CSF)

Maternal or NN serology (syphilis, toxoplasmosis)

Autopsy

Evidence of Inflammation

Leukocytosis, ↑ immature/total neutrophil count ratio

Acute-phase reactants: CRP, ESR Cytokines:interleukin 6

Pleocytosis in CSF or synovial or pleural fluid

DIC : fibrin split products

Evidence of Multi-organ System Disease

Metabolic acidosis: pH, P_{CO_2}

Pulmonary function: PO_2, P_{CO_2}

Renal function: BUN , creatinine

Hepatic injury/function : bilirubin, ALT, AST

NH_3, PT, PTT

Bone marrow function: neutropenia, anemia, thrombocytopenia

Treatment

Once the pathogen has been identified & antibiotic sensitivities determined, the most appropriate drug or drugs should be selected.

For most gram-negative enteric bacteria, Ampicillin & an Aminoglycoside or a 3rd-generation cephalosporin (cefotaxime or ceftazidime) should be used.

Enterococci should be treated with both a penicillin (Ampicillin or piperacillin) & an aminoglycoside because the synergy of both drugs is needed. Ampicillin alone is adequate for *L. monocytogenes*,

and penicillin suffices for GBS.

Clindamycin or metronidazole is appropriate for anaerobic infections

Meningitis caused by GBS usually responds within 24–48 hr & should be treated for 14–21 days.

Gram-negative bacilli may continue to grow from repeated CSF samples for 72–96 hr after therapy despite the use of appropriate antibiotics.

Treatment of gram-negative meningitis *should be continued for 21 days or for at least 14 days after sterilization of the CSF, whichever is longer.*

By the end of this presentation you should be able to :

-Identify the concept of NN sepsis

-Describe the risk factors for NN sepsis

-Explain the types of NN sepsis according to the onset

-Identify the different etiologies

-Discuss the clinical approach to NN sepsis

-Describe the sepsis(infectious) screen

- Outline the treatment