

Practical Identification of Common Dermatophytes

David Ellis, Mycology Unit, Women's and Children's Hospital, North Adelaide, 5006 Australia

Full descriptions and colour illustrations are available in "MYCOLOGY ONLINE" www.mycology.adelaide.edu.au

Microscopic morphology of the micro and/or macroconidia is the most reliable identification character, but you need a good slide preparation and you may need to stimulate sporulation in some strains. Culture characteristics such as surface texture, topography and pigmentation are variable and are therefore the least reliable criteria for identification. Clinical information such as the site, appearance of the lesion, geographic location, travel history, animal contacts and race is also important, especially in identifying rare non-sporulation species like *M. audouini*, *T. concentricum* and *T. schoenleinii* etc.

Species	Microscopy	Culture	Comments
<i>Epidermophyton Group.</i> Smooth walled macroconidia only, no microconidia, colonies a green-brown to khaki colour			
<i>E. floccosum</i> anthropophilic human	Smooth, thin-walled, club-shaped macroconidia, often in clusters. No microconidia are formed.	Slow growing, greenish-brown or khaki suede-like surface, often raised and folded in the centre. Deep yellowish-brown reverse.	Macroconidia rapidly undergo transformation to large "balloon" chlamydoconidia and older cultures become pleomorphic.
<i>Microsporum Group.</i> Macroconidia with rough walls, microconidia may also be present. It is essential to observe macroconidia to make the identification. Difficulties occur with non-sporulating strains of <i>M. canis</i> and with the differential between <i>M. canis</i> and <i>M. audouinii</i> [use polished rice grains and potato dextrose agar].			
<i>M. canis</i> zoophilic cats	Macroconidia are typically spindle-shaped with 5-15 cells, verrucose, thick-walled and often have a terminal knob.	Colonies are flat, white to cream-coloured, with a dense cottony surface and usually have a bright golden reverse pigment, but non-pigmented strains may occur.	Small spored ectothrix hair invasion. Abundant growth and sporulation on polished rice grains.
<i>M. gypseum</i> geophilic soil	Macroconidia are ellipsoidal, thin-walled, verrucose and 4-6 celled.	Colonies are usually flat, suede-like to granular, with a deep cream to tawny-buff to pale cinnamon coloured surface and a yellow-brown reverse pigment.	Large spored ectothrix hair invasion. Do not confuse this species with <i>M. fulvum</i> .
<i>M. nanum</i> Zoophilic pigs and soil from pig yards	Macroconidia are small, ovoid to pyriform, mostly 2-celled with relatively thin, finely echinulate (rough) walls, and broad truncate bases.	Colonies are flat, cream to buff in colour with a suede-like to powdery surface texture with a dark reddish-brown reverse.	Invaded hairs may show a sparse ectothrix or endothrix infection but do not fluoresce under wood's light.

Trichophyton Group. Macroconidia are less distinctive and are often absent. Microconidia are more important and their shape, size and arrangement should be noted. Culture characteristics are also useful. Common species include *T. rubrum*, *T. mentagrophytes* and varieties, *T. tonsurans* and *T. equinum*. *T. verrucosum* may occasionally produce conidia on some media.

<i>T. rubrum</i> downy type anthropophilic	Most cultures show scanty to moderate numbers of slender clavate to pyriform microconidia. Macroconidia are usually absent..	Colonies are flat to slightly raised, white to cream, suede-like to downy, with a yellow-brown to wine-red reverse.	Note: on primary isolation some cultures may lack reverse pigmentation and fail to produce microconidia.
<i>T. rubrum</i> granular strain anthropophilic parent strain of downy type.	Most cultures have numerous clavate to pyriform microconidia and moderate numbers of smooth, thin walled multiseptate, slender cylindrical macroconidia.	Colonies are flat to slightly raised, white to cream, suede-like with a pinkish-red reverse.	Intermediate strains between the two types do occur and that many culture and morphological characteristics overlap.
<i>T. mentagrophytes</i> var. <i>interdigitale</i> anthropophilic	Numerous subspherical to pyriform microconidia, occasional spiral hyphae and spherical chlamydoconidia are present, the latter being more abundant in older cultures. Occasional slender, clavate, smooth-walled, multiseptate macroconidia are also present in some cultures.	Colonies are usually flat, white to cream in colour with a powdery to suede-like surface and yellowish and pinkish brown reverse pigment, often becoming a darker red-brown with age.	Key features include culture characteristics, microscopic morphology and <i>in vitro</i> perforation of human hair.
<i>T. mentagrophytes</i> var. <i>mentagrophytes</i> zoophilic mice, guinea-pigs, kangaroos, cats, horses, sheep and rabbits.	Numerous single-celled, spherical to subspherical microconidia are formed, often in dense clusters. Varying numbers of spherical chlamydoconidia, spiral hyphae and smooth, thin-walled, clavate shaped, multicelled macroconidia may also be present.	Colonies are generally flat, white to cream in colour, with a powdery to granular surface. Some cultures show central folding or develop raised central tufts or pleomorphic suede-like to downy areas. Reverse pigmentation is usually a yellow-brown to reddish-brown colour.	Key features include culture characteristics, microscopic morphology and clinical disease with known animal contacts.

T. mentagrophytes var. *interdigitale* can be distinguished from *T. rubrum* and from other varieties of *T. mentagrophytes* by (a) its culture characteristics and microscopic morphology on Sabouraud's dextrose agar and/or Lactrimel agar; (b) its growth and colony morphology on Sabouraud's salt agar (colonies of *T. mentagrophytes* unlike *T. rubrum*, grow very well on this medium and usually produce a distinctive dark reddish-brown reverse pigment); (c) Other confirmatory tests useful for distinguishing *T. mentagrophytes* from *T. rubrum* include a positive urease test (within 7 days), a positive hair perforation test and the production of a yellow-brown to pinkish-brown reverse pigment on pigment stimulation media like Lactrimel and *Trichophyton* No.1 agars.

<p><i>T. tonsurans</i> anthropophilic</p>	<p>Hyphae are relatively broad, irregular, much branched with numerous septa. Numerous characteristic microconidia varying in size and shape from long clavate to broad pyriform, are borne at right angles to the hyphae, which often remain unstained by lactophenol cotton blue. Very occasional smooth, thin-walled, irregular, clavate macroconidia may be present on some cultures. Numerous swollen giant forms of microconidia and chlamydoconidia are produced in older cultures.</p>	<p>Colonies show considerable variation in texture and colour. They may be suede-like to powdery, flat with a raised centre or folded, often with radial grooves. The colour may vary from pale-buff to yellow, the so called sulfureum form which resembles <i>Epidermophyton floccosum</i>, to dark-brown. The reverse colour varies from yellow-brown to reddish-brown to deep mahogany.</p>	<p>Key features include microscopic morphology, culture characteristics, endothrix invasion of hairs and partial thiamine requirement.</p>
<p>Non-Sporulating <i>Microsporum/Trichophyton</i> Species. No conidia are present, colonies are sterile. Chlamydoconidia or other hyphal structures may be present but are non-diagnostic. Can you stimulate sporulation? eg for <i>M. canis</i> and <i>T. rubrum</i>. Common species include <i>M. audouinii</i>, <i>T. verrucosum</i> and <i>T. violaceum</i>. Less common species include <i>T. concentricum</i>, <i>T. schoenleinii</i>, <i>T. soudanense</i> and <i>M. ferrugineum</i>.</p>			
<p><i>T. verrucosum</i> zoophilic cattle</p>	<p>All strains produce typical chains of chlamydoconidia, often referred to as "chains of pearls", when grown in brain heart infusion broth containing para-aminobenzoic acid (P.A.B.) and agar at 37°C.</p>	<p>Colonies are slow growing, small, button-or-disk-shaped, white to cream coloured, with a suede-like to velvety surface, a raised centre, and flat periphery with some submerged growth. Reverse pigment may vary from non-pigmented to yellow</p>	<p>Key features include culture characteristics and requirements for thiamine and inositol, large ectothrix invasion of hair, clinical lesions and history.</p>
<p><i>T. violaceum</i> anthropophilic</p>	<p>Hyphae are relatively broad, tortuous, much branched and distorted. No conidia are usually seen, although occasional pyriform microconidia have been observed on enriched media. Numerous chlamydoconidia are usually present, especially in older cultures.</p>	<p>Colonies are very slow growing, glabrous or waxy, heaped and folded and a deep violet in colour. Cultures often become pleomorphic, forming white sectors and occasional non-pigmented strains may occur</p>	<p><i>T. violaceum</i> has a partial nutrient requirement for thiamine. The partial requirement for thiamine separates this organism from <i>T. gourvillii</i>, <i>T. rubrum</i>, and other species that may produce purple pigmented colonies.</p>