Obligate Intracellular Pathogens

You can’t make me leave!

Family Chlamydiaceae

<table>
<thead>
<tr>
<th>Order</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
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<tr>
<td></td>
<td>Chlamydiaceae</td>
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<td>Ch. trachomatis</td>
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<td>Ch. suis</td>
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<td>Ch. muridarum</td>
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<td>C. psittaci</td>
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<td>C. abortus</td>
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<td>C. felis</td>
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<td>C. cavine</td>
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<td>C. pneumoniae</td>
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<td></td>
<td>Parachlamydiae</td>
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<td>Humans, horses, koalas</td>
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<td>Simkaniaeae</td>
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<td>Pecora - Bovidae</td>
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<td>Wooddiaceae</td>
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<td>Psittacine birds, avian species</td>
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<td>Ruminants, swine</td>
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<td>Felidae</td>
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<td>Caviidae – Guinea pigs</td>
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Family Chlamydiaceae

- Obligate intracellular
- Gram-neg with: outer membrane, LPS but no PGN
- Unique life cycle: visualized with MZN, Giemsa or Gimenez
  - Infectious “spore-like” Elementary bodies (EBs) - 0.3 \( \mu \text{m} \)
  - Noninfectious metabolically active Reticulate bodies (RBs) – 0.9 \( \mu \text{m} \)

Chlamydophila psittaci: Psittacosis

- Immediately notifiable, (Category B Bioweapon)
  - Psittacine and humans: psittacosis
  - Non-psittacine birds: ornithosis
    - pigeons, doves, turkey
- Occasionally ruminants:
  - Psittacine Birds
    - Fecal/resp/beak – oral route, most subclinical / latent
    - Stress leads to signs, ↑'d shedding
  - Psittacine Signs: nonspecific (Lethargy, anorexia, ruffled feathers)
    - +/- nasal or conjunctival discharge, lower respiratory signs, +/- diarrhea (greenish-yellow)
    - Death can occur - dehydration/starvation
**Cph. psittaci: Psittacosis**

- **Psittacine Dx:**
  - Giemsa, MZN (intracellular, RB, EB)
  - Fabs to detect in EB in tissues
  - Serology: Ab
  - Culture: cloacal swabs (liver spleen)
    - embryonated eggs
    - Now tissue culture
  - **PCR – mainstay (in lab testing)**

- **Psittacine Txt (45 day protocols):**
  - Chlortetracycline (feed)
  - Doxycycline in water or i.m.

- **Psittacine Management**
  - Quarantine (new plus sick)
  - Disinfection (cages, toys, bowls)
  - Lysol, bleach, isopropanol
  - Quaternary ammonium (Roccal® or Zephiran®)

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**Cph. psittaci: humans**

- **Termed Psittacosis or Parrot Fever**
  - 100 – 500 cases/year in N.A.
  - Pet bird owners, abattoir workers (turkey processing), veterinary profession, exotic bird dealers
  - Flu-like symptoms, pneumonitis, bacteremia

- **< 1% mortality: doxycycline (azithromycin)**
**Cph. abortus**

- Ovine Enzootic Abortion (OEA) or Enzootic Abortion in Ewes (EAE)
- Important infectious cause of abortion in U.K., Europe
- Placental/vaginal-oral transmission – no signs prior to abortion
  - Abortion in last month
  - Zoonotic - usually mild (flu-like), **pregnant women** at risk (abortion)
- **Dx**
  - Serology available (*Cph pecorum* x reactivity issue)
  - Giemsa/MZN staining (cotyledons, vaginal swabs, fetal skin)
- **PCR**
- **Txt**
  - Tetracycline (i.m.) can prevent abortion outbreaks
  - Recovered ewes show long term immunity
  - Vaccine available (Canada/U.S.)
- **Other manifestations:**
  - Infertility, cattle (subclinical mastitis), horses, swine

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**Cph. felis**

- Primarily **conjunctivitis**, rarely resp.
- Ocular Signs – subclinical/mild/self-limiting
  - Serous discharge, hyperemia
  - Chemosis (edema of conjunctiva)
  - Secondary infections (muco-purulent)
- **Dx**
  - Conjunctival swab (Giemsa) – 50%
  - Serology
  - PCR
- **Intervention (‘cyclines, vaccines)**
  - Quarantine, Doxycycline
  - Vaccines: Fel-O-Vax (Boehringer); Nobivac (Intervet); Felocell (Pfizer), Purevax (Merial)
  - Reduce clinical severity
The rest

- *Cph. pectorum* (ruminants): **polyarthritis**, enteritis, pneumonia, **conjunctivitis**, urogenital infections, sporadic encephalomyelitis
  - **Trivia**: prevalence in cattle (*Cph. psittaci* > *Cph. abortus* > *Cph. pectorum*)

- *Ch. suis* (swine): conjunctivitis, resp., arthritis, abortion

- *Cph. caviae* (Guinea pigs): **conjunctivitis**, genito-urinary

- *Cph. pneumoniae* – Biovars: Human, Equine (respiratory), Koala

- *Ch. muridarum* (hamsters, mice): respiratory

Q Fever: *Coxiella burnetii*

- **Annually notifiable** (Level 3), category B bioweapon
  - "ubiquitous zoonoses”, endemic worldwide (except New Zealand), emerging
  - infects mammals (**ruminants**), birds, reptiles, fish, arthropods (ticks)
  - Outbreaks: Nfld (2003), Netherlands (2007 – 3000 + cases)

- **Disease**: inhalation (amnion, placenta), dust, unpasteurized milk (?)
- **Pathogenesis**: Obligate intracellular, LPS phase variation
  - Infects monocytes/macrophages (alveolar macrophages) – phagolysosome
  - Antigenic Phase I - infective: long LPS
  - Antigenic Phase II - noninfective: short LPS
- **Clinical Manifestations**:
  - Humans: typically subclinical/self-limiting, **but …. Pregnant women - abortion**
    - Acute – flu-like signs (fever, headache, myalgia), atypical pneumonia, hepatitis
    - Chronic - valvular endocarditis (1-5%), “pseudotumors”, osteoarthritis,
  - Goats/Sheep/Cattle: typically subclinical/endemic: “Coxielliosis?”
  - Abortion “storms”, infertility, +/- subclinical mastitis
Q Fever: Dx/TxT

- Human: Hx, exposure (~2 wks later)
  - ruminant abortion storms, parturient cat
- Human signs: σ’s > ♀’s
- **Human Serology** (NML, Manitoba)
  - Acute: IgM/IgG titres to Phase II > I
  - Chronic: IgM/IgG titres to Phase I > II
- **Human PCR** (NML, Manitoba)
- Animal ELISA/PCR
  - Serum or milk Ab’s
  - PCR is available
- Cell-free culture almost (2009)
- Doxycycline (Human):
  - Oxytet bolus third trimester (goats)
- Vaccines (Q-Vax, Phase I)