



Public Health
England

Protecting and improving the nation's health

Fungal skin and nail infections: Diagnosis and laboratory investigation

Quick reference guide for primary care:
For consultation and local adaptation

About Public Health England

Public Health England (PHE) exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships, and the delivery of specialist public health services. PHE is an executive agency of the Department of Health, and is a distinct delivery organisation with operational autonomy to advise and support government, local authorities, and the NHS, in a professionally independent manner.

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Foreword – Aims and adaptations

Audience

- primary care prescribers in general practice and out of hours settings; including doctors, nurses and pharmacists
- those giving first point of contact for fungal skin and nail infections in adults

Aims

- to provide a simple, effective, economical and empirical approach to the diagnosis and treatment of fungal skin and nail infections
- to minimise the emergence of antibiotic resistance in the community

Implications

- the guidance should lead to more appropriate antibiotic use
- use of this guidance may influence laboratory workload, which may have financial implications for laboratories and primary care commissioners

Production

- the guidance has been produced in consultation with the Association of Medical Microbiologists, general practitioners, nurses, specialists, and patient representatives
- the guidance is in agreement with other publications, including **CKS**, **SIGN** and **NICE**
- the guidance is fully referenced and graded
- the guidance is not all-encompassing, as it is meant to be ‘quick reference’
- if more detail is required we suggest referral to the websites and references cited
- the guidance will be updated every three years; or more frequently if there are significant developments in the field

Poster Presentation of Guidance

- the summary table is designed to be printed out as a poster for use in practice
- the rationale and evidence is designed to be used as an educational tool for you, and your colleagues and trainees, to share with patients as needed

Local Adaptation

- we would discourage major changes to the guidance, but the format allows minor changes to suit local service delivery and sampling protocols
- to create ownership agreement on the guidance locally, dissemination should be agreed and planned at the local level between primary care clinicians, laboratories and secondary care providers

We welcome opinions on the advice given. Please email any evidence or references that support your requests for change so that we may consider them at our annual review. Comments should be submitted to Professor Cliodna McNulty, Head of PHE Primary Care Unit, Microbiology Laboratory, Gloucestershire Royal Hospital, Great Western Road, Gloucester GL1 3NN.

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Quick reference guide

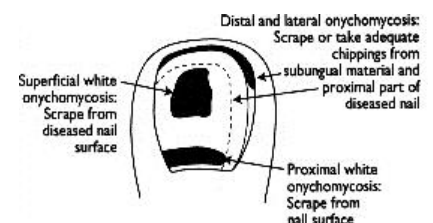
- ☑ Many nail problems can look like fungal infections, eg psoriasis or injury. Always send samples before starting long-term treatment, as only 45% of dermatology samples received are positive for fungal infections.^{1B-}
- ☑ Microscopy detects 91% of positives, and provides the most rapid diagnosis.^{1B-}
- ☑ Culture distinguishes dermatophyte from non-dermatophyte moulds, which is important as this may alter treatment.

WHEN SHOULD I TAKE DERMATOLOGICAL SAMPLES FOR FUNGI?

- Samples are not needed for:
 - uncomplicated Athlete's foot (tinea pedis)
 - mild infections of the groin; if samples are not taken, treat as suspected Candida or Erythrasma with topical imidazole^{5A-}
 - mild skin ringworm
- Take samples for fungi:
 - when oral treatment is being considered (scalp ringworm or nail disease)
 - in severe or extensive skin fungal infections, eg moccasin-type Athlete's foot
 - skin infections refractory to initial treatment, as occasionally gram negative bacterial infections cause interdigital cracking that looks like tinea pedis^{6B+}
 - when the diagnosis is uncertain
- ☑ Ensure clinical details are stated, including treatment, animal contact, and overseas travel.

HOW SHOULD I TAKE SAMPLES FOR FUNGAL INVESTIGATION?

- Swabs are of little value for dermatophytes, unless there is insufficient material obtained by scraping.
- Wipe off any treatment creams before sampling.
- Keep any samples at room temperature. Do not refrigerate as dermatophytes are inhibited at low temperatures, and humidity facilitates the growth of contaminants.^{8C}
- Samples should be collected into folded dark paper squares. Secure dark paper squares with a paper clip and place in a plastic bag, or use commercially available fungal packets, eg Mycotrans; Dermapak.^{9D}
- Skin scrapings:
 - scrape skin from the advancing edge of lesion; use a blunt scalpel blade or similar
 - 5mm² of skin flakes are needed for microscopy and culture
- Nail samples (better taken by clinicians).^{3D}
 - most viable fungi are usually found in the most proximal part of diseased nail; sample with chiropody scissors
 - include full thickness clippings of the diseased nail
 - sample as far back from nail tip as possible, as this is where fungi are usually found; also sample debris from under the diseased part of the nail
 - in superficial infections, scrape surface of diseased nail plate with scalpel blade
- Hair samples:^{2A+,21A-}
 - take scalp scrapings, as this often pulls out infected hair stumps, which are critical for successful culture and microscopy; hair plucking does not produce the best samples.
 - a soft toothbrush can be used if scrapings are not possible.^{21A-}



INTERPRETING THE LABORATORY REPORT

- ❑ When to treat:
 - a positive microscopy (fungal elements seen) is sufficient to start antifungals
 - a positive dermatophyte culture with negative microscopy is still significant
 - a negative microscopy or culture does not rule out fungal infection, particularly with kerion and nail infections; if clinical appearance very suggestive of fungal infection, repeat sample and start treatment.
- ❑ Significant fungi isolated and reported:^{1B-}
 - the most common dermatophytes from foot or trunk infections are *T. rubrum* (80%) and *T. interdigitale* (15%)^{1B-}
 - *Epidermophyton floccosum* and *Microsporum* species are also encountered
 - *T. tonsurans* and *T. violaceum* cause 80% of scalp infections in the UK^{1B-}
 - *Scytalidium* spp. are the most common non-dermatophyte moulds that can cause both skin and nail infections^{10B+}
 - true nail infections with the yeasts *C. albicans* and *C. parapsilosis* are rare and are more likely to affect the finger nail or finger nail folds; other *Candida* spp. may very rarely cause paronychia^{3D,4D,11B+}
- ❑ Fungi of uncertain clinical significance:^{12B-}
 - non-dermatophyte moulds (eg *Aspergillus* spp., *Scopulariopsis* spp., *Acremonium* spp.) are very rare causes of nail infection, usually following nail trauma, immunosuppression, or underlying dermatophyte infection; discuss management with a local microbiologist or dermatologist
 - such a diagnosis requires positive direct microscopy, isolation of the organism in pure culture, and ideally, on repeated occasions
 - repeat sample usually requested to confirm significance of non-dermatophyte moulds
- ❑ Antifungal susceptibilities:^{4D,13D,14B+,15B+,16A+}
 - susceptibility testing of dermatophytes is not required, as antifungal resistance is rare, and there is no known correlation between antifungal susceptibilities and outcome

TREATING FUNGAL SKIN AND NAIL INFECTIONS

- ☑ ❑ **For non-dermatophyte moulds other than *Candida* spp. seek the advice of a microbiologist or dermatologist.**
- ❑ Dermatophyte and candida infection of the fingernail or toenail:^{17A+,18A+,19A-}
 - treat only if infection confirmed by laboratory; only use topical treatment if superficial infection of the top surface of nail plate; 5% amorolfine nail lacquer; 1-2 times weekly; 6 months on fingers; 12 months on toes
 - for infections with dermatophytes use oral terbinafine; 250mg OD; 6-12 weeks on fingers; 3-6 months on toes; or itraconazole; 200mg BD; 2 courses of 7 days a month for fingers; 3 courses of 7 days a month for toes
 - for infections with candida or non-dermatophyte moulds use oral itraconazole
 - idiosyncratic liver and other severe reactions occur very rarely with terbinafine and itraconazole
 - for children, seek specialist advice
- ❑ Dermatophyte infection of the skin:^{17A+,19A-,20A-}
 - take skin scrapings for culture
 - as terbinafine is fungicidal, one week is as effective as 4 weeks azole which is fungistatic; topical 1% terbinafine; 1-2 times daily; 1 week

☑	<ul style="list-style-type: none">• if intractable, consider oral terbinafine• discuss scalp infections with specialist• use a 1% azole cream for groin infections; 1-2 times daily; 4-6 weeks• topical undecenoic acid or 1% azole; 1-2 times daily; 4-6 weeks☐ Candida infection of skin:^{20A-}<ul style="list-style-type: none">• confirm by laboratory• treat with 1% azole cream; use lotion if treating paronychia; 1-2 times daily; 1 week, or in case of paronychia, until swelling goes• seek advice for nail infection☐ <i>Pityriasis versicolor:</i>^{20A-}<ul style="list-style-type: none">• scratching the surface of the lesion should demonstrate mild scaling• 1% azole cream; 1% terbinafine or shampoo containing ketoconazole; 1-2 times daily; usually 1 week☐ Follow-up: unless there is underlying disease, eg psoriasis, eradication of the fungus generally restores the nail to its pre-infection state.^{4D} Siblings of children with scalp ringworm should be screened by scalp brushing.^{21A-}
KEY: ☑ = good practice point	

GRADING OF GUIDANCE RECOMMENDATIONS

The strength of each recommendation is qualified by a letter in parenthesis. This is an altered version of the grading recommendation system used by **SIGN**.

STUDY DESIGN	RECOMMENDATION GRADE
Good recent systematic review and meta-analysis of studies	A+
One or more rigorous studies; randomised controlled trials	A-
One or more prospective studies	B+
One or more retrospective studies	B-
Non-analytic studies, eg case reports or case series	C
Formal combination of expert opinion	D

This guidance was originally produced in 2009 by the South West GP Microbiology Laboratory Use Group, in collaboration with the Association of Medical Microbiologists, general practitioners, nurses and specialists in the field. This guidance was reformatted in 2017 in line with PHE recommendations. For detailed information regarding the comments provided and action taken, please email sarah.alton@phe.gov.uk. Public Health England works closely with the authors of the **Clinical Knowledge Summaries**.

If you would like to receive a copy of this guidance with the most recent changes highlighted, please email sarah.alton@phe.gov.uk.

For detailed information regarding the search strategies implemented and full literature search results, please email sarah.alton@phe.gov.uk.

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RATIONALE: An excellent well-referenced comprehensive review of the management of fungal skin and nail infections.
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RATIONALE: Erythrasma is due to a Gram-positive bacterium *Corynebacterium minutissimum* that produces porphyrins and therefore fluoresces and characteristic coral-pink colour under a Wood's light. Azoles are effective for the treatment of erythrasma as they are active against Gram-positive bacteria.
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RATIONALE: There are three reasons for not refrigerating specimens. Firstly, it is important to keep skin, hair, and nail samples dry as this reduces bacterial growth, and

refrigeration and warming to room temperature might increase humidity. Secondly, storage at room temperature is simpler, and most specimens are sent in the ordinary post, which is all at room temperature. Finally, low temperatures do affect the growth of some dermatophytes, *Malassezia* species, and a very few candidas.

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RATIONALE: This large study including 1,361 patients, includes the treatment of patients with dermatophytes, *Candida albicans*, and *Malessezia furfur* (*Pityrosporum orbiculare*), the causative agent of *Pityriasis versicolor*.

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NOTE: Brushes are available from Brushaway Products. Some GP stores will supply them to a local area. They are small, easy to use, and are robust enough to be posted without damage. They are very useful for screening family contacts, or when insufficient material can be obtained by scraping. They are not a direct alternative to scraping, as you have to wait for the culture result (2-3 weeks), whereas the microscopy result from a scrape should be available within 1-2 days.

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QUICK REFERENCE GUIDE AUTHORS

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For any further information regarding the review process and those involved in the development of this guidance, please email sarah.alton@phe.gov.uk.

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Abbreviations

BD = Twice daily

C. albicans = *Candida albicans*

C. parapsilosis = *Candida parapsilosis*

mg = Milligram(s)

mm = Millimetre

OD = Once daily

spp. = Species

T. interdigitale = *Trichophyton interdigitale*

T. rubrum = *Trichophyton rubrum*

T. tonsurans = *Trichophyton tonsurans*

T. violaceum = *Tricholosporum violaceum*