2 | *BARTONELLA* SPECIES

2.1 | Disease agents

- *Bartonella henselae*
- *Bartonella quintana*
- *Bartonella bacilliformis*

2.2 | Disease agent characteristics

- Gram-negative pleomorphic bacillus or coccobacillus, aerobic, nonmotile, non-spore forming, fastidious, facultative, intracellular bacterium
- Order: Rhizobiales; Family: *Bartonellaceae*
- Size: 0.3–0.6 × 1.0–3.0 μm
- Nucleic acid: Approximately 1.4–2.6 Mb of DNA

2.3 | Disease names

Bartonella henselae

- Cat scratch disease in normal hosts
- Bacillary angiomatosis in immune-compromised hosts and bacillary peliosis are vasculo-proliferative manifestations of infection in immune-compromised hosts

Bartonella quintana

- Trench fever under conditions of poor sanitation and hygiene
- Bacillary angiomatosis/peliosis in immune-compromised hosts

Bartonella bacilliformis

- Oroya fever
- Verruga peruana
- Carrion disease

2.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical
- Public perception and/or regulatory concern regarding blood safety: Absent
- Public concern regarding disease agent: Very low

2.5 | Background

- The genus *Bartonella* was defined in 1913 and referred to erythrocyte-adherent organisms described by Barton in 1909.
- The name *Bartonella bacilliformis* was used for the only member of the group identified before 1993.
- Several other species of *Bartonella*, most importantly *B. henselae* and *B. quintana*, commonly infect humans, and at present, *B. henselae* represents by far the most common species of *Bartonella* in the United States and is of greatest concern.
- They are primarily infections of nonhuman animals, with humans as incidental hosts.
- A variety of *Bartonellae* from other species have been described infecting humans at the individual case report level.
- Stable in the population.
- These organisms cause intraerythrocytic bacteremia, that can be chronic or relapsing, so concerns have been raised about transfusion transmission.
- In 1885, a medical student injected himself with blood from a verruga peruana lesion (erupting cutaneous nodules and red-to-purple vascular lesions) and subsequently died of "Oroya fever" presumably due to a *B. bacilliformis* infection.
- Infections with *B. bacilliformis* and *B. quintana* occur in populations unlikely to be qualified blood donors. *B. bacilliformis* is geographically restricted to the Andes mountains and is associated with significant acute and chronic morbidity, while infections with *B. quintana* occur primarily in conditions of poor sanitation and hygiene, especially among the homeless and immune compromised persons.
- *Bartonella henselae* is a common human pathogen.

2.6 | Common human exposure routes

- *Bartonella henselae* is commonly transmitted to humans by a saliva-contaminated bite or scratch from cats that are the natural reservoir for the bacteria.
- *Bartonella bacilliformis* and *B. quintana* are vector-borne. Their non-human reservoirs are not yet identified.

2.7 | Likelihood of secondary transmission

- Unlikely

2.8 | At-risk populations

- Persons of all ages are at risk from *B. henselae*, but recognized infections primarily occur in children playing with cats.
- Immunocompromised persons, most notably those with advanced HIV infections, are more likely to have complications like endocarditis and bacillary angiomatosis.

2.9 | Vector and reservoir involved

- Chronically infected cats are the reservoir for *B. henselae*.
- Recent evidence suggests exposure to infected fleas and *Ixodes* ticks may also play a role in transmission to humans, but this route has not been proven. The cat flea is the primary vector for cat-to-cat transmission.
- *Bartonella bacilliformis* and *B. quintana* are vector-borne by sand flies and body lice, respectively. Their non-human reservoirs are not yet identified.

2.10 | Blood phase

- Intraerythrocytic *Bartonellae* species can be identified by a variety of methods in natural infections.
- *Bartonella henselae* is found in endothelial cells and RBCs. Infected CD34+ hematopoietic progenitor cells give rise to infected RBCs *in vitro* and this, rather than attachment and invasion of mature RBCs, may be the source of intraerythrocytic bacteria.
- Occult bacteremia sometimes occurs.

2.11 | Survival/persistence in blood products

- An RBC spiking study suggests that *B. henselae* added to RBCs can be recovered on solid media through 35 days of storage at 4°C.

2.12 | Transmission by blood transfusion

- Theoretical but plausible.
- Survival in stored RBCs; concern regarding transfusion transmission to solid organ transplant recipients have been cited.
- Subclinical bloodstream *Bartonella* species infections in humans provide the possibility of transfusion-transmitted infection.

2.13 | Cases/frequency in population

- 22,000 cases of cat scratch disease per year estimated in the United States
- 2%–6% seroprevalence of *B. henselae* in US blood donors
- Cumulative seroprevalence of 7.1% to *B. henselae* and *B. quintana* in US veterinary professionals

2.14 | Incubation period

- 3–10 days to appearance of papule at *B. henselae* inoculation site; regional adenopathy may follow after a few weeks

2.15 | Likelihood of clinical disease

- Cat scratch disease in normal hosts is relatively benign and self-limiting, lasting 6–12 weeks in the absence of antibiotic therapy.

2.16 | Primary disease symptoms

- *Bartonella henselae* generally causes a mild infection at point of injury and lymphadenopathy involving the draining nodes, generally of the head, neck, and upper torso.
- Fever, headache, fatigue, nausea and vomiting, sore throat, conjunctivitis (Parinaud's oculoglandular syndrome) and poor appetite also occur.
- Symptoms may be intermittent or chronic with a waxing and waning course.

2.17 | Severity of clinical disease

- More severe manifestations from *B. henselae*, such as bacillary angiomatosis or peliosis and endocarditis, can occur in immune-compromised hosts and often complicate HIV infection.

2.18 | Mortality

- Unknown, but probably low

2.19 | Chronic carriage

- Limited data suggest the possibility of persistence in humans
- Persists in many animals, including cats

2.20 | Treatment available/efficacious

- Immunocompetent patients usually do not require treatment, but immunocompromised patients should be treated with macrolide antibiotics (erythromycin, azithromycin, or clarithromycin) or doxycycline.

2.21 | Agent-specific screening question(s)

- No specific question is in use.
- Not indicated because transfusion transmission has only been postulated.
- No sensitive or specific question is feasible.

2.22 | Laboratory test(s) available

- No FDA-licensed blood donor screening test exists.
- Unlicensed immunofluorescence assay and PCR available.
- In immunocompetent at-risk persons, diagnosis of the agent is enhanced by combining PCR with pre-enrichment culture.

2.23 | Currently recommended donor deferral period

- No FDA Guidance or AABB Standard exists.
- Prudent practice would be to defer donor until signs and symptoms are gone and any course of treatment is complete.

2.24 | Impact on blood availability

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

2.25 | Impact on blood safety

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

2.26 | Leukoreduction efficacy

- Unknown, but unlikely to affect intraerythrocytic organisms

2.27 | Pathogen reduction efficacy for plasma derivatives

- Specific data indicate that the multiple steps in the fractionation process are robust and capable of inactivating and/or removing bacteria at concentrations that may be present in plasma.

2.28 | Other prevention measures

- None

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