

What is sepsis and why does it matter?

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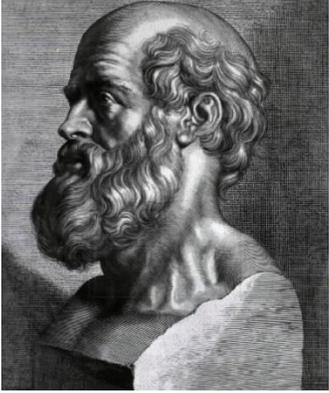


What is sepsis?

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Sepsis (σηψις)

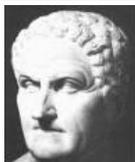


Hippocrates
(BC ~460-370)

“The process by which flesh rots, swamps generate foul airs at night, and wounds fester.

It is rank, disease-producing, and evil.”

The 2000 year evolution of 'germ theory'



- Galen (AD 129-199)
 - Wounds heal by 'secondary' intention - 'laudable' pus



- Fracastoro (1478-1553)
 - Passage of minute bodies from one person to another



- Pasteur (1822-1895)
 - Confirmation of the germ theory; vaccination



- Semmelweis (1818-1865) and Lister (1827-1912)
 - Antiseptic control

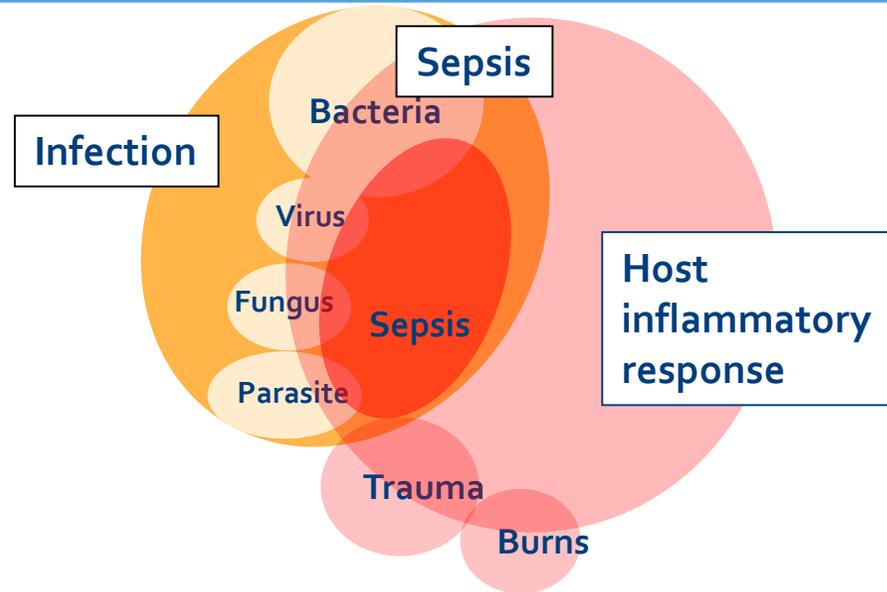
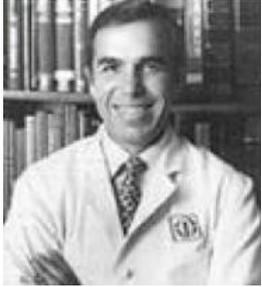


- Koch
 - Scientific basis for interrogation of mechanism of action



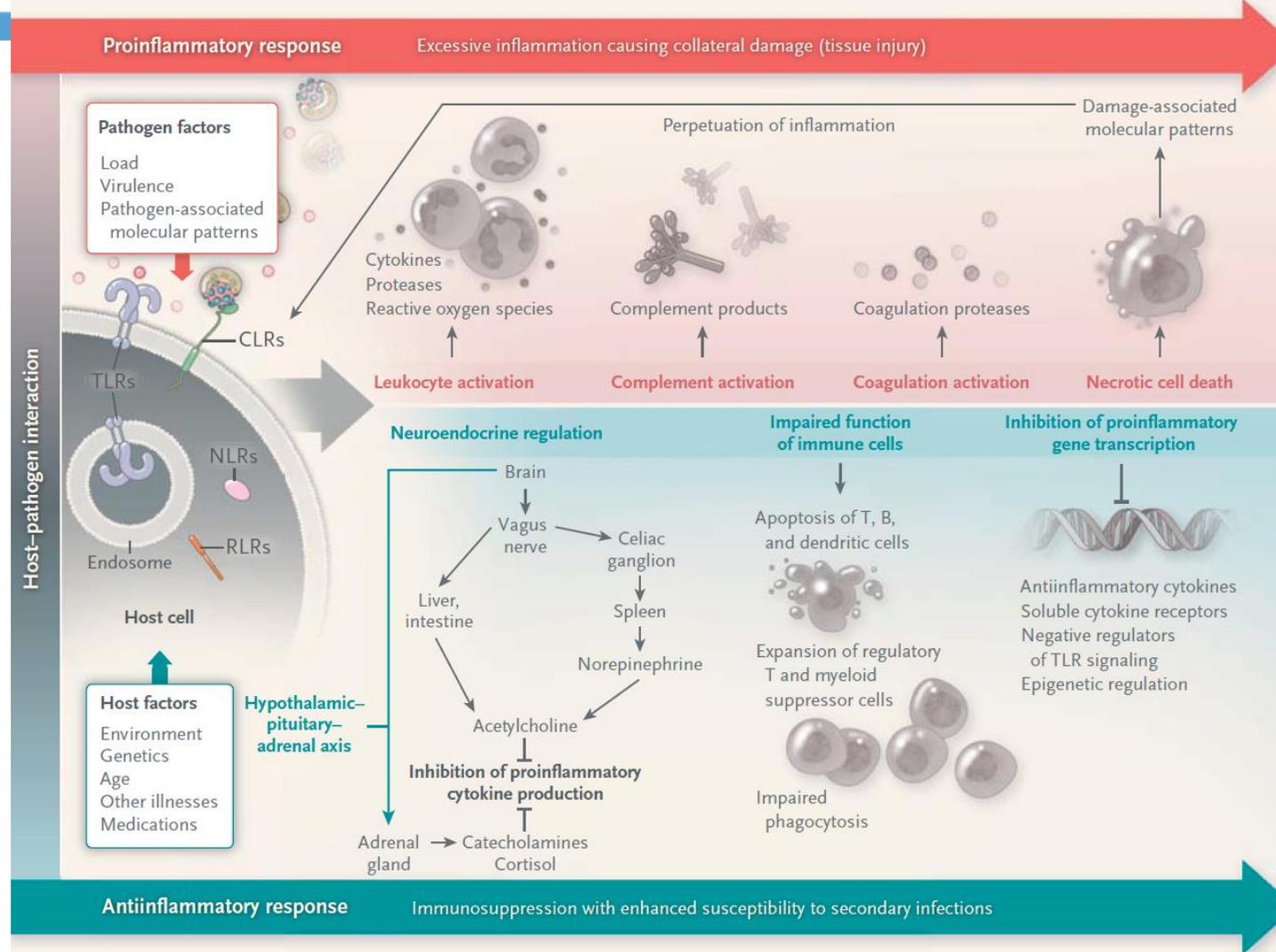
- Domagk, Fleming, et al (20th century)
 - Modern era of antibiotics

▶ Moving beyond 'germ theory' ...



- Patients still die **DESPITE** effective antibiotics
- Sepsis is a host response to infection gone awry!
 - A case of harm by friendly fire
- Leading to life-threatening acute organ dysfunction

Rapid, systemic, complex host response

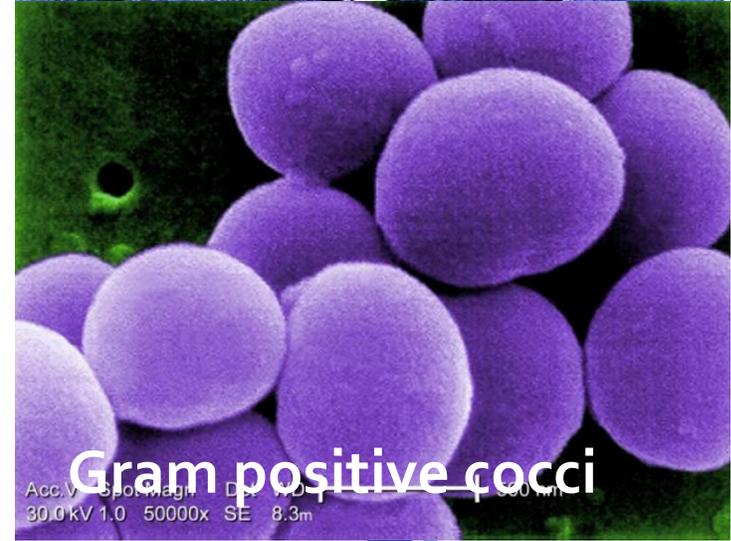


Sepsis ...

- ... is a life-threatening condition
 - when the body's response to an infection injures its own organs
- ... leads to shock, multiple organ failure and death
 - especially if not recognized early and treated promptly
- ... is the primary cause of death from infection
 - despite advances in modern medicine
 - vaccines
 - antibiotics
 - intensive care

Typical precipitating infections

- Site
 - Pneumonia - 53.6%
 - Abdominal - 19.9%
 - Urinary tract - 10.2%
 - Skin and other - 16.3%
- Blood cultures
 - Positive - 32.5%
- Type of infection
 - Purely gram negative - 23.3%
 - Purely gram positive - 25.1%
 - Mixed - 13.9%
 - Unknown - 37.7%
- 2/3 are community-acquired



▶ Modern management of severe sepsis

- Prompt treatment
 - Antibiotics
 - Resuscitation fluids
- Life support for failing organs/systems
 - Respiratory
 - Kidney
 - Cardiovascular
 - Gastrointestinal
 - Hepatic
 - Endocrine
 - Neurologic
 - Immune
 - Coagulation



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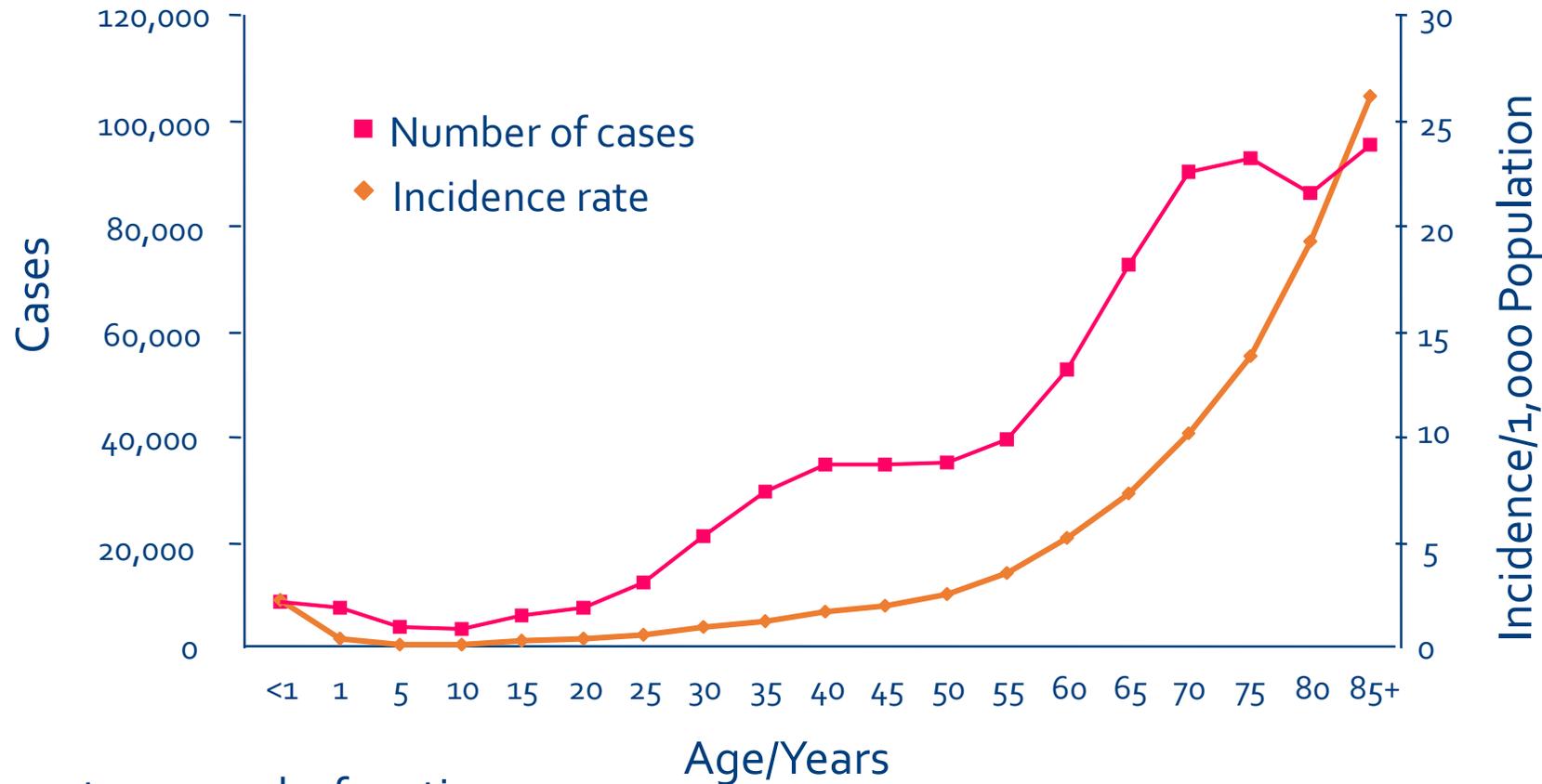


Why does sepsis matter?

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... because it is very common!

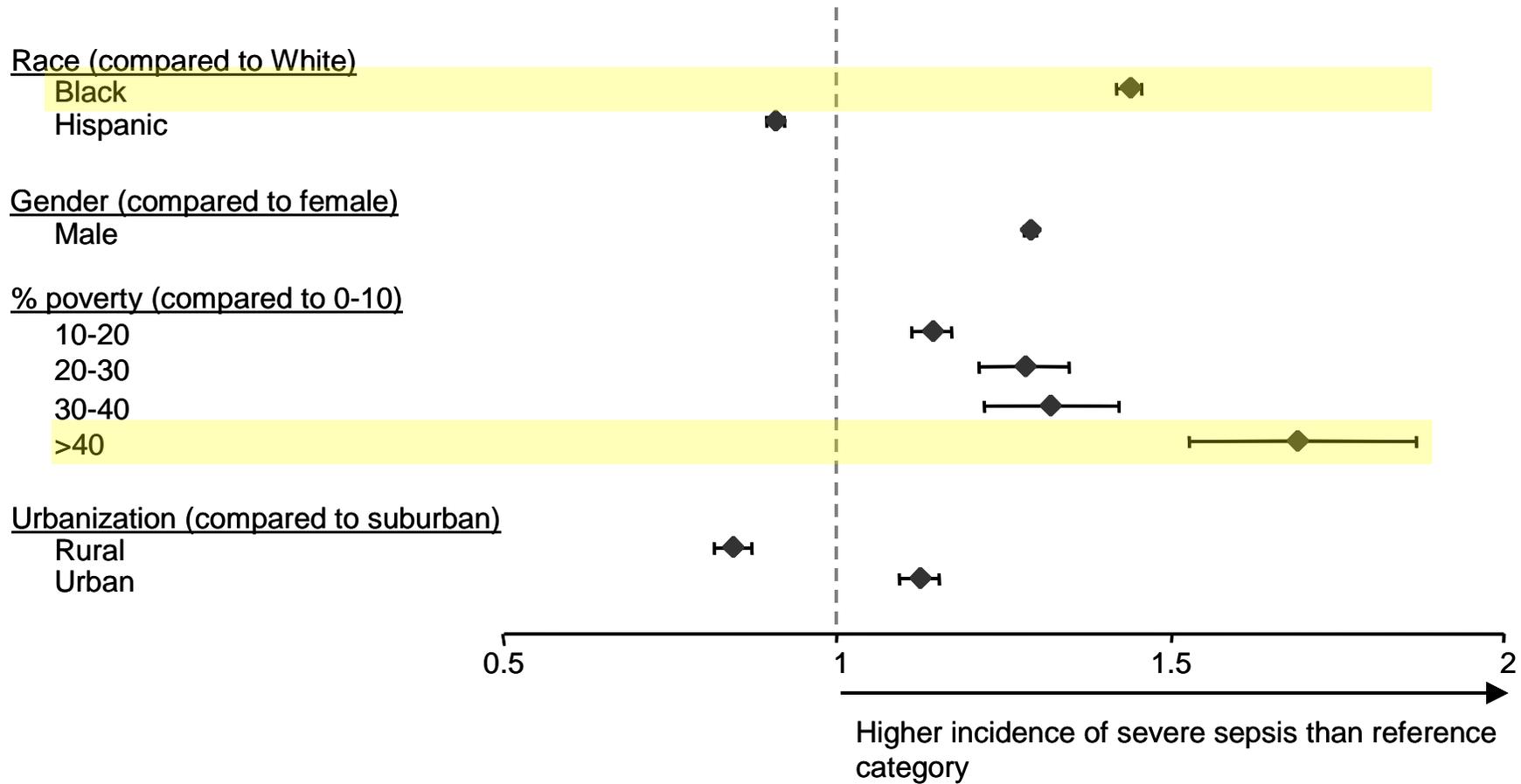


- Infection PLUS acute organ dysfunction
- 751,000 cases per year per year

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Angus, et al. CCM 2001;29:1303-1310.

... especially in vulnerable populations



... because it is deadly!

Kaiser Permanente Northern California (2010-2012) (n = 21 Hospitals) (14 206 Deaths/482 828 Admissions)				
	Explicit	Explicit POA ^c	Implicit	Implicit POA ^c
Hospitalizations	55 008 (11.4) [11.3-11.5]	50 520 (10.5) [10.4-10.5]	80 678 (16.7) [16.6-16.8]	73 933 (15.3) [15.2-15.4]
Hospital mortality	6272 (11.4) [11.1-11.7]	5238 (10.4) [10.1-10.6]	7941 (9.8) [9.6-10.0]	7391 (10.0) [9.8-10.2]
% (95% CI) of all hospital deaths among patients with sepsis	44.2 (43.3-45.0)	36.9 (36.1-37.7)	55.9 (55.1-56.7)	52.0 (51.2-52.8)

#1 cause of hospital deaths in the US

Sepsis in Pennsylvania

- In 2013
- 162,831 cases
 - 27,678 deaths
- 40% cared for in hospitals of 250 beds or less

... because it is pernicious

The New York Times



Can an otherwise healthy 58-year-old man die from a bad cold? He can, and he did.

... missed diagnosis of viral pneumonia ...

... Tom Wilson, a systems analyst for Westinghouse ...

... from bad to worse until every major organ system stopped working

... after 10 days in the ICU during which doctors struggled, he died.

Cause of death: septic shock

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New York Times, March 5, 2002



➤ And, because we can make a difference

- Extensive evidence
 - Care is variable
 - Diagnosis can be missed
 - Treatment can be delayed
- Best practice guidelines
 - Developed
 - Disseminated
 - Associated with considerable reductions in mortality

Caveat emptor

- Enhanced screening and recognition may have unintended consequences
 - Antibiotic ‘creep’ and overtreatment
- ‘Never’ cases may still occur
- ‘Blanket’ initiatives can miss important nuance
 - Individual clinical circumstance
 - Patient preferences
- Treatment is still source of vigorous study
 - Mechanism to update and disseminate guidelines

Conclusions

- Sepsis is life-threatening organ dysfunction secondary to a dysregulated host response to infection
- Sepsis afflicts old and young, healthy and infirm
 - Disproportionate in the vulnerable
 - Community and hospital-acquired
 - Every hospital involved
- Sepsis afflicts over a million Americans every year
 - Over 160,000 Pennsylvanians every year
- Sepsis is a leading cause of death
 - ‘The’ cause of death from infection
 - #1 cause of in-hospital death

Conclusions

- Sepsis is NOT easy to treat
 - Can be hard to recognize
 - Requires prompt intervention
 - Can progress to the need for highly-specialized intensive care
- But, systematic dissemination of treatment guidelines can yield important gains in patient-centered outcomes
- Pennsylvania is at the vanguard for sepsis care ...
 - An opportunity to promote best care for its citizens