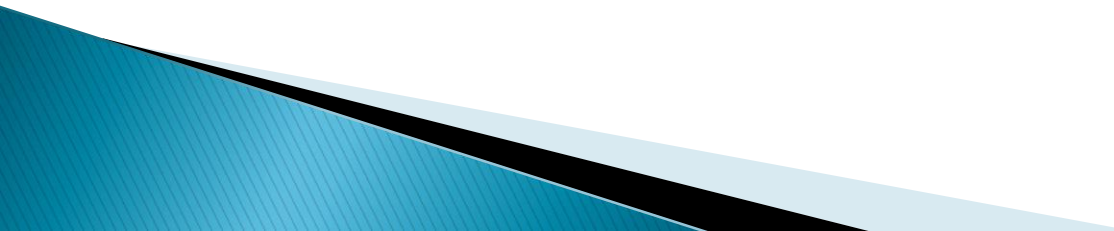


# Neonatal Sepsis

Dr. Zsuzsanna Horváth

# CASE 1.

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- ▶ Uncomplicated pregnancy – prenatal records are not available
  - ▶ 36-week gestation
  - ▶ 20 hours after membrane rupture
  - ▶ Vaginal birth
  - ▶ Birth weight: 2,9 kg
  - ▶ Apgar score 8/10
  - ▶ Good breastfeeding
- 

# CASE 1.

---

- ▶ 10 hours of age
- ▶ Symptoms:
  - breathing hard
  - Refusing to breast-feed

# CASE 1.

---

## ► Physical examination:

- Pale skin
- Cyanosis in extremities, around mouth
- Temperature: 35.8 °C
- Respiratory rate: 60/ min
- Grunting
- Blood pressure: 75/50 Hgmm
- Heart rate: 170/min
- CRT: 3 sec

### Differential diagnosis

- Respiratory distress
- Cardiac disease
- Infection/Sepsis

# CASE 1.

## ▶ CBC:

- WBC: 2500 /microL
- neu: 2000 /microL **80%**
- HGB: 15.0 g/dl
- PLT: 150,000/microL

▶ CRP: **147** mg/l

▶ PCT: **1,3** ng/ml

## Normal ranges

### Newborn:

- 9–20,000 >
- 25–65 % <
- 13.0–20.0 >
- 100–250,000 <

### Older child:

- 8–12,000
- 35–70 %
- 10.0–13.0
- 150–400,000

## Diagnosis:

- Infection/Sepsis

# CASE 1. – What's next?

---

- ✓ Blood cultures →
- ✓ Culture of ear, umbilical region
- ✓ Culture of stomach lavage
- ✓ Urinalysis
- ✓ Urine culture
- ✓ Lumbar puncture, CSF analysis
- ✓ Chest X-ray →
- ✓ Empirical antibiotic treatment

Group B Streptococcus



# CASE 1.

---

- ▶ Diagnosis: GBS pneumonia (early-onset)
- ▶ Treatment:
  - Septic shock treatment protocol (ABC):
    - Fluid resuscitation
  - Antibiotic treatment (empirical):
    - Ampicillin iv.
    - Gentamycin iv.
    - 14 days

# Neonatal infections cause sepsis

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## ▶ Early-onset sepsis (<48h/7d)

- During delivery and birth
  - E. coli
  - Group B Streptococcus
  - L. monocytogenes

## ▶ Late-onset sepsis (48h/7d–90d)

- After birth, community acquired
  - E. coli
  - GBS
  - S. pneumoniae
  - N. meningitidis
  - H. influenzae b
  - S. aureus

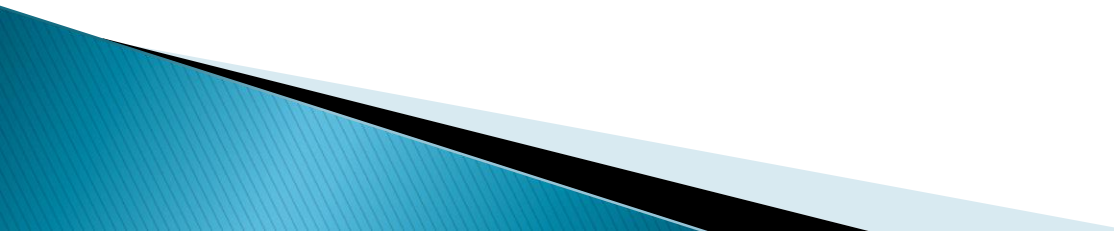
### Viral:

- HSV
- Enteroviruses
- influenza



# Focal infections

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- ▶ Urinary tract infection/ Pyelonephritis
  - ▶ Meningitis
  - ▶ Pneumonia
  - ▶ Skin abscess/ Cellulitis
  - ▶ Otitis media
  - ▶ Omphalitis
  - ▶ Bacterial gastroenteritis
  - ▶ Septic arthritis/ Osteomyelitis
- 

# Symptoms of neonatal infections

<u><b>General:</b></u> <ul style="list-style-type: none"><li>▶Fever, hypothermia</li><li>▶Poor feeding</li><li>▶Lethargy</li><li>▶Ill-appearing</li></ul>	<u><b>Cardiovascular:</b></u> <ul style="list-style-type: none"><li>▶Hypotension</li><li>▶Cyanosis</li><li>▶Pallor, cold skin</li><li>▶Tachycardia, bradycardia</li><li>▶Oliguria</li></ul>
<u><b>Gastrointestinal:</b></u> <ul style="list-style-type: none"><li>▶Abdominal distension</li><li>▶Vomiting</li><li>▶Diarrhea</li><li>▶Hepatomegaly</li></ul>	<u><b>Hematological:</b></u> <ul style="list-style-type: none"><li>▶Petechiae, purpurae</li><li>▶Bleeding</li><li>▶Splenomegaly</li><li>▶Pallor</li><li>▶Icterus</li></ul>
<u><b>Respiratory:</b></u> <ul style="list-style-type: none"><li>▶Dyspnea</li><li>▶Tachypnea</li><li>▶Apnea</li><li>▶Grunting</li></ul>	<u><b>CNS:</b></u> <ul style="list-style-type: none"><li>▶Irritability</li><li>▶Tremor, convulsion</li><li>▶Hyporeflexia, hypotonia</li><li>▶Bulging fontanelle</li></ul>



Source: Adv Neonatal Care © 2004 W.B. Saunders



Source: Adv Neonatal Care © 2004 W.B. Saunders



# Treatment

---

## ▶ Early-onset sepsis (<48h/7d)

### ◦ During delivery and birth

- E. coli
- Group B Streptococcus
- L. monocytogenes

• Ampicillin + Gentamycin  
• Ampicillin + Ceftriaxon

## ▶ Late-onset sepsis (48h/7d–90d)

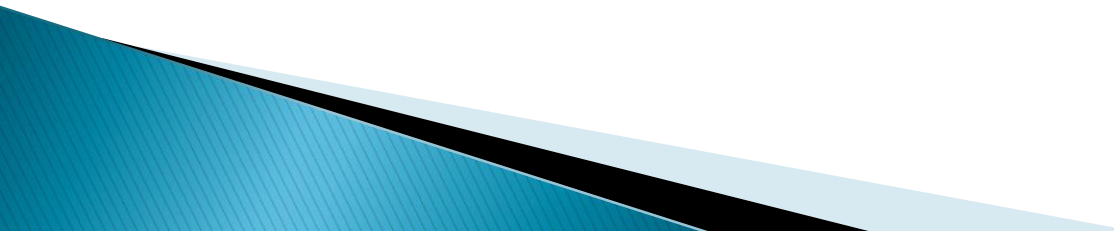
### ◦ After birth, community acquired

- E. coli
- GBS
- S. pneumoniae
- N. meningitidis
- H. influenzae b
- S. aureus

Specific therapy:  
• Gentamycin  
• Ceftriaxon  
• Vancomycin

# CASE 2.

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- ▶ Uncomplicated pregnancy – routine prenatal care
  - ▶ 38-week gestation
  - ▶ Vaginal birth – no complications
  - ▶ Birth weight: 3,89 kg
  - ▶ Apgar score 8/10
  - ▶ Breastfed only
  - ▶ Went home on 3rd day
- 

# CASE 2.

---

- ▶ 5-weeks old
- ▶ Symptoms:
  - 12 hours of fever (38,9 °C)
  - somnolence
  - decreased oral intake



# CASE 2.

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## ► Physical examination:

- 37,5 °C
- Well-appearing
- 2 cm wide, red, indurated patch on forehead (?)



# Fever – definition

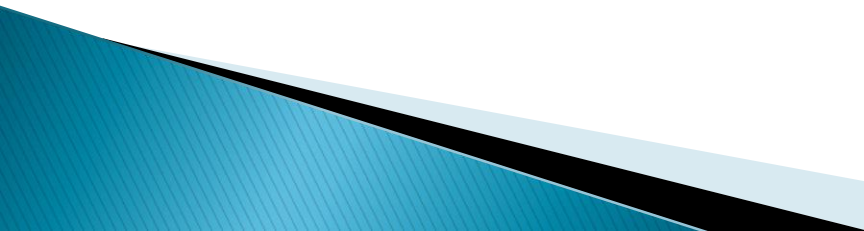
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- ▶ Rectal measurement
- ▶  $>38^{\circ}\text{C}$
- ▶ Temperature instability – esp. Newborns
  - Hypothermia  $<36^{\circ}\text{C}$



# DD – Neonatal fever

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- ▶ Transitional (physiological weight loss after birth)
  - ▶ Immunization <48h
  - ▶ Dehydration
  - ▶ Intraventricular haemorrhage (cerebral fever)
  - ▶ Infection
    - Viral
    - Bacterial
- 

# CASE 2.

## ▶ CBC:

- WBC: 18,500 /microL
- neu: 15,900 /microL **85%**
- HGB: 11.5 g/dl
- PLT: 213,000/microL

## Normal ranges

### Newborn:

- 9–20,000 >
- 25–65 % <
- 13.0–20.0 >
- 100–250,000 <

### Older child:

- 8–12,000
- 35–70 %
- 10.0–13.0
- 150–400,000

▶ CRP: **65** mg/l

▶ PCT: **0.5** ng/l

## Diagnosis:

- Bacterial infection/Sepsis

# CASE 2.

---

## ▶ What's next?

☐ Chest X-ray

☐ Empirical antibiotic treatment

☐ Lumbar puncture

☒ Urinalysis



• Negative

• Sediment: WBC count < 5 WBCs /hpf

# Meningeal signs in infants

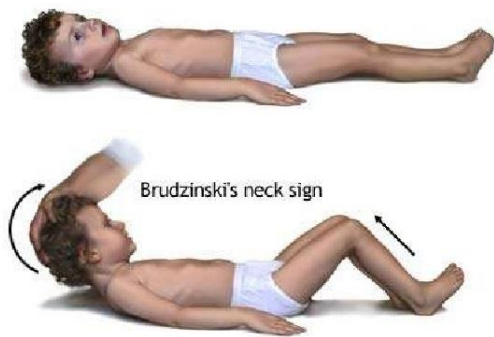
## Older child:

- ▶ Neck stiffness
- ▶ Kernig's sign
- ▶ Brudzinski's sign
- ▶ Tripod position

## Young infant:

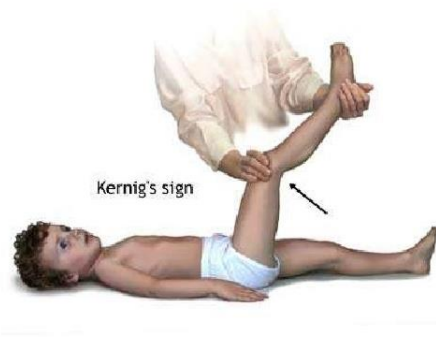
- ▶ Bulging fontanelle
- ▶ +/- nuchal rigidity
- ▶ opisthotonus
- ▶ Irritable, unconscious
- ▶ No specific clinical signs

Brudzinski Sign of Meningitis:



\* Pathogenesis: Meningeal irritation.

Kernig's Sign of Meningitis:



\* Pathogenesis: Meningeal irritation.



Source: Adv Neonatal Care © 2004 W.B. Saunders

# Lumbar puncture in infants

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- ▶ Age <28 days
- ▶ Ill-appearance
- ▶ Seizures
- ▶ High risk for invasive bacterial infection
  - WBC count <5000/microL, >15000/microL
  - CRP >20 mg/L
  - PCT >0,3 ng/mL



# Lumbar puncture in infants

- ▶ Opening pressure
- ▶ Quality of CSF
- ▶ Gram stain
- ▶ Culture
- ▶ Cell counts: RBC, WBC
- ▶ Protein
- ▶ glucose analysis
- ▶ PCR: HSV, enterovirus

meningitis

In our case

↑  
not clear  
bacteria

↑  
↑  
↓

} negative

# CASE 2.

---

- ▶ Diagnosis: late-onset sepsis, originating from facial cellulitis
  
  - ▶ Treatment:
    - Antibiotic treatment (empirical):
      - Vancomycin iv. (cellulitis – Staphylococcus)
      - Gentamycin iv.
  
    - No positive cultures
    - Fever subsided
- } Therapy stopped after 3 days

