

Protozoan agents and nematode agents (5th section)

1 | FILARIAE

1.1 | Disease agent

- *Wuchereria bancrofti*, *Onchocerca volvulus*, *Brugia* spp., *Loa loa*, *Mansonella* spp.

1.2 | Disease agent characteristics

- Nematode worms, 177–300 mm (microfilariae).
- Order: Spirurida.
- Family: *Onchocercidae*.
- All are parasitic nematodes, which have a microfilariae life-cycle stage in the peripheral blood.

1.3 | Disease name

- Broad spectrum of clinical presentation from asymptomatic to severe/debilitating disease
- Lymphatic filariasis (e.g., elephantiasis)
- Onchocerciasis; river blindness
- Mansonellosis
- Loiasis

1.4 | Priority level

- Scientific/epidemiologic evidence regarding blood safety: Very low; allergic reactions to transfused microfilaria may occur.
- Public perception and/or regulatory concern regarding blood safety: Absent.
- Public concern regarding disease agent: Absent.

1.5 | Background

- Under normal life-cycle conditions, adult worms that reside in lymphatics and lymph nodes produce microfilariae that are infectious to the vector arthropod, in which they must pass through several molts before

they can progress to the infectious filariform stage that gives rise to adult worms in a subsequent human host.

- Broad distribution in tropical and subtropical regions (i.e., Africa, Asia-Pacific, South and Central America).
- Incidence stable in endemic areas.
- Adult worms reside in tissues; microfilariae circulate in the blood.

1.6 | Common human exposure routes

Vector-borne transmission (i.e., bite of an infected mosquito, fly or midge).

1.7 | Likelihood of secondary transmission

- Transplacental transmission

1.8 | At-risk populations

- Individuals at enhanced risk for exposure to infected arthropod vectors (e.g., mosquitoes, blackflies, midges) due to travel or residence in areas where agents are endemic

1.9 | Vector and reservoir involved

- *W. bancrofti* (mosquitoes; e.g., *Culex*; also *Aedes* and *Anopheles* depending on location)
- *B. malayi*, (mosquitoes; e.g., *Aedes*, *Anopheles*)
- *O. volvulus* (*Simulium* blackflies)
- *L. loa* (Tabanid flies)
- *Mansonella* (midges, blackflies)

1.10 | Blood phase

- May occur and manifest with or without symptoms; periodic extracellular microfilaremia is common and

may last for years (e.g., up to 15), depending on survival of adult worms.

- Approximately 1 year from time of infection until microfilariae detected in blood in natural infection.

1.11 | Survival/persistence in blood products

- 21 days

1.12 | Transmission by blood transfusion

- Microfilariae introduced following transfusion of contaminated blood are incapable of maturing into adult worms.
- Transfusion transmission of microfilariae has not been shown to result in serious adverse events. An association with mild allergic transfusion reactions has been suggested in endemic areas.
- Caveat: hemovigilance in endemic areas is suboptimal and cases of transfusion acquisition, if they were to occur, are unlikely to be detected.

1.13 | Cases/frequency in population

- Unknown, but can be common in endemic areas.
- Wide geographic distribution in tropical and subtropical areas; risk varies by individual agent.

1.14 | Incubation period

- Adult worms mature over several months after human infection, and mature females release microfilariae into the circulation for many years.

1.15 | Likelihood of clinical disease

- Most infections are asymptomatic; inflammatory responses to adult worms are responsible for classic findings.

1.16 | Primary disease symptoms

- Asymptomatic infection is common, despite damage to lymphatics.
- Lymphatic filariasis (*Wuchereria* and *Brugia*) has a clinical spectrum spanning asymptomatic microfilaremia, acute

episodic adenolymphangitis (also called filarial fever), and chronic lymphatic obstruction (e.g., elephantiasis).

- Loiasis (*Loa Loa* “African Eye Worm”): infected persons from nonendemic areas generally lack microfilaremia but have severe allergic symptoms with frequent and incapacitating Calabar swellings, pruritus, and urticaria. Calabar swellings are localized areas of evanescent erythema and angioedema (up to 5–10 cm in diameter) that occur primarily on the extremities lasting up to 3 days. Subcutaneous adult organisms are large enough to be visible (they rarely migrate across the conjunctiva). Among individuals from endemic areas, infection is usually asymptomatic with microfilaremia and a much lower incidence of Calabar swellings and allergic manifestations. Eye worm occurs in up to 50% of these individuals. In chronically infected individuals, nephropathy and cardiomyopathy occur rarely.
- Onchocerciasis (*O. volvulus*; “river blindness”): ocular and skin infections; corneal neovascularization can lead to visual loss/blindness. This remains the second leading infectious cause of blindness. Mass administration of ivermectin is being used successfully to control this infection.

1.17 | Severity of clinical disease

- Wide clinical spectrum specific for the species; a high proportion of infections are asymptomatic.
- Heterogeneity ascribed to immune response of the individual host (patient) and inflammatory sequelae.
- Severe manifestations are well-described: for example, elephantiasis and blindness.
- Major functional health deficits may occur.

1.18 | Mortality

- Unknown

1.19 | Chronic carriage

- Adult worms live 15 years or longer.

1.20 | Treatment available/efficacious

- Diethylcarbamazine is effective against microfilariae, but only partially effective against adult worms.

- Ivermectin should be used in settings where onchocerciasis is present.

1.21 | Agent-specific screening question(s)

- No specific question is in use.
- Not indicated given the low incidence of infection in high-income countries.
- No sensitive or specific question is feasible.

1.22 | Laboratory test(s) available

- Optimal testing approach varies by agent; none are in routine use for blood donor screening.
- No FDA-licensed blood donor screening test exists.
- Microscopy may be used in endemic areas to identify microfilariae in peripheral blood smears.
- Serological (antibody and antigen) assays are available for selected agents, including point of care assays; these may be used for clinical diagnosis or surveillance in endemic areas.
- Antigen detection has had an important role in elimination programs.
- Advances in molecular diagnostics for lymphatic filariasis.

1.23 | Currently recommended donor deferral period

- No FDA Guidance or AABB standard exists.
- Given the possibility of chronic carriage or the possibility of provoking an allergic reaction, lifetime deferral seems warranted if a history of infection is provided.

1.24 | Impact on blood availability

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

1.25 | Impact on blood safety

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

1.26 | Leukoreduction efficacy

- Unknown

1.27 | Pathogen reduction efficacy for plasma derivatives

- No specific data available

1.28 | Other prevention measures

- Effectiveness of pathogen reduction unknown

SUGGESTED READING

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