COMMON FUNGAL INFECTIONS

Shannon W. Fields, BA, CPhT

Fungal infections—a challenge to treat, a frustration for patients. In addition to being unsightly and uncomfortable, the prolonged treatment time and tendency toward recurrence of dermatophyte and fungal yeast infections may be discouraging to patients who are hoping for more immediate relief. When considering these factors along with the hepatic concerns that accompany the use of some systemic antifungal agents, it may be beneficial to have some alternatives available to patients for common fungal infections such as onychomycosis, tinea pedis, ringworm, and yeast-based infections. Compounding pharmacists can be an excellent resource in treating patients with resistant fungal infections.

Onychomycosis

Onychomycosis, or nail fungus, appears in approximately 12% of the population at any given time and is most common among adults. Around 80% of onychomycosis cases involve the toenails, and the infection becomes increasingly common with advancing age. Patients generally present with nail changes such as thickening of the nail, discoloration, brittleness, changes in the nail shape, or loosening or detachment of the nail. A fungal culture of material under the nail can confirm diagnosis. There are four basic subtypes of onychomycosis:

- **Distal Subungual Onychomycosis**: The most common subtype, usually presenting as a yellow or white patch of discoloration at the distal end of the nail.
- **White Superficial Onychomycosis (WSO)**: Fungi invade the superficial layer of the nail plate and cause white spots to appear. WSO accounts for approximately 10% of all onychomycosis cases.
- **Candidal Onychomycosis**: Often occurs in nails previously damaged by infection or trauma and is particularly common in patients with chronic mucocutaneous candidiasis.
- **Proximal Subungual Onychomycosis**: The least common form of onychomycosis, usually seen in immunocompromised patients. This subtype affects the fingernails more often than other subtypes.

Many oral antifungal treatments pose a risk of liver toxicity and other significant side effects, such as headache, rash, and gastrointestinal symptoms. Serious drug interactions may occur with the use of systemic antifungal agents, and full disclosure of all current medications is vital. Terbinafine, itraconazole, griseofulvin, and fluconazole are commonly used systemic agents, though treatment times may exceed three months, particularly in toenail infections. Pulse dose therapy may be used in some patients, in which medication is given for short durations, and then discontinued for a period. The cycle is repeated until the infection clears, and this method may pose less hepatic risk to the patient. However, given the extended treatment time that is often required, oral antifungals may be quite costly.

Some oral medications can be prepared as topical compounds, which benefit the patient by providing localized treatment with minimal side effects. Other agents may be added to enhance the absorption and effectiveness of the compound. Tea tree oil is a natural antifungal and antibacterial agent and can be added to topical medications such as itraconazole and terbinafine. Dimethyl sulfoxide or ibuprofen may be added to topical medications to enhance penetration. In addition, topical compounded antifungals may be more cost effective than their oral counterparts.
There are four primary categories of fungal sinusitis:

1. Acute/fulminant (most likely to affect people with diabetes and compromised immune systems)
2. Chronic/indolent (generally found outside the U.S., mostly in Sudan and northern India)
3. Fungal ball (necrosed noninvasive and usually occurs in one sinus, most often the maxillary sinus)
4. Allergic fungal sinusitis (typically occurs because of an allergy to aspergillus)

Other Dermatophyte Infections

Most basic fungal skin infections are caused by dermatophytes, which typically only affect the outer layers of skin, rather than the living tissues. The term "dermatophyte" refers to one of three types of fungus: Epidermophyton, Microsporum, or Trichophyton. Tinea infections fall into this category and are often caused by excess moisture in the skin, making them especially likely to occur in cases where skin is not dried properly after sweating or bathing, or when skin is covered by a material that doesn’t allow moisture to evaporate.

Tinea pedis, or athlete’s foot, is a very common infection that occurs in one in five adults. Athlete’s foot is often caused by a combination of fungi and bacteria and causes scaling and itching, particularly in the web spaces between the toes. The infection is often picked up in communal areas such as swimming pools and locker rooms.

Tinea cruris, often referred to as "jock itch," causes an itchy red rash in the groin area. It is common among athletes, occurring as a result of excessive sweating. In some cases, athlete’s foot and jock itch may occur together, as it is possible to spread tinea infections to other areas of the body.

Tinea corporis and Tinea capitis are commonly known as ringworm of the body and scalp, respectively. Ringworm infections occur in exposed areas, causing red patches that are scaly at the edge with clear skin at the center. Tinea capitis can cause hair loss in the affected area. Ringworm infections may be spread through direct contact with an infected person or animal.

Tinea infections are among the simplest fungal infections to treat, but in cases where the infection is widespread, over-the-counter antifungals may be insufficient. A pharmacist can prepare prescription-strength transdermal medications or shampoos, which may be a better choice in treating a tinea infection than an oral antifungal.

Yeast Infections

Some common fungal infections are caused by yeast. Candida albicans is a type of yeast present in normal digestive systems, but in certain cases, such as during an illness or as a course of antibiotics, the normal balance is upset and the yeast fungi multiply and cause thrush symptoms. Fusgal yeast infections are most likely to affect the mouth and tongue, or areas of the body that are lined with a mucous membrane, such as the vaginal area, or any area with skin folds where moisture collects. Fungal infections caused by Candida albicans are generally classified by the appearance of white patches on the skin, which may be accompanied by itching, redness, and irritation.

Nystatin is often used in the treatment of thrush and can even be compounded into kid-friendly or topical forms. A good probiotic supplement may be added to the diet to keep the levels of Candida albicans balanced in the body. Gentian violet can also be highly beneficial in the treatment of fungal yeast infections.

Conclusion

Common fungal infections can pose treatment challenges, and some of the current commercial treatment protocols may be contraindicated in certain patients. Compounded treatments may be tailored to meet the needs of the individual patient and often have fewer side effects and hepatic risks of systemic agents.

**Fungal Sinusitis**

Loyd V. Allen, Jr., PhD, RPh

It’s the time of year when sinus infections are relatively common. However, sinusitis cases involving fungal infections are relatively uncommon and difficult to treat. Fungal infections can be very serious, and both chronic and acute fungal sinusitis require immediate treatment. The preparation of antifungals in nasal delivery systems is a challenge, but compounding pharmacists are qualified to meet the challenge.

Fungal sinusitis has become a more prominent health problem due to:

- Acquired immune deficiency syndrome (AIDS)
- Immunosuppression for transplantation procedures and from chemotherapy
- Common use of long-term, broad-spectrum antibiotic therapy
- Widespread travel into and out of endemic areas

Fungal infections should be suspected in individuals with sinusitis who also have diabetes, leukemia, AIDS, or other conditions involving an impaired immune system.

Fungi

Fungi are almost everywhere but are commonly found in air, dust, soil, plants, and decaying organic matter. Fungi adhere to dust particles and can be inhaled and then deposited on the nasal and paranasal sinus mucosa. This warm and moist environment is an ideal situation for the proliferation of these organisms. Most individuals, however, will never develop a fungal infection because of their resistance to the fungi. However, in comprised individuals such as those listed above, fungal infection is becoming more commonplace.

Causes of Symptoms

Fungi do not normally produce toxins, with the exception of aflatoxin produced by Aspergillus flavus, but the cell-wall constituents can induce hypersensitivity in the individual, resulting in apparent symptoms.

Categories and Symptoms of Fungal Sinusitis

There are four primary categories of fungal sinusitis:

1. Acute/fulminant (most likely to affect people with diabetes and compromised immune systems)
2. Chronic/indolent (generally found outside the U.S., mostly in Sudan and northern India)
3. Fungal ball (necrosed noninvasive and usually occurs in one sinus, most often the maxillary sinus)
4. Allergic fungal sinusitis (typically occurs because of an allergy to aspergillus)

**Treatment**

Treatment for fungal sinusitis may include oxygen, surgery, systemic antifungals, saline and antifungal irrigations, and corticosteroids. Antifungals used to treat fungal sinusitis include amphotericin B, ketoconazole, miconazole, and nystatin.

**ComPOunded Formulations For Fungal Infections:**

- Rx
  - Fluconazole 1% Nail Solution with Tea Tree Oil
  - Itraconazole 1% Nail Solution with Tea Tree Oil
  - Clotrimazole 3%/Miconazole 3% in Pluronic Lecithin Organogel

**COMPOunded Formulations For Fungal Sinusitis:**

- Rx
  - Amphotericin 100-mcg/mL Nasal Irrigation Spray
  - Ketoconazole 1% Nasal Irrigation/Spray
  - Miconazole 1% Nasal Irrigation/Spray
  - Nystatin 50,000-Units/mL Nasal Irrigation