Table 1. Characteristics of common human filarial parasites

Species	*Wuchereria bancrofti*	*Brugia malayi*	*Brugia timori*	*Loa loa*	*Mansonella ozzardi*	*Mansonella perstans*	*Mansonella streptocerca*	*Onchocerca volvulus*
Geographical distribution	Tropics and subtropics worldwide	South-east Asia, Indian subcontinent	Indonesian archipelago, Timor, Lesser Sunda Islands	West and Central Africa	Caribbean, Central and South America	Africa and South America	West and Central Africa	Africa, Yemen, Central and South America
Vectors	Mosquitos: *Culex, Aedes, Anopheles, Mansonia*	Mosquitos: *Mansonia, Anopheles, Aedes*	Mosquitos: *Anopheles*	Tabanid flies: *Chrysops*	Biting midges: *Culicoides* Black flies: *Simulium*[a]	Biting midges: *Culicoides*	Biting midges: *Culicoides*	Black flies: *Simulium*
Adult habitat	Lymphatic system	Lymphatic system	Lymphatic system	Subcutaneous tissues, conjunctivae	Subcutaneous tissues	Mesenteries, connective tissues of abdominal organs	Dermis	Subcutaneous and deeper tissues
Habitat of microfilaria	Blood	Blood	Blood	Blood	Blood	Blood	Skin	Skin
Periodicity	Nocturnal[b]	Nocturnal[c]	Nocturnal	Diurnal	Aperiodic	Aperiodic	—	—
Sheath	Present	Present	Present	Present	Absent	Absent	Absent	Absent
Length (μm)[d] smears 2% formalin skin snips	 244–296 (260) 275–317 (298) —	 177–230 (220) 240–298 (270) —	 265–323 (287) 332–383 (358) —	 231–250 (238) 270–300 (281) —	 163–203 (183) 203–254 (224) —	 190–200 (195) 183–225 (203) —	 — — 180–240 (210)	 — — 304–315 (309)
Width (μm)	7.5–10.0	5.0–6.0	4.4–6.8	5.0–7.0	3.0–5.0	4.0–5.0	5.0–6.0	5.0–9.0
Tail	Tapered; anucleate	Tapered; subterminal and terminal nuclei widely separated	Tapered; subterminal and terminal nuclei widely separated	Tapered; nuclei irregularly spaced to end of tail	Long, slender, pointed; anucleate	Bluntly rounded; nuclei to end of tail	Bluntly rounded; bent into hook; nuclei to end of tail	Typically flexed; tapered to a point; anucleate
Key features of microfilaria	Short head space; dispersed nuclei; sheath unstained in Giemsa; body in smooth curves	Long head space; sheath stains pink in Giemsa; terminal and subterminal nuclei	Long head space; sheath unstained in Giemsa; terminal and subterminal nuclei	Single row of nuclei to end of tail; sheath unstained in Giemsa	Small size; long slender tail; aperiodic	Small size; blunt tail filled with nuclei; aperiodic	Slender shape; hooked tail filled with nuclei; occurs in skin	Flexed tail; occurs in skin, occasionally in urine or blood after treatment

[a] Reported in Brazil, Guyana, and the Amazon region of Colombia.
[b] Diurnally subperiodic in New Caledonian and Polynesian regions; nocturnally subperiodic in rural areas of Thailand.
[c] Nocturnally subperiodic in parts of Indonesia, Malaysia, Philippines, and Thailand.
[d] Mean values given in parentheses.

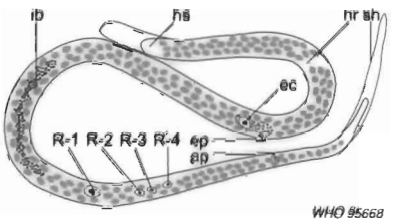
Introduction

Several species of filarial worms infect humans in the tropical and subtropical regions of the world (Table 1, overleaf). The adult worms inhabit various tissues and organs of the body and are inaccessible for identification. Consequently, diagnosis of filarial infections depends primarily on the identification of the larval stage of the parasite (microfilaria). Most species of microfilaria circulate in peripheral blood; however, some are found in the skin.

The microfilaria

At the light-microscopic level and with the aid of a variety of stains, a microfilaria appears as a primitive organism, serpentine in shape and filled with the nuclei of many cells. Figure 1 is a diagram of a typical microfilaria. In many, but not all, species, the body may be enveloped in a membrane called a sheath (**sh**). Where a sheath is present it may extend a short or long distance beyond either extremity of the microfilaria. In some species, depending on the stain used, the sheath displays a characteristic staining quality which aids in species identification. The nuclei of the cells that fill the body are usually darkly stained and may be crowded together or dispersed. The anterior extremity is typically devoid of nuclei and is called the cephalic or head space (**hs**); it may be short or long. Along the body of the microfilaria there are additional spaces and cells that serve as anatomical landmarks. These include the nerve ring (**nr**), excretory pore (**ep**), excretory cell (**ec**), and anal pore (**ap**). In some species, an amorphous mass called the innerbody (**ib**) and four small cells called the rectal cells (**R-1**, **R-2**, **R-3**, **R-4**) can be seen, usually with the aid of special stains. These structures and their positions are sometimes useful for species identification. The shape of the tail and the presence or absence and distribution of nuclei within it are also important in species identification.

Fig. 1 Typical microfilaria

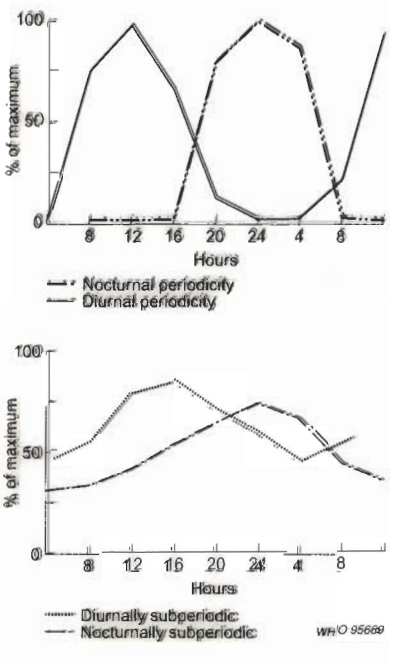


Periodicity

Some species of microfilariae circulate in peripheral blood at all hours of the day and night, while others are present only during certain periods. The fluctuation in numbers of microfilariae present in peripheral blood during a 24-hour period is referred to as periodicity (Fig. 2). Species that are found in the blood during night-time hours but are absent at other times are designated *nocturnally periodic* (e.g. *Wuchereria bancrofti*, *Brugia malayi*); those that are present only during certain daytime hours are designated *diurnally periodic* (e.g. *Loa loa*). Microfilariae that are normally present in the blood at all hours but whose density increases significantly during either the night or the day are referred to as *subperiodic*. Microfilariae that circulate in the blood throughout a 24-hour period without significant changes in their numbers are referred to as *nonperiodic* or *aperiodic* (e.g. *Mansonella* spp.).

The periodicity of a given species or geographical variant is especially useful in determining the best time of day to collect blood samples for examination. To determine microfilarial periodicity in an individual, it is necessary to examine measured quantities of peripheral blood collected at consecutive intervals of 2 or 4 hours over a period of 24–30 hours.

Fig. 2 Patterns of periodicity



Further reading

Basic laboratory methods in medical parasitology. Geneva, World Health Organization, 1991.

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