Miscellaneous Bacterial Agents of Disease

Chapter 21
Gram negative human pathogens

- *Treponema*
- *Leptospira*
- *Borrelia*
Treponema

- thin, regular, coiled cells
- live in the oral cavity, intestinal tract, & perigenital regions of humans & animals
- pathogens are strict parasites
Treponema pallidum

- human is the natural host
- extremely fastidious & sensitive, cannot survive long outside of the host
- causes syphilis
- infectious dose is 57 organisms
- Primary syphilis
- Secondary syphilis
- Tertiary syphilis
- Congenital syphilis – nasal discharge, skin eruptions, bone deformation, nervous system abnormalities
- treatment: penicillin G
<table>
<thead>
<tr>
<th>Stage</th>
<th>Average Duration</th>
<th>Clinical Setting</th>
<th>Diagnosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation</td>
<td>3 weeks</td>
<td>No lesion; treponemes adhere and penetrate the epithelium; after multiplying, they disseminate</td>
<td>Asymptomatic phase</td>
<td>Not applicable</td>
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<tr>
<td>Primary</td>
<td>2–6 weeks</td>
<td>Initial appearance of chancre at inoculation site; intense treponemal activity in body; chancre later disappears</td>
<td>Dark-field microscopy; VDRL, FTA-ABS, MHA-TP testing</td>
<td>Benzathine penicillin G, $2 \times 10^6$ units; aqueous benzyl or procaine penicillin G, $4.8 \times 10^6$ units</td>
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<tr>
<td>Primary latency</td>
<td>2–8 weeks</td>
<td>Healed chancre; little scarring; treponemes in blood; few if any symptoms</td>
<td>Serological tests (+)</td>
<td>As above</td>
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<tr>
<td>Secondary</td>
<td>2–6 weeks after chancre leaves</td>
<td>Skin, mucous membrane lesions; hair loss; patient highly infectious; fever, lymphadenopathy; symptoms can persist for months</td>
<td>Dark-field testing of lesions; serological tests</td>
<td>Double doses of penicillins listed above</td>
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<tr>
<td>Latency</td>
<td>6 months to 8 or more years</td>
<td>Treponemes quiescent unless relapse occurs; lesions can reappear</td>
<td>Seropositive blood test</td>
<td>As above</td>
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<tr>
<td>Tertiary</td>
<td>Variable, up to 20 years</td>
<td>Neural, cardiovascular symptoms; gummas develop in organs; seropositivity</td>
<td>Treponeme may be demonstrated by DNA analysis of tissue</td>
<td>As above</td>
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</tbody>
</table>
Vibrio cholera
Pathogenesis of cholera

(a) The specific action of cholera toxin (CT) upon the intestinal epithelial cells heightens the activity of an enzyme called adenyl cyclase (AC).

(b) This enzyme stimulates abnormally high levels of cAMP (cyclic adenosine monophosphate), a chemical messenger that normally mediates the action of hormones on cells, but in higher concentrations promotes removal of anions (chloride and carbonate) by the cell membrane.

(c) Under the constant action of cAMP, the cells begin to secrete large quantities of chloride (Cl⁻) and bicarbonate (CO₃²⁻) ions into the intestinal lumen. Electrolyte loss is followed by water loss from epithelial cells, which is what causes the major symptoms.
Campylobacter jejuni

- important cause of bacterial gastroenteritis
- transmitted by beverages & food
- reach mucosa at the last segment of small intestine near colon; adhere, burrow through mucus and multiply
- symptoms of headache, fever, abdominal pain, bloody or watery diarrhea
- heat-labile enterotoxin CJT
Campylobacter jejuni
Helicobacter pylori

- curved cells discovered in 1979 in stomach biopsied specimens
- causes 90% of stomach & duodenal ulcers
- people with type O blood have a 1.5-2X higher rate of ulcers
- produces large amounts of urease
Chlamydia

- obligate intracellular parasites
- small gram-negative cell wall
- alternate between 2 stages
  - elementary body – small metabolically inactive, extracellular, infectious form
  - reticulate body – grows within host cell vacuoles
Chlamydia
Chlamydia trachomatis

- human reservoir
- 2 strains
- trachoma – attacks the mucous membranes of the eyes, genitourinary tract & lungs
  - ocular trachoma – severe infection, deforms eyelid & cornea, may cause blindness
  - inclusion conjunctivitis – occurs as babies pass through birth canal; prevented by prophylaxis
  - STD – urethritis, cervicitis, salpingitis (PID), infertility, scarring
- lymphogranuloma venereum – disfiguring disease of the external genitalia & pelvic lymphatics
Chlamydia trachomatis
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