microfilariae. Microfilariae have the characteristic **basic structure**: sheath—head—body—tail; they do not contain vacuoles and they are not refractile or septated.

**Note**: spores of helicosporous fungi (e.g. Helicosporium, Helicomyces) that get on the blood film while it is drying, may be mistaken for microfilaria (Figure 13).

**Three microscopical methods are used for detection of microfilariae in peripheral blood:**

Thick films > Thin film capillary blood > Thin film venous blood  
(Gold standard → thick film capillary blood)

Use a 10× objective to locate microfilariae (search the entire blood film systematically) and switch to 40× and 100× (oil immersion) objectives to examine microfilariae for specific identification. Also, remember to look for malaria parasites with the 100× objective. For specific identification. Also, remember to look for malaria parasites with the 100× objective.

Unfortunately, not all the diagnostic features can be seen in Giemsa stained films, so occasionally special stains such as Delafield’s haematoxylin or diluted haematoxylin must be used to demonstrate them.

A concentration method may be used to increase sensitivity (dilute blood 1:2 in distilled water or saponin saline solution or 2% formalin to lyse red cells, spin at high speed and examine deposit).

**Microfilariae seen in blood films include:**
- *Wuchereria bancrofti* → tropical Africa, Asia, Egypt, Central and South America, Caribbean, Indian Ocean  
- *Wuchereria bancrofti var. pacifica* → Pacific Ocean (Melanesia, Polynesia, Caledonia)  
- *Brugia malayi* → southern India, South-East Asia e.g. Thailand and the Philippines. (southern China and Korea are now free of infection)  
- *Brugia timori* → South-East Asia (Indonesian archipelago, Timor Island)  
- *Loa loa* → West and Central Africa  
- *Mansonella perstans* → tropical Africa  
- *Mansonella ozzardi* → Latin American and Caribbean region (infests humans but is probably non pathogenic)

The most important filariases are *W. bancrofti* and *B. malayi* → lymphatic filariasis: 90% *Wuchereria*, 10% *Brugia* and *Loa loa* → loiasis.

In cases of suspected filariasis*, the time of day is important in taking blood samples for examination because some species have a periodicity. That is, microfilariae, released from the uterus of adult female worms, are present in the blood only at certain times of the day and in order to detect their presence, the blood must be collected at the appropriate time (‘window’ of detection), as shown in Table 3.

**TABLE 3. Blood collection times for suspected filariasis.**

<table>
<thead>
<tr>
<th>Species</th>
<th>When to take a blood specimen</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Wuchereria bancrofti</em></td>
<td>At night (best hours between 22 h and 24 h)</td>
</tr>
<tr>
<td><em>Wuchereria bancrofti</em> var. <em>pacific</em></td>
<td>Any time</td>
</tr>
<tr>
<td><em>Brugia malayi</em></td>
<td>At night (best between 22 h and 24 h)</td>
</tr>
<tr>
<td><em>Loa loa</em></td>
<td>During the day (best hours between 10 h and 12 h)</td>
</tr>
<tr>
<td><em>Mansonella spp.</em></td>
<td>Any time</td>
</tr>
</tbody>
</table>

Microfilariae may also be observed in **lymph node aspirates** usually in a background of a mixed population of cells comprising of mature lymphocytes, centrocytes, centroblasts, histiocytes, and eosinophils.

Microfilariae may occasionally be observed in **bone marrow aspirates**, more commonly in immunocompromised hosts e.g. patients with HIV, haematological malignancies, and solid tumours. An increased number of bone marrow eosinophils and their precursors are typically seen. Bone marrow filariasis may be asymptomatic or lead to aplastic, hypoplastic, or hyperplastic marrow with a normoblastic or a megaloblastic appearance.

In some cases, involvement of the bone marrow is associated with marrow hypoplasia, fever, and pancytopenia which may be severe. Whether these cases represent co-existence of filariasis with aplastic anaemia or toxic suppression of the bone marrow mediated by liberation of toxic metabolites by growing larvae (microfilariae) or cytokines is unclear. The majority of reported cases of aplastic anaemia with microfilariae in the bone marrow smears were *W. bancrofti* infections in patients from India.

A typical microfilaria appears serpentine in shape and filled with the nuclei of many cells; there are clear spaces (anucleate) which correspond to anatomic landmarks (Figure 14).

The presence of a **sheath** is a major virulence factor for microfilariae (it inhibits the attraction-aggregation of eosinophils to the microfilaria; binds complement inhibitors factor H and C4bBP and blocks complement activation). Microfilariae without a sheath (*M. perstans* and *M. ozzardi*) are doubtfully pathogenic microfilariae (Figure 15). A pathogenic microfilaria has a diameter of approximately