Superficial fungal infections are common and universal, but can often be remedied quickly with appropriate medication. However, their presenting features mean that fungal infections are all too frequently mistaken for disorders such as eczema and psoriasis, and consequently mistreated. *Fast Facts – Superficial Fungal Infections,* written by two clinical mycology specialists, is a concise guide to the accurate diagnosis and effective treatment of commonly encountered fungal infections.

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Superficial Fungal Infections

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<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td>Common fungi and their routes of transmission</td>
<td>7</td>
</tr>
<tr>
<td>Laboratory diagnosis</td>
<td>13</td>
</tr>
<tr>
<td>Tinea capitis</td>
<td>23</td>
</tr>
<tr>
<td>Tinea corporis and cruris</td>
<td>30</td>
</tr>
<tr>
<td>Tinea unguium (onychomycosis)</td>
<td>35</td>
</tr>
<tr>
<td>Other tinea infections</td>
<td>41</td>
</tr>
<tr>
<td>Pityriasis versicolor</td>
<td>45</td>
</tr>
<tr>
<td>Cutaneous <em>Candida</em> infections</td>
<td>49</td>
</tr>
<tr>
<td>Future trends</td>
<td>52</td>
</tr>
<tr>
<td>Key references</td>
<td>53</td>
</tr>
<tr>
<td>Index</td>
<td>54</td>
</tr>
</tbody>
</table>

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Introduction

Superficial fungal infections (dermatomycoses) are very common and occur throughout the world. Most of these infections are caused by dermatophytic moulds (the terms tinea and ringworm are synonymous with dermatomycosis). Dermatophytic infections are contagious diseases caused by either a human (anthropophilic) or animal (zoophilic) species of dermatophyte fungi.

A second group of superficial infections is caused by yeasts. *Candida* species cause infections of the mucous membranes, skin and fingernails (candidiasis or thrush) and *Malassezia furfur* (*Pityrosporum orbiculare*) infects the skin, usually the trunk (pityriasis versicolor). Both organisms are commensals of humans.

These infections can be difficult to diagnose and are often mistaken for other disorders, such as eczema or psoriasis. With the exception of nail infections, fungal infections respond quickly and can be managed effectively if treated correctly. In *Fast Facts–Superficial Fungal Infections*, we have tried to provide clinicians with a brief, accessible and illustrated introduction to fungal diseases of the skin, hair and nails. Particular attention has been paid to clinical presentation, laboratory investigation, diagnosis, treatment and prevention. A special effort has been made to ensure that dosage recommendations are accurate and in agreement with consensus opinion at the time of publication. The medications described do not necessarily have specific approval by the appropriate regulatory authorities for use as they are recommended here. As dosage regimens may be modified as new research and laboratory studies are undertaken, clinicians are advised to check packaging information for recommended doses and contraindications for use. This is particularly important with new or infrequently used drugs.
Fungal infections of the skin, hair and nails are among the most common causes of skin disease in the UK and USA. They can be difficult to diagnose, however, and are often mistaken for other disorders, such as eczema or psoriasis. With the exception of nail infections, fungal infections respond quickly and can be managed satisfactorily if treated correctly.

Fungal infections are generally diagnosed on the basis of clinical appearance. However, the steroid response of a dermatosis may be used in diagnosis, so it is important that appropriate investigations are instigated before administering any form of treatment, which often comprises an antifungal/steroid cream. This approach will enable the diagnosis to be reassessed if initial treatment is unsuccessful.

The principal fungal infections are caused by dermatophyte fungi (tinea or ringworm infections), and the yeasts *Candida albicans* and *Pityrosporum orbiculare* (*Malassezia furfur*).

**Dermatophytes**

Dermatophytes belong to three genera:

- *Trichophyton*
- *Microsporum*
- *Epidermophyton*.

**Aetiology.** Dermatophytes are characterized by their ability to exist and grow in keratin. This enables them to invade the stratum corneum of the skin and keratinized structures, such as hair and nails, with minimal stimulation of the host’s immune response.

Fungal growth in keratinized tissues is restricted to the production of hyphae, which branch and segment into chains of spores called arthrospores or arthroconidia (Figure 1.1). Arthrospores are the main means of dissemination and propagation of the fungus (Figures 1.2–1.5), and can remain viable and infective in the environment and exfoliated skin for many months, and even years. Although arthrospores are common, in the horny layer of the skin and in nail, hyphae may be present without
Figure 1.1 Arthrospores of *Trichophyton mentagrophytes*.

Figure 1.2 Arthrospores of *Trichophyton mentagrophytes* adhering to a human corneocyte.

Figure 1.3 Growth of *Trichophyton mentagrophytes* on human stratum corneum.

Figure 1.4 Growth of *Trichophyton mentagrophytes* on human nail.

Figure 1.5 Growth of *Trichophyton mentagrophytes* on a human hair shaft.
Tinea capitis is a common infection occurring predominantly in prepubertal children. Although infection in adults can occur, it is rare. One risk factor for adult disease is immunosuppression resulting from drugs or therapeutic interventions. *Microsporum* and *Trichophyton* species are the aetiological agents of tinea capitis. The most common causative fungi are *T. tonsurans* and *M. canis*.

All species can cause similar types of infection in terms of inflammatory and non-inflammatory conditions. However, the organisms that cause endothrix tinea capitis are *T. tonsurans*, *T. violaceum*, *Trichophyton soudense*, *Trichophyton gourvilli* and, occasionally, *T. rubrum*.

The fluorescent *Microsporum* species (*M. canis*, *M. audouinii*, *Microsporum ferrugineum* and *Microsporum distortum*) and other *Trichophyton* organisms, such as *T. rubrum*, which can also cause endothrix infection, and *T. mentagrophytes*, produce ectothrix infection.

**Epidemiology**

Although the epidemiology of tinea capitis has changed over the past 30 years, the infection remains endemic in the developing world and mainly involves anthropophilic species. Anthropophilic infection secondary to *M. audouinii* is now relatively uncommon in the developed world as a result of improved social conditions and the development of effective treatments. Sporadic cases of *M. canis* infection occur worldwide and are difficult to eradicate, because domestic animals, such as cats and dogs, are the primary hosts.

More recently, the prevalence of *T. tonsurans* has increased significantly, particularly in poor urban communities. The infection is more common in individuals of African descent, though the reasons for this are unclear. *T. tonsurans* is also the most common pathogen in the USA and is emerging as such in Europe. It is likely that both hair-care products and genetic predisposition play a role in susceptibility to this infection.
Clinical presentation

Tinea capitis can present in several different ways. The clinical picture varies geographically, and is also dependent on the primary host. Tinea capitis normally presents as either grey-patch ringworm, usually associated with *M. audouinii* and previously common in North America and Europe, or as black-dot ringworm, often associated with *T. tonsurans* or *T. violaceum* infection. Lesions vary from a dry, scaly patch of alopecia, often associated with *M. audouinii* or *M. canis*, to a kerion, which is most commonly seen in *T. tonsurans* or *T. verrucosum* infection. *T. tonsurans* also produces a more diffuse infection, resulting in fragile broken hairs.

Alopecia. The most common presentation is as a discrete patch of alopecia, with or without scale (Figures 3.1 and 3.2), that may mimic alopecia areata. Patients with tinea capitis also develop posterior cervical adenopathy, which helps to distinguish tinea capitis from other cutaneous diseases that result in alopecia, such as alopecia areata. Broken hairs close to the root in the scalp may also be seen and, if the patient has black hair, this is often referred to as a ‘black-dot’ presentation. Black dots may occur within a single patch or diffusely across the scalp.

Kerion. The development of pustules and abscesses, known as a kerion, is another possible presentation (Figure 3.3). Such abscesses can be painful and several centimetres in diameter. A kerion is an advanced form of tinea capitis and is a hypersensitive reaction. It can occur on some parts of the scalp,