AGING AND EPIDEMIOLOGY OF INFECTIONS

Pre-antibiotic Era

- Infections: Major cause of death and disabilities in U.S. until mid-20th century
- Smallpox, tuberculosis, diphtheria, cholera, typhoid fever, typhus, plague (deaths)
- Scarlet fever, rheumatic fever, measles, mumps, syphilis and poliomyelitis (deaths and disabilities)
AGING AND EPIDEMIOLOGY OF INFECTIONS

Pre-antibiotic Era (2)

- Life expectancy in U.S. at birth in 1900
  - female: 47 years
  - male: 45 years

- Elderly population 65+
  - 3-4% total population
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Germ Theory

- Antisepsis
- Antibiotics
- Immunization
- Sanitation
- Public health
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Germ Theory (2)

Reduced childhood mortality
- Life expectancy in U.S. at birth 2002
  female: 79 years
  male: 74 years
- Elderly population 65+
  13% of total population (36 million)
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Germ Theory (3)

Increase in old-old population

- Life expectancy at 65+ & 75+

<table>
<thead>
<tr>
<th></th>
<th>65+</th>
<th>75+</th>
</tr>
</thead>
<tbody>
<tr>
<td>males</td>
<td>15 yrs</td>
<td>9 yrs</td>
</tr>
<tr>
<td>females</td>
<td>19 yrs</td>
<td>14 yrs</td>
</tr>
</tbody>
</table>
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Germ Theory (4)

Changes in top 10 Causes of Deaths in U.S.

- Heart disease
- Cancer
- Stroke
- Pneumonia
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Germ Theory (5)

However, worldwide:

- Infections account for 30-35% of all deaths
- TB infects 30% of world population
Impact of Aging on Infections

- Physiological Changes of Aging
  - Immune changes: ↑ infection risks (e.g., TB)
  - Other organ changes: ↑ infection risks (e.g., UTI)
- Age-related diseases (e.g., cancer, dementia): ↑ infection risk (e.g., pneumonia, UTI)
# Aging and Epidemiology of Infections

## Impact of Aging on Infections (2)

### Common infections by age

<table>
<thead>
<tr>
<th>Young</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD</td>
<td>UTI</td>
</tr>
<tr>
<td>HIV</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>URI</td>
<td>Skin/soft tissue</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>TB</td>
</tr>
<tr>
<td></td>
<td>Young</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Bronchitis</td>
<td></td>
</tr>
<tr>
<td>UTI (women)</td>
<td></td>
</tr>
<tr>
<td>Meningitis (Viral)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Aging and Epidemiology of Infections**

**Impact of Age (3)**

**Differences in Microbial Etiology by Age**

<table>
<thead>
<tr>
<th>Infection</th>
<th>Young</th>
<th>Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td><em>S. pneumoniae</em></td>
<td><em>S. pneumoniae</em></td>
</tr>
<tr>
<td>Mycoplasma</td>
<td></td>
<td>Gram-negative bacilli</td>
</tr>
<tr>
<td>UTI</td>
<td><em>E. coli (80%)</em></td>
<td><em>E. coli (60%)</em></td>
</tr>
</tbody>
</table>
## Impact of Age (4)

### Differences in Microbial Etiology by Age (2)

<table>
<thead>
<tr>
<th>Infection</th>
<th>Young</th>
<th>Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningitis</td>
<td>Viral</td>
<td>Bacterial</td>
</tr>
<tr>
<td>Bacterial meningitis</td>
<td><em>S. pneumoniae</em></td>
<td><em>S. pneumoniae</em></td>
</tr>
<tr>
<td></td>
<td><em>N. meningitides</em></td>
<td>Gram-negative bacilli</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Listeria</em></td>
</tr>
</tbody>
</table>
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Age (5)

Mortality by age

Pneumonia = 3 times higher in old
Pyelonephritis = 5-10 times higher in old
Tuberculosis (non-HIV) = 10 times higher in old
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Age (5)

Mortality by age (cont’d)

Bacterial meningitis = 2 times higher in old

Infective endocarditis = 2 times higher in old

Sepsis = 2-3 times higher in old
AGING AND EPIDEMIOLOGY OF INFECTIONS

Impact of Aging on Infections

- Institutionalization (nursing homes)
  - Aspiration pneumonia
  - Catheter-related UTI
  - Infected pressure ulcer