Focus False Parasites in Tissue Sections

J.K. Baird

An accurate histopathological diagnosis of parasitic infections may elude experienced parasitologists and pathologists. The parasitologist is often unacquainted with parasites presented in cross-section, and the pathologist is generally unfamiliar with parasitology. Thus the parasite in tissue sections is sometimes an enigma to those with diagnostic responsibilities.

The histopathological diagnosis of a parasitic infection is often a 'best fit' based on anatomic location, histopathology, and geographic location. For example, *Dirofilaria repens* in a subcutaneous abscess from an African patient can be misidentified as *Onchocerca volvulus*. Specific morphological features in tissue sections that would allow an accurate diagnosis are not widely known and not often considered, so it is not surprising that foreign bodies bearing a resemblance to parasites cause confusion. The result is not just misidentification, but a false positive diagnosis of a parasitic infection. Certain types of misidentification occur relatively often; occasionally quite startling errors are made (Figs 1–16, centrefold).

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**Common Confusion**

Liesegang bodies, the product of diffusion, nucleation, flocculation, precipitation, and supersaturation in colloidal solutions, may form in living tissues in the presence of inflammation and/or necrosis and can be confused with nematodes in tissue sections. Their location in the centres of necrosis creates the illusion of cause and effect.
Artefacts in Histopathological Diagnosis of Parasites

Histopathological diagnosis can be a minefield for the unwary. Misdiagnosis can take many forms. Lesion body found in lung tissue in the presence of inflammatory cells or necrosis are often confused with nematodes in tissue sections (Figs. 1 and 2). Diagnosis tends to reflect anatomic location (e.g., pulmonary diarrheal infection in lung; or the giant kidney worm in renal tissue). Serial sections should reveal the spherical geometry of the bodies. Starch grains from a bean in a necrotizing granuloma have also been confused with nematode eggs (Fig. 3). The non-infectious fungal L. pneumophila produces spores that appear in necrotizing granulomas in the lung. The pattern of the fungus in the lung (Fig. 4) is unusual. Serological finding of lymphocytosis suggestive of a nonspecific inflammatory reaction. The pattern of the fungus in the lung (Fig. 4) is unusual. Serological finding of lymphocytosis suggestive of a nonspecific inflammatory reaction.

1. Section: Leishman body in lung (L. pneumophila) Erro! diagnostic: pulmonary diarrheal infection
2. Section: Leishman body in kidney (H & E) Erro! diagnostic: giant kidney worm of dog
3. Section: blood smear Helicobacter pylori (H & E) Erro! diagnostic: gastritis
4. Section: Lycopodium spore (H & E) Erro! diagnostic: microfilaria
5. Section: wood splinter causing access in ear (H & E) Erro! diagnostic: maggot
6. Section: plant seed in epidermis (H & E) Erro! diagnostic: nematode
7. Section: plant seed in epidermis (H & E) Erro! diagnostic: nematode
8. Section: Demodex folliculorum (H & E) Erro! diagnostic: Demodex folliculorum
9. Section: Phorbus's arm (H & E) Erro! diagnostic: mycosis
10. Section: Pneumocystis (H & E) Erro! diagnostic: Pneumocystis jiroveci
11. Section: Pneumocystis (H & E) Erro! diagnostic: mycosis
12. Section: cytochrome oxidase in lung (H & E) Erro! diagnostic: toxoplasma gondii
13. Section: adult Strongyloides stercoralis (H & E) Erro! diagnostic: strongyloidiasis
15. Diatom from Fig. 14 (H & E) Erro! diagnostic: diatoms

Reformations for Histopathological Diagnosis of Parasitic Infections

1. Measure the diameter of the 'parasite' and compare it to known values.
2. Study multiple sections to appreciate the geometry of the object (e.g., sphere or tube).
3. Study special stains (e.g., PAS stain for plant materials).
4. Be comparative (e.g., compare the size of the object to similar organisms known to be parasitic. North America would be extraordinary).
5. First study a specimen without benefit of clinical history or opinion of others—decide or the ability to identify an organism based on its own merits and not on potentially misleading facts.
6. Seek the opinions of others without revealing one's own.
7. Once a diagnosis is rendered, consult a text to check agreement for morphology, life cycle, clinical symptoms and geography. Compare the general appearance with known sections of the parasite.
Non-infectious fungi produce spores that may lead to misdiagnosis. When lycopodium spores are diagnosed as _Ascaris lumbricoides_ eggs, patients invariably have a history of laparotomy in the Soviet Union where the spores once occurred in the talc of surgeon's gloves. Spores of _Helicosporum_ may be confused with microfilariae. Plant fibers, seeds and pollen also are a potential hazard. They may appear in almost any organ of man and present bizarre structures in tissue sections that are confused with parasites.

Insect parts occasionally appear in tissue sections. They are usually mouthparts of ticks, mosquitoes or lepidoptera, stings from hymenoptera, or commensal mites. These structures are confused with nematodes, maggots, scabies mites, maggots or helminth eggs.

Patients with acquired immune deficiency syndrome (AIDS) may suffer several opportunistic infections simultaneously. These are sometimes first recognized in tissue sections and misidentified, or as with the scabies mites the true cause of symptoms may be overlooked, and only discovered on subsequent re-examination.

### Avoiding Errors

Although some of the examples given (such as a Pharaoh's ant stumbling into an excised lymph node) are decidedly peculiar, the problem of misidentification is more widespread. To avoid confusion, a set of guidelines should be adhered to (see centrefold). These involve the careful analysis of the size, structure and staining pattern of the "parasite." Histopathological investigation should proceed without knowledge of clinical history and outside opinion, and at a later stage advice should be sought without any attempt to influence this advice. On diagnosis, texts should be examined to see if they accord with the characteristics of the parasite and the patient's condition, and known reference sections of the parasite should be consulted. But finally, at the end of the process, it is no failure to be still unsure of the identity of the parasite.

### References


Kevin Baird is in the Medical Service Corps, US Navy, Department of Parasitology, US Naval Medical Research Unit no. 2, Jakarta Detachment, APO San Francisco 96556–SO00, USA