

## PATHOPHYSIOLOGY OF SHOCK

- Definitions
- Types of Shock
- Septic Shock
- Immunological aspects
- General view
- Nosocomial infections
- Toxic Shock – ethiological agentes
- References and videos

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## Shock – definitions and types

- Shock is a life-threatening manifestation of circulatory failure. Circulatory shock leads to cellular and tissue hypoxia resulting in cellular death and dysfunction of vital organs. Effects of shock are reversible in the early stages, and a delay in diagnosis and/or timely initiation of treatment can lead to irreversible changes, including multiorgan failure (MOF) and death.
- Four broad categories of shock: hypovolemic, cardiogenic, obstructive and distributive.

$$BP = CO + SVR$$

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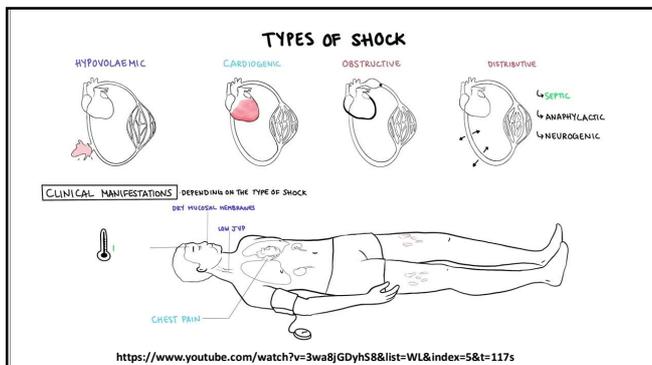
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	RR	HR	BP	SKIN	TEMP	URINE	OTHER S&S
<b>ANAPHYLACTIC</b> Severe allergic reaction.	↑↓	↑	↓	Flushed Swollen Itchy	↑	↓	Urticaria, Pruritus, Decreased LOC, Bronchoconstriction
<b>CARDIOGENIC</b> Failing pumping ability of the heart.	↑	↑	↓	Pale Cool Clammy	↓	↓	Chest Discomfort, Syncope, JVD, Pulmonary Edema, Orthopnea
<b>HYPOVOLEMIC</b> Reduced circulating blood volume.	↑	↑	↓	Pale Cool Clammy	↓	↓	Anxiety, Thirst, Syncope, Weakness, Confusion, Dizziness, Syncope, Weak Pulse
<b>OBSTRUCTIVE</b> Physical obstruction of great vessels or the heart.	↑	↑	↓	Extremities: Pale Cool	↓	↓	Muffled Heart Sounds, JVD, Decreased LOC, Signs of Poor Perfusion
<b>NEUROGENIC</b> Severe central nervous system damage.	↑	↓	↓	Warm Flushed Dry	↑	No Bladder Control	Paralysis Distal to Injury Site, Priapism
<b>SEPTIC</b> Extreme immune system response to an infection.	↑	↑	↓	Flushed then Pale & Cool	≥38°C OR <36°C	↑	Bounding Pulse, Altered LOC

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### Sepsis and Septic Shock

- Sepsis is defined as life-threatening organ dysfunction resulting from dysregulated host response to infection. Septic shock is a subset of sepsis with severe circulatory, cellular, and metabolic abnormalities resulting in tissue hypoperfusion manifested as hypotension leading to disseminated intravascular coagulation (DIC), multiple organ dysfunction syndrome (MODS).

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**BACTEREMIA X SEPTICEMIA X SEPSIS X SEPTIC SHOCK**

**SIRS - Sepsis – Severe Sepsis – Septic shock**

Systemic Inflammatory Response Syndrome

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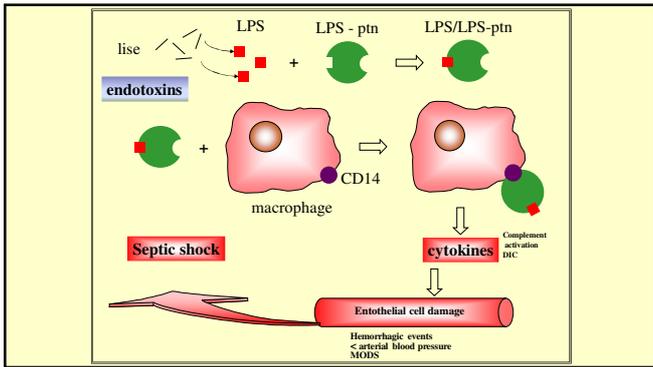
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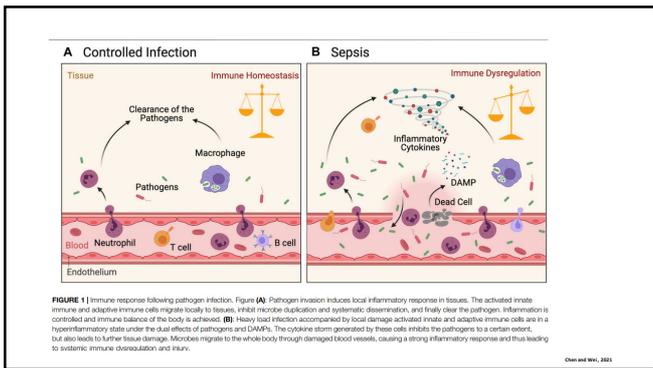
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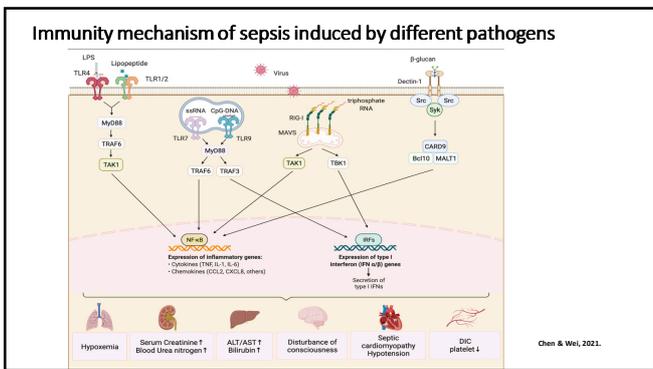
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**Nosocomial infections - NI**

Any infection acquired after the patient's hospitalization (minimum of 72 hours), which manifests itself during the patient's stay in the hospital, or after discharge, and which may be related to the hospitalization, is a hospital infection (nosocomial). Although they can be controlled, they are not eradicable.

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**INCIDENCE OF NI**

It varies depending on the country, geographic region, hospital, treatment unit and population served. In developed countries it ranges from 5 to 20% of hospitalized patients. In developing or underdeveloped countries it can reach 30% to 50% of hospitalized patients.

Brazil - >45.000 deaths/year

World - 8/1,000 death rate - 7 millions deaths/year

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**Major causative agents of sepsis in NI**

<i>Pseudomonas sp</i>	20%
<i>Klebsiella sp</i>	20%
<i>Staphylococcus aureus</i>	20%
<i>E. coli</i> e outras entéricas	15%

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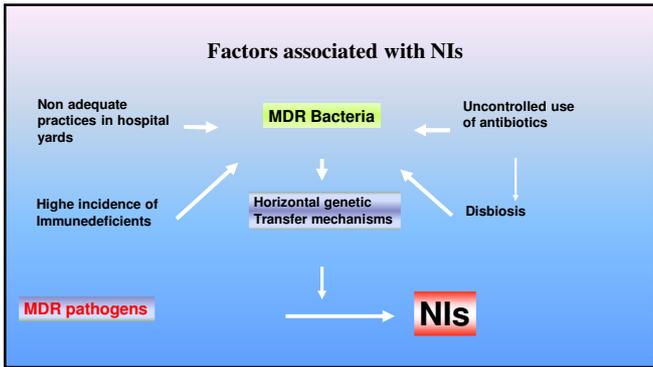
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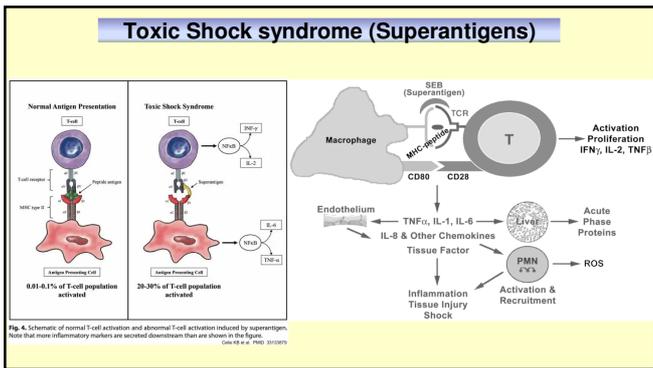
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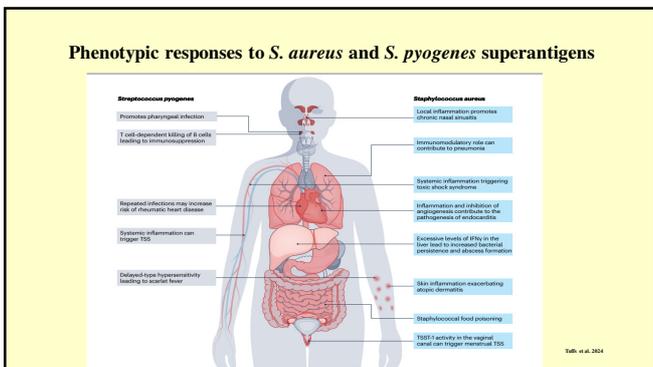
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**Toxic Shock Syndrome - Etiological agents**

- *Staphylococcus aureus*
- *Streptococcus pyogenes*

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**Vídeos**

choque

- <https://www.youtube.com/watch?v=NqkdqJrxIfs&t=608s>
- <https://www.youtube.com/watch?v=3wa8jGDyhS8&list=WL&index=6&t=117s>

choque séptico

- <https://www.youtube.com/watch?v=emOgJCoUy6Q> (Khan)
- <https://www.youtube.com/watch?v=Rxr1x25kAbs&list=WL&index=1&t=17s> (Rhesus)

superantígenos

- <https://www.youtube.com/watch?v=qSams9-onRs> - superantigens Animation

choque tóxico

- [https://www.youtube.com/watch?v=AOLzM\\_pDbas&t=3s](https://www.youtube.com/watch?v=AOLzM_pDbas&t=3s)

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**References**

- doi:10.1038/nrdp.2016.45 - Sepsis and septic Shock
- doi: 10.1016/j.immu.2021.1010.012 – The immunology of sepsis
- doi:10.1038/s41577-023-00979-2  
Novel insights into the immune response to bacterial T cell superantigens

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