

TABLE 258-1 CHARACTERISTICS OF THE FILARIAE

| Organism                    | Periodicity | Distribution   | Vector                                       | Location of Adult                          | Microfilarial Location | Sheath |
|-----------------------------|-------------|--|--|--|------------------------|--------|
| <i>Wuchereria bancrofti</i> | Nocturnal   | Cosmopolitan areas worldwide, including South America, Africa, southern Asia, Papua New Guinea, China, Indonesia | <i>Culex, Anopheles</i> (mosquitoes)         | Lymphatic tissue                           | Blood                  | +      |
|                             | Subperiodic | Eastern Pacific  | <i>Aedes</i> (mosquitoes)                    | Lymphatic tissue                           | Blood                  | +      |
| <i>Brugia malayi</i>        | Nocturnal   | Southeast Asia, Indonesia, India   | <i>Mansonia, Anopheles</i> (mosquitoes)      | Lymphatic tissue                           | Blood                  | +      |
|                             | Subperiodic | Indonesia, Southeast Asia  | <i>Coquillettidia, Mansonia</i> (mosquitoes) | Lymphatic tissue                           | Blood                  | +      |
| <i>B. timori</i>            | Nocturnal   | Indonesia  | <i>Anopheles</i> (mosquitoes)                | Lymphatic tissue                           | Blood                  | +      |
| <i>Loa loa</i>              | Diurnal     | West and Central Africa  | <i>Chrysops</i> (deerflies)                  | Subcutaneous tissue                        | Blood                  | +      |
| <i>Onchocerca volvulus</i>  | None        | South and Central America, Africa  | <i>Simulium</i> (blackflies)                 | Subcutaneous tissue                        | Skin, eye              | –      |
| <i>Mansonella ozzardi</i>   | None        | South and Central America  | <i>Culicoides</i> (midges)                   | Undetermined site                          | Blood                  | –      |
|                             |             | Caribbean  | <i>Simulium</i> (blackflies)                 |  |                        |        |
| <i>M. perstans</i>          | None        | South and Central America, Africa  | <i>Culicoides</i> (midges)                   | Body cavities, mesentery, perirenal tissue | Blood                  | –      |
| <i>M. streptocerca</i>      | None        | West and Central Africa  | <i>Culicoides</i> (midges)                   | Subcutaneous tissue                        | Skin                   | –      |

adenolymphangitis (ADL), and chronic lymphatic disease. In areas where *W. bancrofti* or *B. malayi* is endemic, the overwhelming majority of infected individuals have few overt clinical manifestations of filarial infection despite large numbers of circulating microfilariae in the peripheral blood. Although they may be clinically asymptomatic, virtually all persons with *W. bancrofti* or *B. malayi* microfilaremia have some degree of subclinical disease that includes microscopic hematuria and/or proteinuria, dilated (and tortuous) lymphatics (visualized by imaging), and—in men with *W. bancrofti* infection—scrotal lymphangiectasia (detectable by ultrasound). Despite these findings, the majority of individuals appear to remain clinically asymptomatic for years; in relatively few does the infection progress to either acute or chronic disease.

ADL is characterized by high fever, lymphatic inflammation (lymphangitis and lymphadenitis), and transient local edema. The lymphangitis is retrograde, extending peripherally from the lymph node

draining the area where the adult parasites reside. Regional lymph nodes are often enlarged, and the entire lymphatic channel can become indurated and inflamed. Concomitant local thrombophlebitis can occur as well. In brugian filariasis, a single local abscess may form along the involved lymphatic tract and subsequently rupture to the surface. The lymphadenitis and lymphangitis can involve both the upper and lower extremities in both bancroftian and brugian filariasis, but involvement of the genital lymphatics occurs almost exclusively with *W. bancrofti* infection. This genital involvement can be manifested by funiculitis, epididymitis, and scrotal pain and tenderness. In endemic areas, another type of acute disease—dermatolymphangioadenitis (DLA)—is recognized as a syndrome that includes high fever, chills, myalgias, and headache. Edematous inflammatory plaques clearly demarcated from normal skin are seen. Vesicles, ulcers, and hyperpigmentation may also be noted. There is often a history of trauma, burns, irradiation, insect bites, punctiform lesions, or chemical injury. Entry lesions, especially in the interdigital area, are common. DLA is often diagnosed as cellulitis.

If lymphatic damage progresses, transient lymphedema can develop into lymphatic obstruction and the permanent changes associated with elephantiasis (Fig. 258-2). Brawny edema follows early pitting edema, the subcutaneous tissues thicken, and hyperkeratosis occurs. Fissuring of the skin develops, as do hyperplastic changes. Superinfection of these poorly vascularized tissues becomes a problem. In bancroftian filariasis, in which genital involvement is common, hydroceles may develop (Fig. 258-1); in advanced stages, this condition may evolve into scrotal lymphedema and scrotal elephantiasis. Furthermore, if there is obstruction of the retroperitoneal lymphatics, increased renal lymphatic pressure leads to rupture of the renal lymphatics and the development of chyluria, which is usually intermittent and most prominent in the morning.

The clinical manifestations of filarial infections in travelers or transmigrants who have recently entered an endemic region are distinctive. Given a sufficient number of bites by infected vectors, usually over a 3- to 6-month period, recently exposed patients can develop acute lymphatic or scrotal inflammation with or without urticaria and localized angioedema. Lymphadenitis of epitrochlear, axillary, femoral, or inguinal lymph nodes is often followed by retrogradely evolving lymphangitis. Acute attacks are short-lived and are not usually accompanied by fever. With prolonged exposure to infected mosquitoes, these attacks, if untreated, become more severe and lead to permanent lymphatic inflammation and obstruction.

#### DIAGNOSIS

A definitive diagnosis can be made only by detection of the parasites and hence can be difficult. Adult worms localized in lymphatic



**FIGURE 258-1** Hydrocele associated with *Wuchereria bancrofti* infection.