

# Senescence and Vaccination

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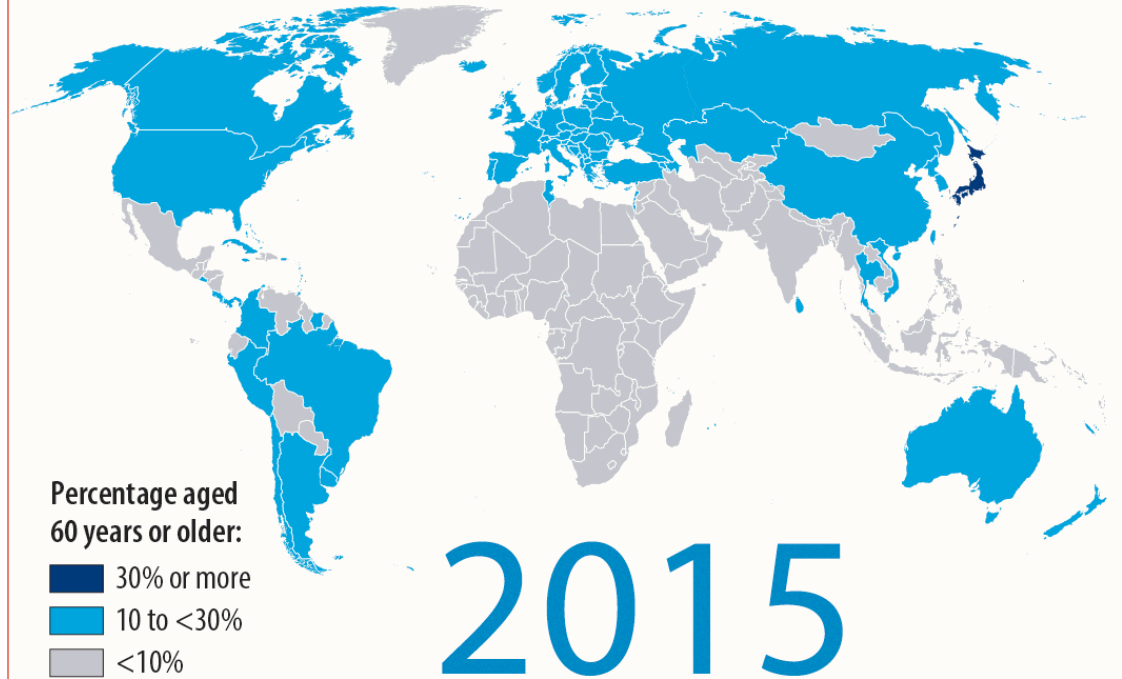
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# Objectives

- Recognize that the Asia is aging
- Compare aging vs. senescence
- Describe Immunosenescence
- Identify factors beyond the immune system that challenge older people's response to infections
- Discuss the clinical implications of these challenges
  - vaccination
  - healthy aging among PLWH

## Populations are getting older



# Aging: Definition

Aging is the accumulation of changes responsible for the sequential alterations that accompany advancing age and the associated progressive increases in the chance of disease and death.

Harman D, *Proc National Academy of Science USA, 1991*

# Why do we age?

- n Complex interaction of genetics and environmental factors

- n Major theories on Aging:

  - Genetic control

  - Accumulation of damage by free radicals

  - Cross linkage of macromolecules

  - Somatic mutation

# Senescence

- *def.* that phase in the life span which is associated with an increasing probability of dying as a function of time
- survival rate begins to decline
- in placental mammals: is progressive, universal and intrinsic
- little clear evidence that senescence itself causes death

# Principles of Aging

Some physiologic changes alter the appearance of disease.

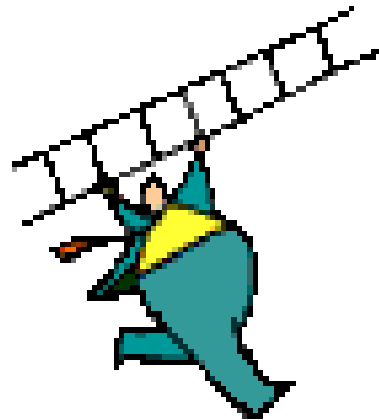
*different symptomatology of disease for young vs. old*

ex. anorexia in pneumonia or sepsis  
vomiting in cardiac ischemia

# Principles of Aging

Loss of function may not be apparent until the body is subjected to stress.

*“The hallmark of aging lies not in the resting level of performance, but how the organism adapts to external stress.”*

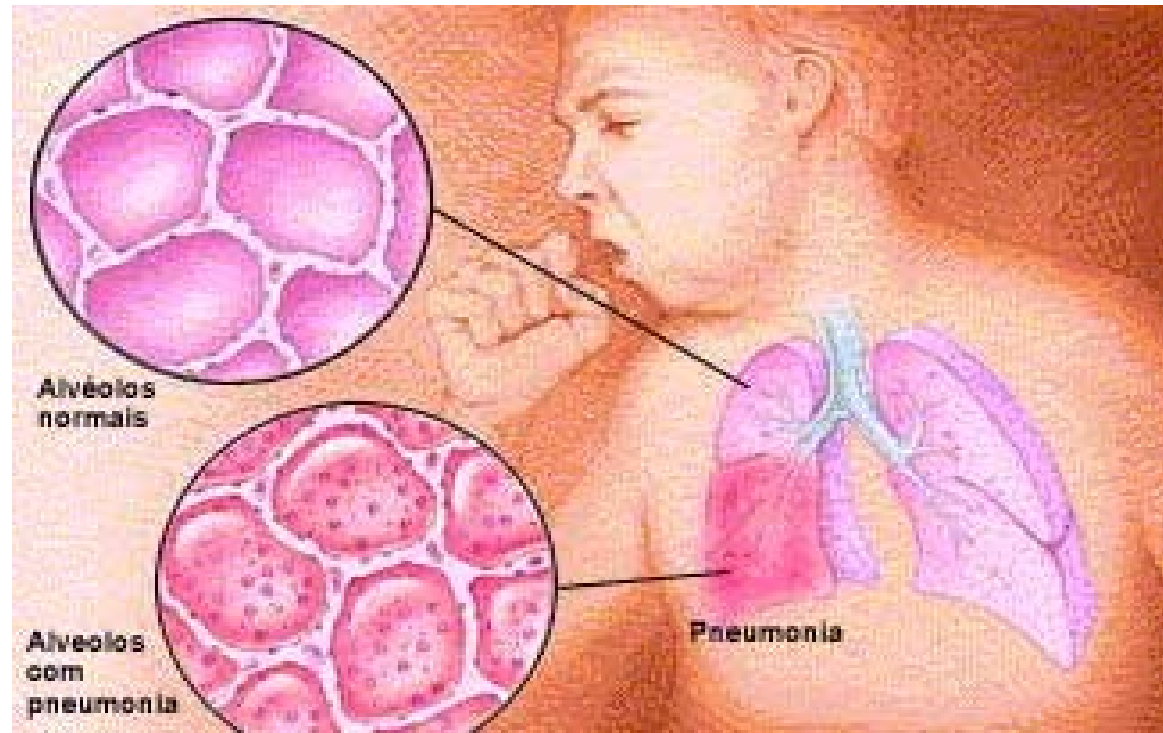




# Heterogeneity of Aging

- Young old
  - 60- 75
  - Generally healthy
  - Active, vital and vigorous
- Old old
  - Or “middle old”
  - 75-85
  - In general, frail, infirm, problems with ADL
- Oldest Old

# Organ-Specific Aging



# The Aging Immune System

- Reduced cell-mediated immunity
- Blunted IgG and IgM responses following primary antigenic stimulation or rechallenge
- Reduced antibody response to infection or vaccination
- Reduced supply and responsiveness of T cells

# Non-Immune Host Defenses

- Chronic illness, multiple morbidities or disability predisposes to infections
  - Reduced gag/cough reflex
- Medications
  - Steroids
  - Cytotoxic agents
  - H2 blockers
  - Sedatives
- Instrumentation
  - Catheters
  - Knee or hip replacement
- Hospitalization, nursing homes

# The Aging Lung

- Decreased elasticity
- Decreased cilia activity
- Decreased vital capacity
- Decreased maximal oxygen uptake
- Decreased cough reflex

# Normal Aging and Swallowing

- Salivary flow diminished
- Chewing/mastication:
  - Increased mastication time
  - Tendency to hold food bolus in floor of mouth
- Drop in resting laryngeal position
  - Reduced laryngeal and hyoid bone elevation
- Slowing of pharyngeal contractions and triggering
- ALL OF ABOVE do not usually lead to dysphagia

# Dysphagia

- CNS
  - CVA
  - Parkinson's disease
  - Progressive supranuclear palsy
  - Dementia – Alzheimer's
  - Neoplasia
- Oropharyngeal
  - Drug related
- Extrinsic
  - Masses/ Neoplasia
- Diabetes

# Cultural and Psychological Barriers

- Ageism
- Multiple health care professionals
- Other health care providers
  - Inappropriate diagnosis
  - Tendency to treat symptoms, not cause
- Low educational background



# CLINICAL IMPLICATIONS

TUBERCULOSIS

# TB, Malnutrition and Diabetes

- Immunosenescence
- Limitation of macrophage activation
- Reduced NK cytotoxic capacity
- Decrease IL 12
- Decrease in IFN gamma

Menon et al. Biomed Central 2016

# CLINICAL IMPLICATIONS

VACCINE PREVENTABLE DISEASES

# Response to Vaccination

- Immunosenescence and co-morbidities of the cardiovascular and respiratory systems increase the risk of complications and death from viral infections<sup>1</sup>
- One of the most profound clinical impacts of age on the immune system is the decline in the response to vaccination<sup>2</sup>
- In particular, the deleterious impact on the response to influenza vaccination is significant
  - Vaccine efficacy in the elderly is 50-60% compared with 70–90% in young adults<sup>3</sup>
  - Compared with the antibody response in younger adults, the response in the elderly is approximately<sup>4</sup>
    - 25% as rigorous for H1 and B antigens
    - 50% as rigorous for H3 antigens

1. Gruver AL *et al.* J Pathol. 2007; 211: 144–56. [8]
2. Pawelec G. Immunity Ageing. 2005; 2: 16. [28]
3. Nichol KL. Vaccine 2003;21:1769–75. [29]
4. Goodwin K *et al.* Vaccine. 2006; 24 :1159–69. [30]

# Pneumococcal Bacteremia

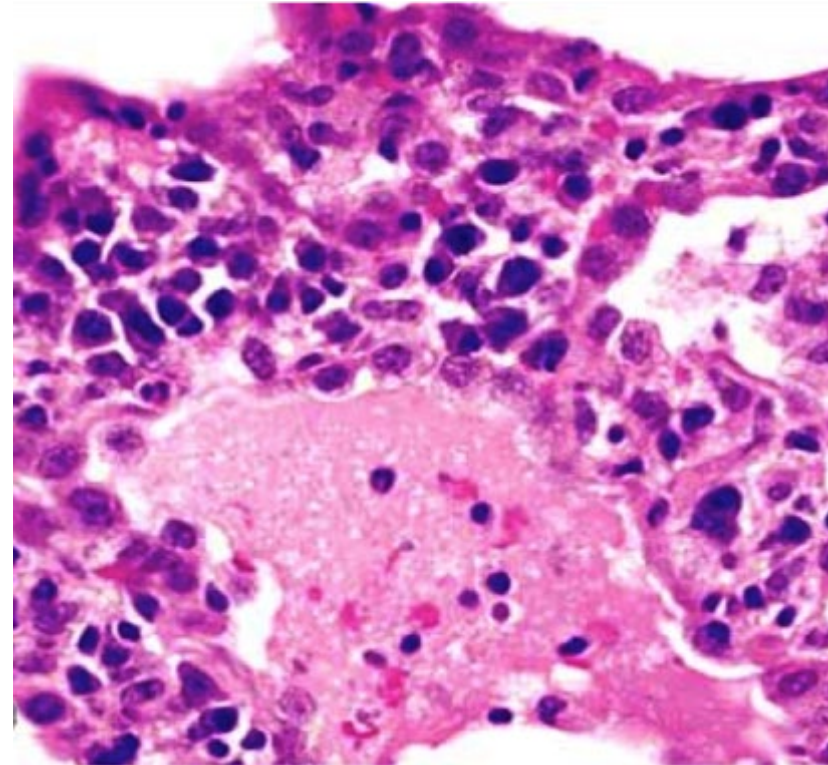
Higher incidence in elderly

Highest case fatality rate, among older persons the number approaching 40%

Pneumococcal vaccine is efficacious in reducing frequency of bacteremic pneumococcal pneumonia among adults in low risk groups

*Fine, MJ et al, Efficacy of pneumococcal vaccination in adults, meta analysis of RCTs*

*Archives Int. Med. 1994*



# Pneumococcal Vaccination

- Routine vaccination
- **Age 65 years or older** (immunocompetent): 1 dose PCV13 if previously did not receive PCV13, followed by 1 dose PPSV23 at least 1 year after PCV13 and at least 5 years after last dose PPSV23
  - Previously received PPSV23 but not PCV13 at age 65 years or older: 1 dose PCV13 at least 1 year after PPSV23
  - When both PCV13 and PPSV23 are indicated, administer PCV13 first (PCV13 and PPSV23 should not be administered during same visit)
- Special situations
- **Age 19 through 64 years with chronic medical conditions (chronic heart [excluding hypertension], lung, or liver disease; diabetes), alcoholism, or cigarette smoking:** 1 dose PPSV23

# ACIP June 2019

- PCV 13 based on shared clinical decision making for adults age 65 and older who do not have immunocompromising conditions
- All adults 65 years and older should receive PPV23

# Herpes Zoster

- Defined risk factors<sup>1</sup>
  - Advancing age
  - Impaired cell-mediated immunity
  - Reactivation of latent Varicella Zoster Virus
- Post-herpetic Neuralgia PHN





# Vaccines

- Effective in boosting the declining immune response
- Reduced vaccine uptake among older persons
  - Many misperceptions about vaccination
  - Lack of recommendation and reminders from doctors
  - Not affordable
  - Not available in doctor's offices

# General Guidelines

- CDC, ACIP 2019
- Recommendations by age
- Recommendations by special medical conditions

# General Recommendations by age

- 50 years and older
- Influenza vaccination, inactivated annually
- Tdap – one dose then Td every 10 years
- Zoster Recombinant (2 doses, preferred) or live (1 dose)
- Pneumococcal conjugate or pneumococcal polysaccharide

# Special Considerations

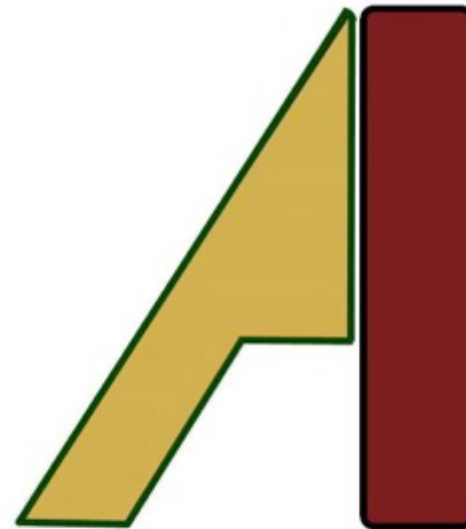
- Liver disease: Hepatitis B

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