
# Sepsis course – I.
# From „blood poisoning” to septic shock

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# Introduction: why sepsis?

Modern intensive therapy

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Severe sepsis, septic shock therapy

Sepsis

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A concept rather than diagnosis

# The past 20 years

- Anaesthesia
  - Mortality - 1:1560 (1952) – 1:185.000 (2007)
  - Bigger surgery – on sicker patients
  - The concept of perioperative medicine

Beecher H, Todd DP. *Ann Surg* 1954; 140: 2
Anesthesia Patient Safety Foundation (IOM 1999,IOM 2001; IHI 2007; JC 2007)

- Intensive therapy
  - Technical development
    - Invasive, continuous organ function monitoring/support
  - Sepsis: worldwide problem
    - Millions affected, high costs and mortality ~25-75%

Dellinger RP, et al. *Crit Care Med* 2004; 32: 858-872

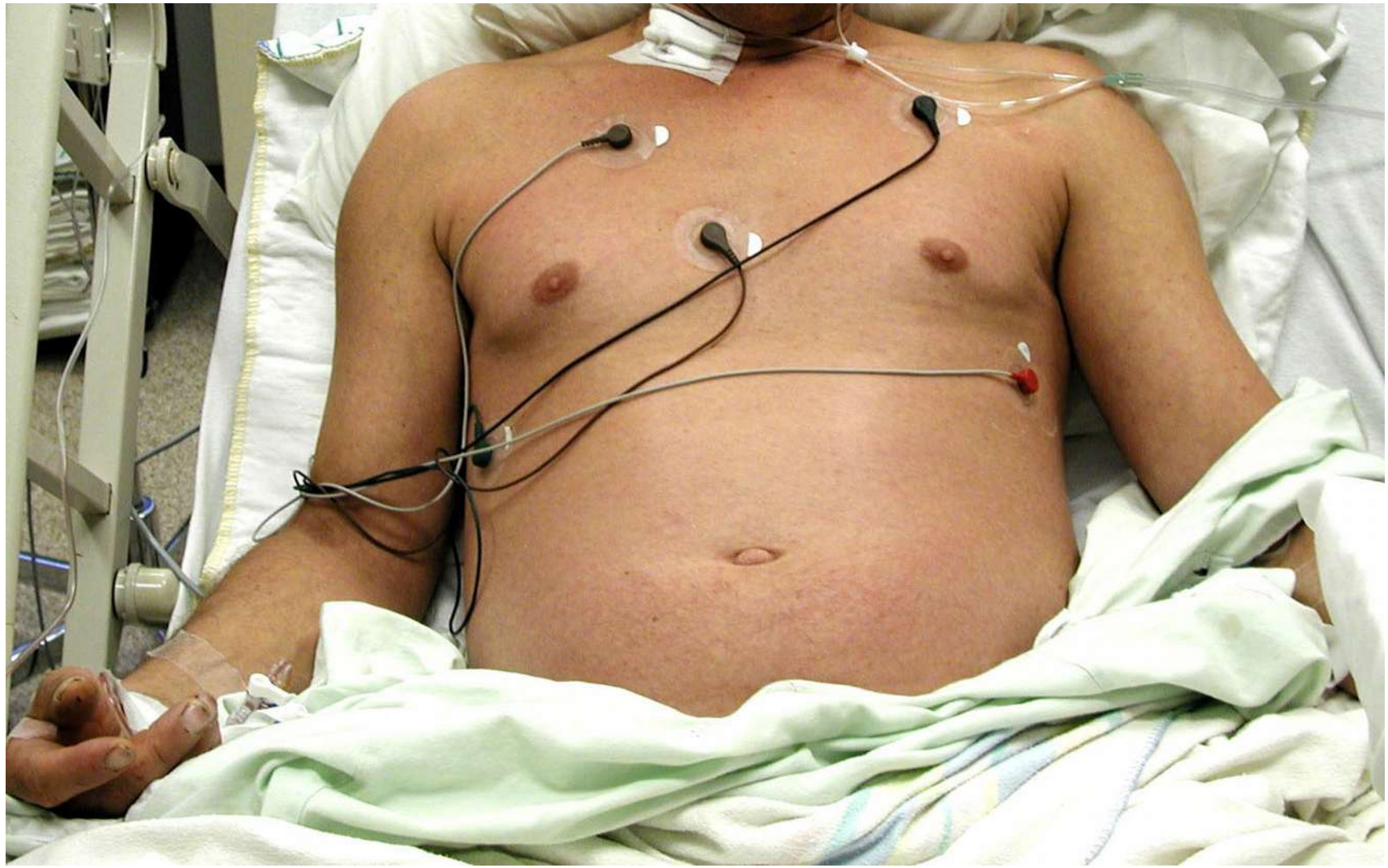
# Definition – 2000 years ago

- Hippocrates:
  - Breakdown of living tissues: „pepsis” and „sepsis”
- Celsus:
  - Rubor
  - Dolor
  - Calor
  - Tumor

# Definíció – több mint 2000 éve

- Hippocrates:
  - Az élő szövet lebomlása: „pepsis” és „sepsis”
- Celsus:
  - Rubor - Skin features
  - Dolor
  - Calor
  - Tumor

# Diffuse erythema



# Definíció – több mint 2000 éve

- Hippocrates:
  - Az élő szövet lebomlása: „pepsis” és „sepsis”
- Celsus:
  - Rubor - Peripheral vasodilatation
  - Dolor - Altered mental status
  - Calor - Fever, hypothermia
  - Tumor - Oedema

# Generalised oedema

# Definíció – több mint 2000 éve

- Hippocrates:
  - Az élő szövet lebomlása: „pepsis” és „sepsis”
- Celsus:
  - Rubor - Bőrtünetek
  - Dolor - Tudatzavar
  - Calor - Láz, hipotermia
  - Tumor - Ödéma
- Galen:
  - Functio laesa - Organ dysfunction enség

# Szepszis: nem definitív betegség

- „Sepsis-syndrome” and Las Vegas:
  - Fever or hypothermia (> 38 °C or < 36 °C)
  - Tachycardia (>90/min)
  - Leukocytosis or leukopenia (> 12 000cells/mm$^3$, < 4000cells/mm$^3$, or > 10% immature forms)
  - Hypotension (<90mmHg)

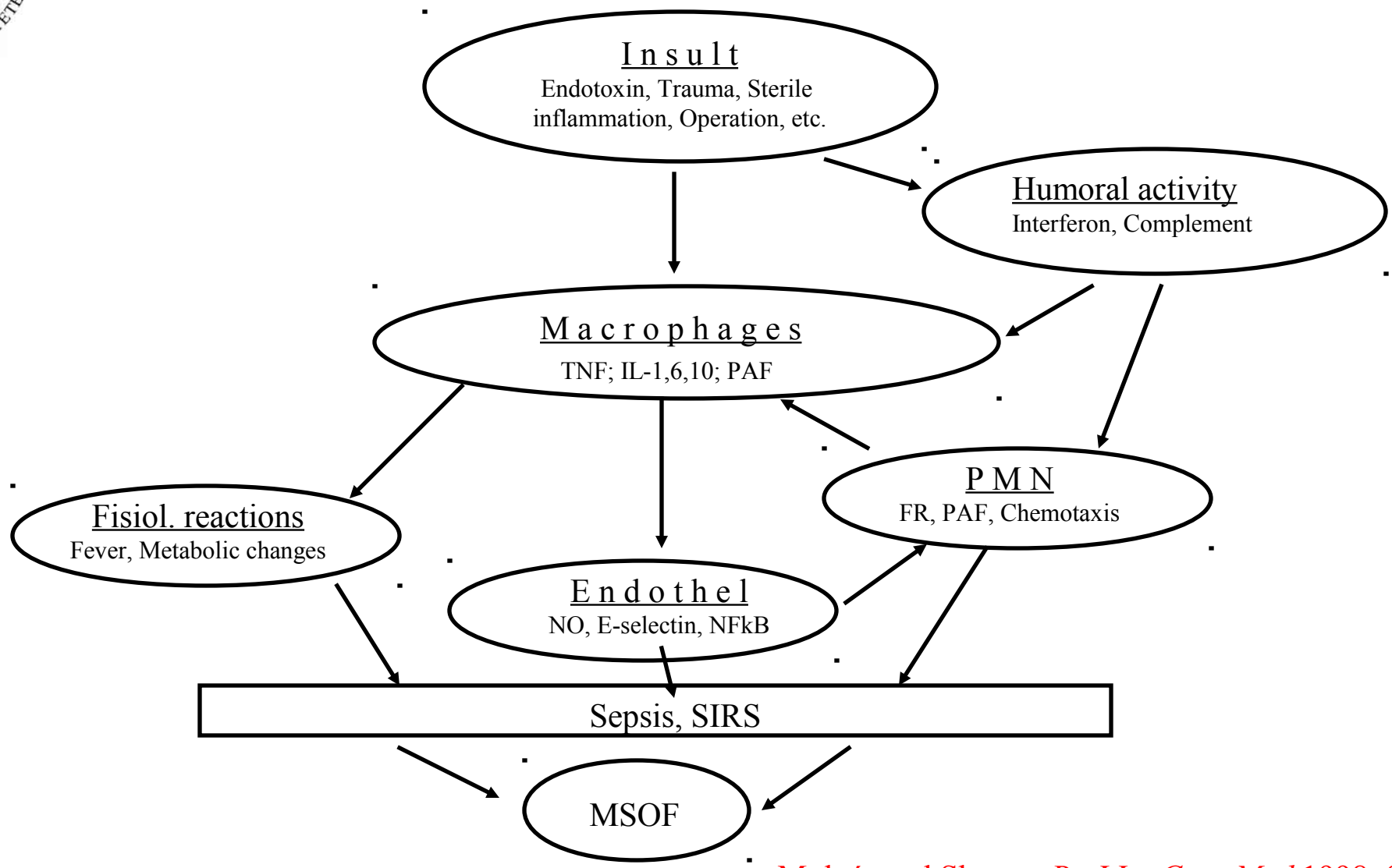
Bone RC, et al. *N Engl J Med* 1987; 317: 654

- Consensus conference ACCP/SCCM:
  - Infection
  - Bacteraemia
  - Systemic inflammatory response syndrome (SIRS)
  - Sepsis = SIRS + Infection
  - Severe sepsis (Sepsis + one organ dysfunction)
  - Septic shock (hypoperfusion despite adequate fluid load)
  - Multiple System Organ Failure (MSOF)

ACCP/SCCM. *Crit Care Med* 1992; 20: 864

# Definitive diagnoses

# Pathomechanism




Molnár and Shearer *Br J Int Care Med* 1998; 8: 12

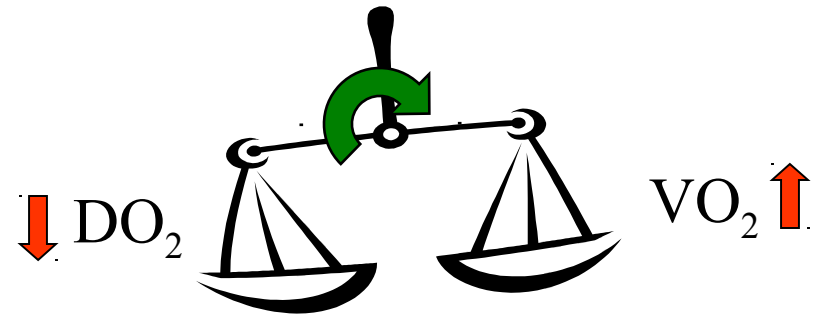
# Why patients get into trouble?

# The debt…

- $DO_2 = \underbrace{(SV \cdot P)}_{CO} \cdot \underbrace{(Hb \cdot 1.39 \cdot SaO_2 + 0.003 \cdot PaO_2)}_{CaO_2} \sim 1000 ml/p \ (SaO_2 = 100\%)$
- $VO_2 = CO \bullet (CaO_2 - CvO_2) \sim 250 \ ml/p \ (ScvO_2 \sim 70\text{-}75\%)$

# The debt…

- $DO_2 = \underbrace{(SV \cdot P)}_{CO} \cdot \underbrace{(Hb \cdot 1.39 \cdot SaO_2 + 0.003 \cdot PaO_2)}_{CaO_2} \sim 1000 ml/p \ (SaO_2 = 100\%)$
- $VO_2 = CO \bullet (CaO_2 - CvO_2) \sim 250 \ ml/p \ (ScvO_2 \sim 70\text{-}75\%)$
- In critical illness:
- Shock = $VO_2 > DO_2$

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# Examples

# 1. case

- On assessment on A&E:
  - Elderly, exhausted patient
  - Laboured breathing
  - Talks in adequate full sentences
- How to proceed?
  - Semi sitting position, $O_2$, venous access
- History
  - Age: 80 years
  - Complaints: 1/7 weeze and cough
  - Physical examination:
    - Resp: 26/min, BP: 95/45 mmHg, HR: 120/m, T: 39C
- How to proceed?
  - Fluid, monitoring ($SpO_2$, NIBP, ECG)

# 1. case

- Diagnostics, results
  - CXR
  - FBC
  - Micro: BC, sputum
  - $SpO_2$=96%
  - RR: 110/50 mmHg, P: 110/m
  - WCC: 12.000
- How to proceed?
- Dg: Pneumonia
  - Infection+fever+leukocytosis+tachycardia = Sepsis
  - But: it is not severe sepsis/septic shock
  - Admit to a medical ward: AB, $O_2$, observation

# 2. eset

- On a surgical ward at 11 p.m.:
  - A middle aged man
  - Tachypnoeic, sweaty, clammy, tachycardic
  - Can't speak in full sentenecs
- How to proceed?
  - Semi sitting position, $O_2$, venous access
- History
  - Age: 57 years
  - Complaints: sugery for colon tu. 2 days ago
  - PE:
    - Resp: 37/m, BP: 80/45 mmHg, P: 135/m, T: 37.2C
- How to proceed?
  - Fluid, monitoring ($SpO_2$, NIBP, ECG)

# 2. eset

- Results
  - $SpO_2$=86 %
  - BP: 90/50 mmHg, P: 130/m
- Diagnostics
  - ECG, CXR, bloods…
  - Van rá idő?
- Dg: Critically ill patient
  - Pneumonia, AMI, pulm. emb.?
  - Tachycardic + hypotension + resp. distress +/- infection
  - Alarming shock
- How to proceed?
  - Call for help!
  - ITO konzílium – ITO felvétel

# Motto

Diagnosis can wait, cells can’t!