

Microbe of the month

Breaking The Chain of Infection

Cutimed®

MARCH 2021

Newsletter

Compiled by Helen Loudon (PC Consultant)

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Featured this month:

SUPERFICIAL FUNGAL INFECTIONS

Commonly seen, sometimes difficult to treat.

Hello readers!

Summer is here! And with it, higher temperatures, and humidity... Yeasts and fungi thrive under these conditions, and contributory factors such as HIV, cytotoxic chemotherapy, broad-spectrum antibiotic therapy (which promotes the overgrowth of fungi in the gut) diabetes mellitus and corticosteroid therapy make people more susceptible to these infections.

More than 20% of the world's population suffers from fungal disease, ranging from superficial skin, nail, and mucous membrane infections to invasive and life-threatening fungal infections such as *Candida auris* (**Microbe of the Month October 2019**) and Cryptococcal meningitis.

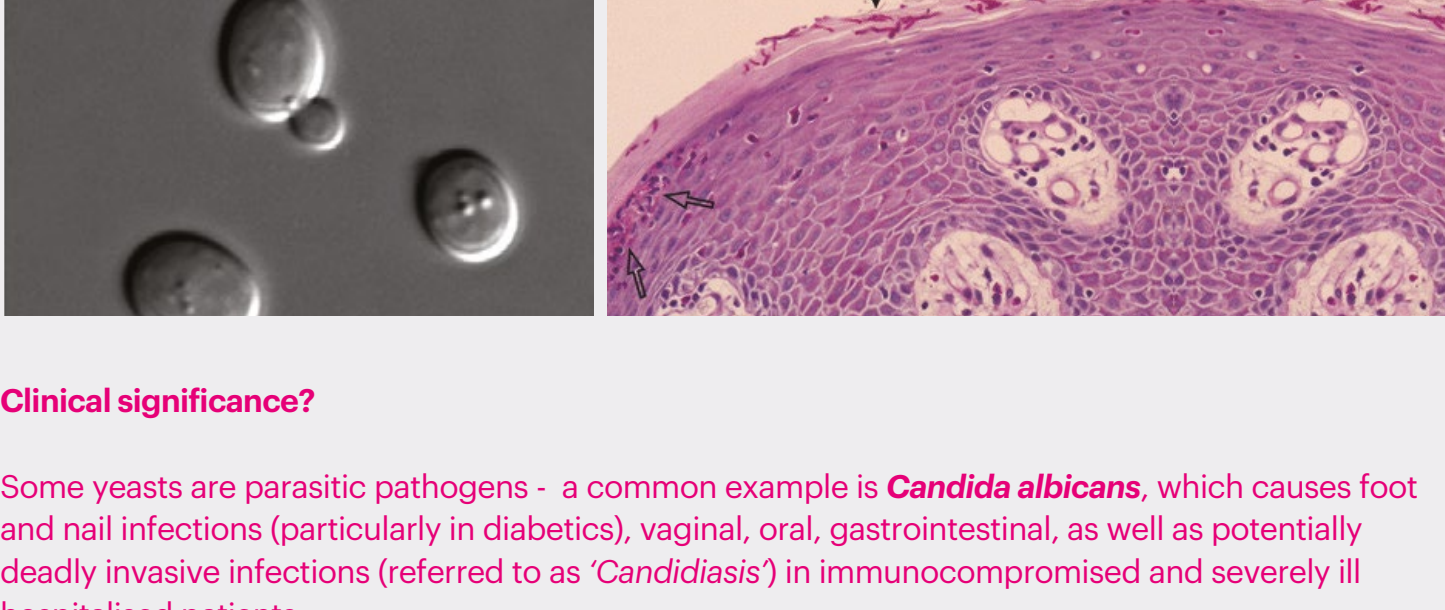
IS THERE A DIFFERENCE BETWEEN YEASTS AND FUNGI?

Simply put, YES! Basic insights into the structure and proliferation of these microorganisms are quite important to understand how and why they cause different types of infection and is helpful in their diagnosis and treatment.

Similarities between pathogenic yeasts and fungi (the singular term is 'fungus')

Both yeasts and fungi belong to the kingdom of Fungi. The main difference is in their structure and how they proliferate (reproduce). Their cell walls are made up of a fibrous polysaccharide substance called 'chitin', and because they feed upon non-living organic matter - in this case, the stratum corneum of the epidermis, and the hair and nails of humans and animals - they are referred to as '**dermatophytes**' (from the Greek 'dermatos' for skin, and 'phyton' for plant).

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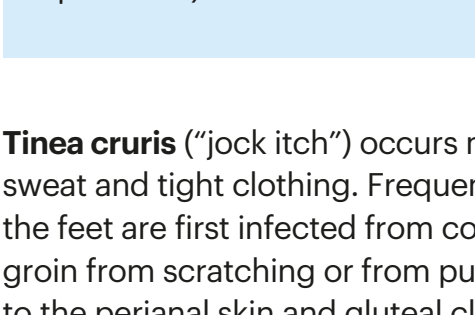
Some moulds and fungi grow rapidly by forming branch-like filaments known as 'hyphae'.



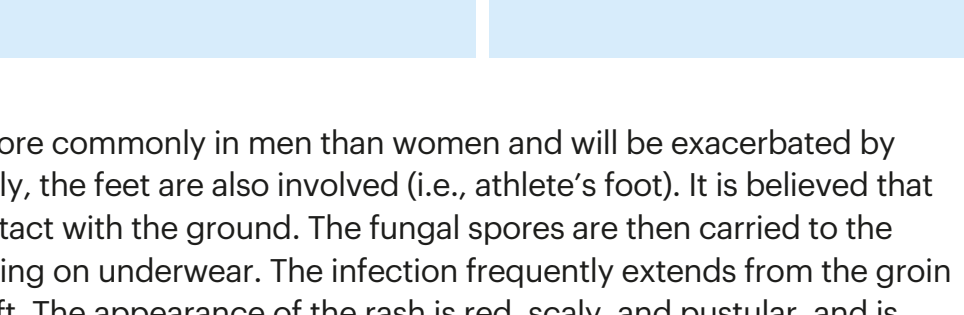
Moulds and fungi reproduce through the production of spores which can remain viable in the environment for months to years.



Moulds cultured on a petri dish - the vivid colours are from the pigments in the spores, which are used for reproduction.



Yeasts reproduce by 'budding' (eg. Candida albicans)

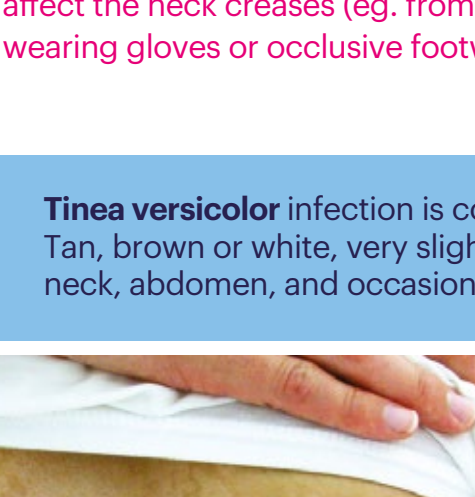


Skin biopsy demonstrating Candida fungal pseudohyphae in the stratum corneum of the epidermis.

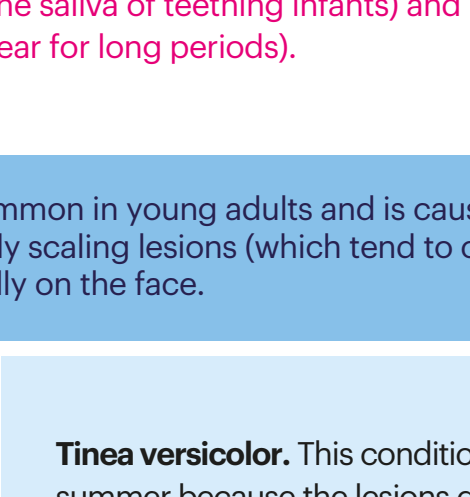
Clinical significance?

Some yeasts are parasitic pathogens - a common example is **Candida albicans**, which causes foot and nail infections (particularly in diabetics), vaginal, oral, gastrointestinal, as well as potentially deadly invasive infections (referred to as 'Candidiasis') in immunocompromised and severely ill hospitalised patients.

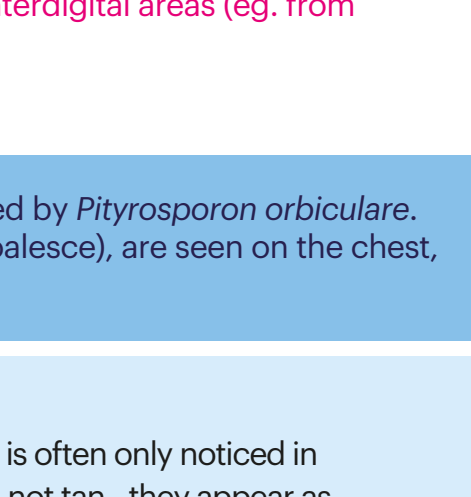
Fungal dermatophytes cause diseases such as 'ringworm' and 'athlete's foot' in humans and animals - *Microsporium*, *Trichophyton* and *Epidermophyton* are most commonly implicated in these superficial skin infections.



Tinea corporis with an active border and central clearing.



Tinea faciei or facial ringworm.



Tinea capitis or scalp ringworm.

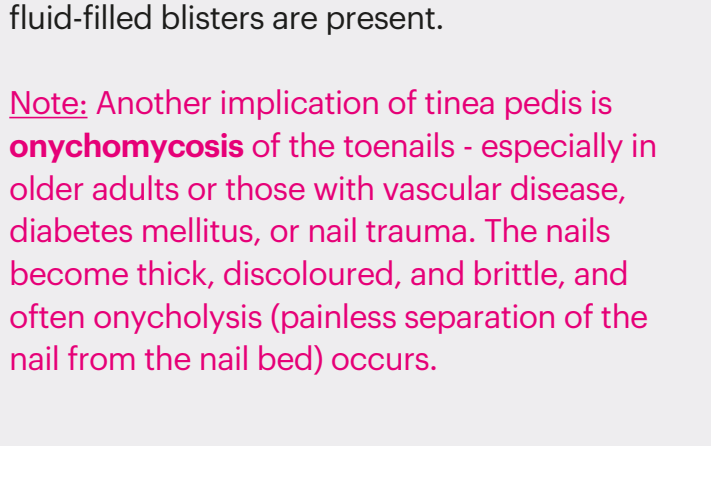
The lesions appear as round, red, scaly, patches with well-defined, raised edges, often with a central clearing, and are very itchy. (Note: 'ringworm' can be confused with contact dermatitis, eczema, and psoriasis.)

It may be misdiagnosed for other conditions like psoriasis, discoid lupus, etc. and will be aggravated by treatment with topical steroid creams.

Children from ages 3 to 7 are most commonly infected with tinea capitis. **Note:** Tinea capitis should be treated with systemic antifungal agents.

Tinea cruris ('jock itch') occurs more commonly in men than women and will be exacerbated by sweat and tight clothing. Frequently, the feet are also involved (i.e., athlete's foot). It is believed that the feet are first infected from contact with the ground. The fungal spores are then carried to the groin from scratching or from putting on underwear. The infection frequently extends from the groin to the perianal skin and gluteal cleft. The appearance of the rash is red, scaly, and pustular, and is usually very itchy.

Note: It is important to differentiate *Tinea cruris* from other similar dermal conditions such as intertriginous Candidiasis, erythrasma, or psoriasis.



Tinea cruris - also referred to as 'jock itch'



Intertrigo in a skin fold

Clinical significance?

Intertrigo (also known as 'intertriginous dermatitis') is an inflammatory condition of the skin folds, induced or aggravated by heat, moisture, maceration, friction, and lack of air circulation. This condition is frequently complicated by secondary infection, most commonly with **Candida species**; however bacterial, viral, or other fungal microorganisms may be implicated. Intertrigo commonly affects the axilla, perineum, inframammary creases, and abdominal folds. Less commonly, it can affect the neck creases (eg. from the saliva of teething infants) and interdigital areas (eg. from wearing gloves or occlusive footwear for long periods).

Tinea versicolor infection is common in young adults and is caused by *Pityrosporum orbiculare*. Tan, brown or white, very slightly scaling lesions (which tend to coalesce), are seen on the chest, neck, abdomen, and occasionally on the face.



Tinea versicolor. This condition is often only noticed in summer because the lesions do not tan - they appear as white 'sunspots'.



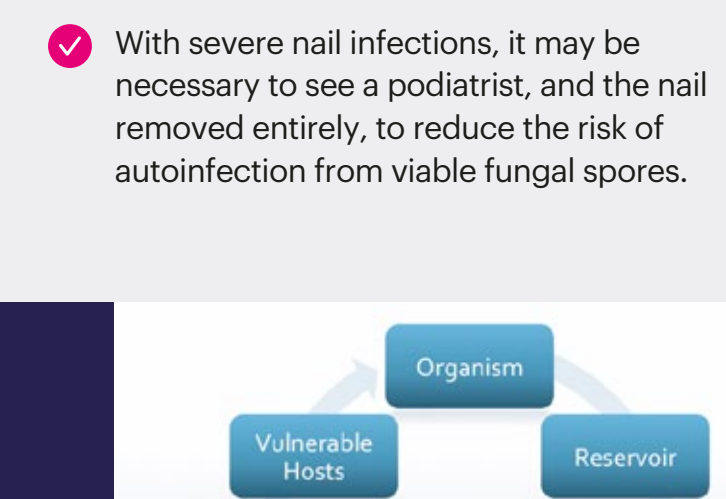
Wood's lamp examination - a source of long wave ultraviolet light. It is used to detect the fluorescence in fungal skin and hair infections which is a feature of some dermatophytes.

Athlete's Foot - 'Tinea pedis'

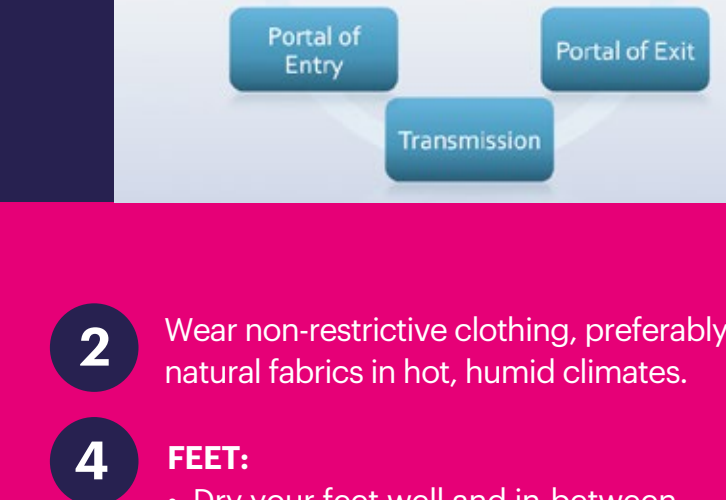
Contrary to the name, **Tinea pedis** does not solely affect athletes. **Tinea pedis** affects more than women and is uncommon in children. The primary method of incubation and transmission is when people go barefoot in a moist communal environment such as a changing room or shower, and then put on their shoes. Infected skin 'squames' (flat, keratinised, dead skin cells), which are continually shed from the horny, outermost layer of the skin, spread the fungal spores.

The infection can be seen between the toes and may spread to the sole of the foot in a 'moccasin' pattern. The lesions may be accompanied by peeling, maceration (peeling due to moisture), and itching. In severe cases, the infection may progress into a 'vesiculobullous pattern' in which small, fluid-filled blisters are present.

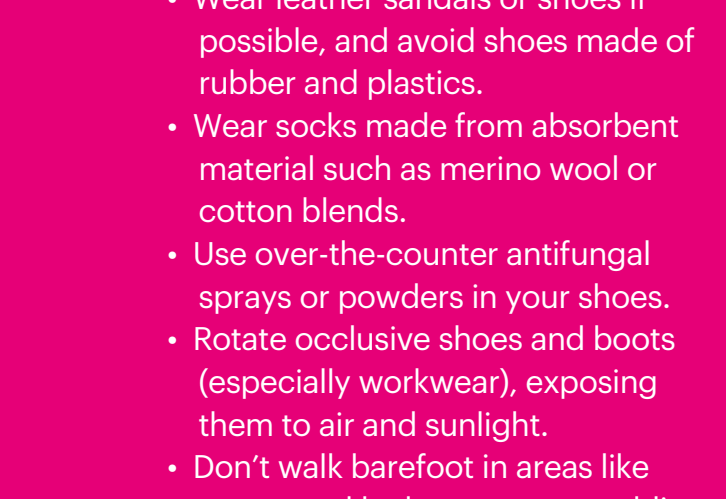
Note: Another implication of tinea pedis is **onychomycosis** of the toenails - especially in older adults or those with vascular disease, diabetes mellitus, or nail trauma. The nails become thick, discoloured, and brittle, and often **onycholysis** (painless separation of the nail from the nail bed) occurs.



Athlete's foot - Tinea pedis



Moist inter-digital Tinea pedis

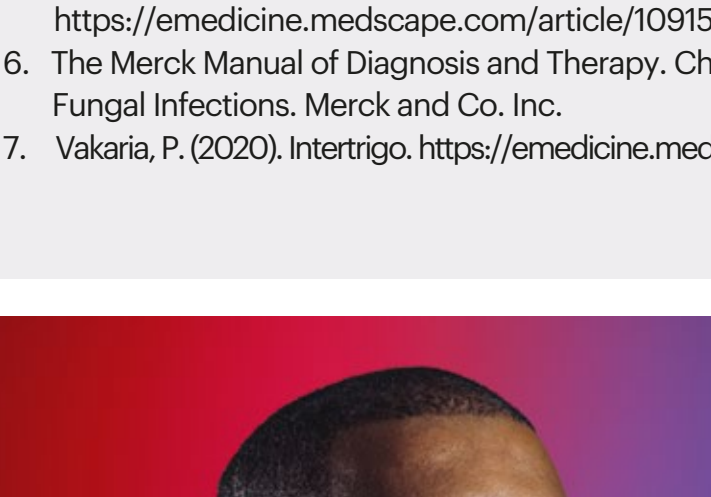


Tinea pedis - 'moccasin' type

FUNGAL NAIL INFECTIONS - 'ONYCHOMYCOSIS'

Fungal nail infections are more common in toenails than fingernails and cause the nail to become discoloured (yellow or brown), thickened, and more likely to crumble and break. Fungal nail infections are caused by many different types of fungi (yeasts or moulds) which live in the environment.

A small crack or an injury to the nail or the surrounding skin (for example, during a pedicure, especially where cleaning and disinfection of the equipment and infection control precautions are poor) permits ingress of these fungi and the development of infection. A fungal nail infection is not usually painful unless it becomes severe and may also be accompanied by another infection (usually between the toes) commonly referred to as 'athlete's foot'.



Fingernail infections are usually cured more quickly and effectively than toenail infections. Mild infections affecting one or two nails may respond to topical antifungal medications, however a cure usually requires oral antifungal medication for several months.



Candida infection of the nail plate generally results from paronychia (inflammation around the nail), and starts near the nail fold (the cuticle).

The nail fold is swollen and red. White, yellow, green, or black marks appear on the nearby nail and spread.

The nail may lift off its bed and is tender under pressure.

HOW IS THE DIAGNOSIS OF FUNGAL SKIN AND NAIL INFECTIONS MADE?



✓ Examination and a detailed history will usually highlight likely risk factors for the infection.

✓ Clippings should be taken from crumbling tissue at the end of the infected nail or the debris can be scooped out from under the nail. Similarly, skin scrapings are taken, and these are sent to the mycology section of the pathology laboratory.

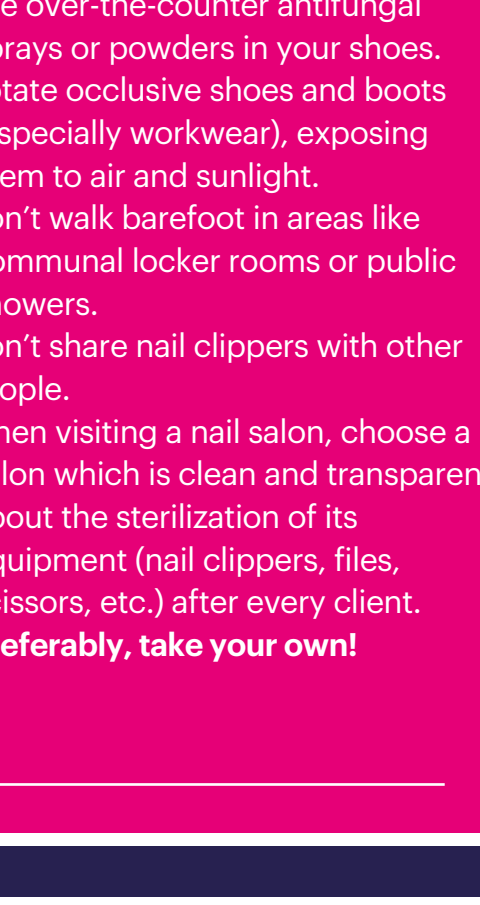
✓ Previous treatment may reduce the chance of growing the fungus successfully in a culture, so it is advisable to take the nail clippings or skin scrapings before any treatment is commenced.

✓ Since there are so many different types of fungi, and because moulds and yeasts require different treatment, laboratory culture is advisable where there is the possibility of a differential diagnosis (eg. psoriasis) or fungal resistance.

✓ Treatment (topical or systemic) is required for a prolonged period and is expensive.

✓ With severe nail infections, it may be necessary to see a podiatrist, and the nail removed entirely, to reduce the risk of autoinfection from viable fungal spores.

INFECTION PREVENTION



- Practice good personal hygiene, and always wash your hands after handling pets.
- Wash non-restrictive clothing, preferably natural fabrics in hot, humid climates.
- Wash clothing regularly, and avoid sharing hats, combs, shoes etc.
- FEET:**
 - Dry your feet well and in-between your toes after bathing.
 - Wear leather sandals or shoes if possible, and avoid shoes made of rubber and plastics.
 - Wear socks made from absorbent material such as merino wool or cotton blends.
 - Use over-the-counter antifungal sprays or powders in your shoes.
 - Rotate occlusive shoes and boots (especially workwear), exposing them to air and sunlight.
 - Don't walk barefoot in areas like communal locker rooms or public showers.
 - Don't share nail clippers with other people.
 - When visiting a nail salon, choose a salon which is clean and transparent about the sterilization of its equipment (nail clippers, files, scissors, etc.) after every client. **Preferably, take your own!**
- HANDS:**
 - Clip nails straight across and keep them clean.
 - Avoid nail prosthetics and gel overlays - moisture accumulates underneath acrylic nails, providing an optimal environment for fungi and other pathogenic microorganisms. Nail technicians use abrasive files or acetone to remove/replace nail prosthetics, which may injure the nail bed, making you more susceptible to fungal invasion and infection.
 - Dry hands carefully after washing and avoid wearing gloves for long periods.
 - Apply an emollient hand cream at night to help protect and replace the skin's natural sebum barrier, making the skin less susceptible to drying, cracks and injury.

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* Essity Medical, Bloom H, Ostrowski K, et al (2020) Randomised controlled trial evaluating (dibutyldimethylammonium chloride) incorporated dressing for the prevention of surgical site infections in adult women undergoing caesarean section. Surg Infect (Larchmt) 3(14):427-35
² Davies A, Petherbridge J, et al. Cost effectiveness of SSI prevention in primary SS following caesarean section. Proceedings of the Royal Society Open Science. November 2020
³ Cutting K, Higgins J. Site infection management: A clinical review of SSI prevention. Journal of Wound Care 19(24):6-5

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