Fungal Skin Infections
Recognition and Self-Care

Prepared and Presented by
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Objectives

- Identify predisposing factors that put patients at risk for developing topical fungal infections
- Differentiate between the different stages of progression of topical fungal infections
- Compare and contrast the different types of topical fungal infections
- Analyze the different types of topical fungal infections and which ones are appropriate to self-treat
- Identify notable exclusion factors for the self-treatment of topical fungal infections
- Analyze different topical antifungal medications to appropriately treat topical fungal infections
- Review different counseling points that are pertinent to individual patients
- Integrate pharmacologic and nonpharmacologic measures for the appropriate treatment for patients
Introduction

- Common cutaneous disorders
- Usually superficial infections
  - Hair
  - Nails
  - Skin
- Tinea infection refers to a dermatophyte infection
  - Fungal infection of the skin
    - *Trichophyton*
    - *Microsporum*
    - *Epidermophyton*
- Further categorized based on site presentation
- Self-treatment is appropriate in many of these infections
Epidemiology

- Overall prevalence in the United States
  - 10-20%

- Range of infection
  - Instantaneous infection from a single spore to a massive infection after a severe trauma

- Predisposing factors
  - Ill-fitting footwear (most common)
  - Diabetes mellitus and other conditions associated with a depressed immune system
  - Immunosuppressant medications
  - Poor nutrition and hygiene
  - Trauma
  - Occlusion of the skin, especially in warm and humid climates
Epidemiology

- **Tinea pedis (athlete’s foot)**
  - Approximately 26.5 million people in the United States
  - 70% of these suffers are male
  - Rare in African-Americans but common in Caucasians
    - Particularly those in tropical urban areas
  - Overall occurrence of 70% of people
    - 45% of these will have periodic recurrence over the course of 10 years
  - Traditionally, occurs more commonly in adults
    - Based on increased opportunities for exposure

- **Tinea unguium (infection of the nails)**
  - Approximately 2.5 million people in the United States
  - Requires systemic prescription drug therapy
Epidemiology

- Tinea corporis (ringworm of the body)
  - Most common in prepubescent individuals
  - Other adults are also at risk
- Tinea cruris (jock itch)
  - Occurs more frequently in adults
  - Occurs more frequently in men over woman
- Tinea capitis (ringworm of the head)
  - Actual incidence is unknown
  - Occurs more frequently in children
    - African-American females
Etiology

- Tinea pedis
  - *Epidermophyton* and *Trichophyton*
- Tinea unguium
  - *Trichophyton*
- Tinea corporis
  - *Epidermophyton, Trichophyton, and Microsporum*
- Tinea cruris
  - *Epidermophyton and Trichophyton*
- Tinea capitis
  - *Trichophyton and Microsporum*
Etiology

- Environmental Factors
  - Climate
  - Social Customs
    - Footwear is an especially key variable
  - Sweating
  - Wearing wet clothing for an extended period of time
- Chronic Diseases
  - Suppression of the immune system
- Advanced Age
Pathophysiology

• Stages of Infection
  • Incubation period
  • Enlargement period
    • Two dependent factors
      • Growth rate of the organism
      • Epidermal turnover rate
    • Remains in the stratum corneum
      • Immunologic response
  • Refractory period
    • Inflammation and pruritus
  • Involution period
    • Immune response
    • Resolution of fungal infection
Risk Factors

• Tinea pedis
  • Individuals who use public pools or bathing facilities
  • High-impact sports, such as long distance running
  • Patients who wear restrictive footwear

• Tinea unguium
  • Exposure in the environment (public pools or bathing facilities)
  • Patients who have had athlete’s foot
  • Trauma to the toenail

• Tinea corporis
  • Patients who live in hot and humid climates
  • Patients under stress or who are overweight
Risk Factors

- Tinea cruris
  - Use of occlusive clothing
  - High levels of activity
  - Past infections can serve as a reservoir for future infections
- Tinea capitis
  - Sharing of personal items
  - Contact with other infected individuals
- Complications
## Differentiation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Fungal Infections</th>
<th>Contact Dermatitis</th>
<th>Bacterial Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>Areas of the body with excess moisture</td>
<td>Any area of the body exposed to an irritant</td>
<td>Any area of the body</td>
</tr>
<tr>
<td><strong>Signs</strong></td>
<td>Odor, rash, scaling, inflammation, cracks</td>
<td>Raised wheals to fluid filled vesicles</td>
<td>Redness, notable lesion, warmth</td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td>Itching and pain</td>
<td>Itching and pain</td>
<td>Irritation and pain</td>
</tr>
<tr>
<td><strong>Quantity</strong></td>
<td>Localization with possible spreading</td>
<td>Affects all areas but does not spread</td>
<td>Localization with possible spreading</td>
</tr>
<tr>
<td><strong>Timing</strong></td>
<td>Variable</td>
<td>Variable from immediate to 3 weeks</td>
<td>Variable</td>
</tr>
<tr>
<td><strong>Cause</strong></td>
<td>Fungus</td>
<td>Irritants or allergens</td>
<td>Bacteria</td>
</tr>
<tr>
<td><strong>Modifying Factors</strong></td>
<td>Antifungal, clean and dry area</td>
<td>Skin protectants, astringents, avoidance</td>
<td>Prescription antibiotics</td>
</tr>
</tbody>
</table>
Signs and Symptoms

• **Tinea Pedis**
  - **Chronic, intertriginous**
    - Fissure and scaling in between the toes
    - Production of odor, itching, or a stinging sensation on the feet
  - **Chronic, papulosquamous**
    - Usually found in both feet
    - Mild inflammation and diffuse scaling on the soles
    - May be seen with tinea unguium
  - **Vesicular type**
    - Small vesicles are present near the instep
    - Skin scaling is present near the instep and toe webs
  - **Acute ulcerative**
    - Soft, warm, and weeping ulcerations on the sole of the foot
    - Production of odor
Tinea Pedis (Athlete’s Foot)
Signs and Symptoms

- **Tinea Unguium**
  - The nail and nail beds
    - Thick
    - Rough
    - Yellow
    - Opaque
  - The nail may separate from the nail bed
  - In severe cases, the nail may be lost altogether
  - May be further complicated by concomitant bacterial infection
Tinea Unguium (Nail Infection)
Signs and Symptoms

- Tinea Corporis
  - Diverse clinical presentation
    - Lesions appear as small, circular, erythematous, scaly areas
    - Able to spread peripherally
    - Boarders may contain pustules
  - Can occur on any part of the body
    - Different types of fungus tend to infect different areas
Tinea Corporis (Ringworm – Body)
Signs and Symptoms

- **Tinea Cruris**
  - Appears in the middle to upper part of the thighs and pubic area
    - Lesions
      - Well defined boarders
      - Slight elevation
      - Erythematous
      - Scaling is usually present
      - Excessive pruritus
      - Pain can occur during episodes of excessive sweating
  - Generally occurs bilaterally
Tinea cruris (Jock Itch)
Signs and Symptoms

- **Tinea Capitis**
  - **Non-inflammatory**
    - Lesions appear as small papules around the hair shaft
    - Scaling is present with little inflammation
  - **Inflammatory**
    - Range of inflammation
    - Pruritus, fever, pain, and enlargement of area lymph nodes
- **Black dot**
  - Hairs break off at the scalp level
  - Hair loss, inflammation, and scaling are often seen
- **Favus**
  - Patchy areas of hair loss with yellowish crusts and scales
Tinea Capitis (Ringworm – Scalp)
Treatment Goals

- Provide symptomatic relief
- Eradicate existing infection
- Prevent future infections
General Approach to Treatment

- Self-treatment is appropriate
  - Tinea pedis, tinea corporis, and tinea cruris
- Refer to a primary care provider
  - Tinea unguium and tinea capitis
- Assure that the patient has symptoms that correlate with tinea infections
- Many antifungal medications are available in a variety of dosage forms
- Verify patient compliance to therapy
  - Pharmacologic as well as nonpharmacologic
Exclusions to Self-Treatment

- Causative factor unclear
- Unsuccessful initial treatment or worsening of condition
- Involvement of nails or scalp
- Involvement of the face, mucous membrane, or genitalia
- Signs of possible secondary bacterial infection
- Excessive and continuous exudation
- Condition is extensive, seriously inflamed, or debilitating
- Underlying chronic condition
  - Diabetes, systemic infection, asthma, immune deficiency
- Fever and/or malaise
Treatment Options

- Nonpharmacological
  - Use a separate towel to clean the affected area
  - Do not share personal items with family members
  - Launder contaminated items appropriately
  - Cleanse the skin daily
  - Avoid clothes or shoes that prevent the skin from staying cool and dry
  - Avoid contact with infected individuals
Treatment Options

- Pharmacological
  - Category 1 approval from the FDA
    - The active ingredient has at least one well-designed clinical trial demonstrating its effectiveness
  - Associated agents
    - Butenafine
    - Clioquinol
    - Clotrimazole
    - Miconazole
    - Terbinafine
    - Tolnaftate
    - All are approved for athlete’s foot, jock itch, and body ringworm
  - Recommended treatment period: 2-4 weeks
Treatment Options

- Cloquinol
  - Antifungal and antibiotic properties
  - MOA
    - Unknown
  - Indication
    - Athlete’s foot, jock itch, body ringworm
  - Administration
    - Apply a thin lay twice daily for 4 weeks (2 weeks for jock itch)
  - Safety
    - Itching, redness, and irritation
    - Inadvertent staining
Treatment Options

- Clotrimazole and Miconazole
  - Demonstrate fungistatic and fungicidal activity
  - MOA
    - Inhibit the biosynthesis of sterols by damaging the fungal cell wall and resultant loss of essential intracellular elements
  - Indications
    - Athlete’s foot, jock itch, and body ringworm
  - Administration
    - Apply a thin layer twice daily for up to 4 weeks
  - Safety
    - Skin irritation, burning, and stinging
Treatment Options

• Terbinafine
  • Available as a cream and a spray
  • MOA
    • Inhibits squalene epoxidase, an enzyme needed for fungal biosynthesis
  • Indications
    • Athlete’s foot, jock itch, and body ringworm
  • Administration
    • Apply a thin layer twice daily for up to 4 weeks
  • Safety
    • Irritation, burning, and itching/dryness
Treatment Options

- Butenafine
  - Available as a cream
  - MOA
    - Inhibits squalene epoxidase, an enzyme needed for fungal biosynthesis
  - Indications
    - Athlete’s foot, jock itch, body ringworm
  - Administration
    - Athlete’s foot: twice daily for one week or once daily for four weeks
    - Jock itch or body ringworm: once daily for two weeks
  - Safety
    - None notable
Treatment Options

• Tolnaftate
  • Used as the gold standard to compare other medications
  • Multiple dosage forms available
  • MOA
    • Believed to stunt the growth of the fungus
• Indications
  • Athlete’s foot, jock itch, and body ringworm
• Administration
  • Apply a thin layer twice daily for up to 4 weeks
• Safety
  • Stinging or irritation
<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Generic Name</th>
<th>Dosage Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aftate Aerosol Spray</td>
<td>Tolnaftate</td>
<td>Spray powder</td>
</tr>
<tr>
<td>Curex AF</td>
<td>Clotrimazole</td>
<td>Cream</td>
</tr>
<tr>
<td>Curex Aerosol</td>
<td>Miconazole</td>
<td>Spray Powder</td>
</tr>
<tr>
<td>Curex Cream</td>
<td>Undecylenate</td>
<td>Cream</td>
</tr>
<tr>
<td>Desenex Max</td>
<td>Terbinafine</td>
<td>Cream</td>
</tr>
<tr>
<td>Desenex AF Spray</td>
<td>Miconazole</td>
<td>Spray powder</td>
</tr>
<tr>
<td>Desenex AF Cream</td>
<td>Clotrimazole</td>
<td>Cream</td>
</tr>
<tr>
<td>Lamisil AT</td>
<td>Terbinafine</td>
<td>Cream</td>
</tr>
<tr>
<td>Lotrimin AF Solution</td>
<td>Clotrimazole</td>
<td>Cream</td>
</tr>
<tr>
<td>Lotrimin AF Powder</td>
<td>Miconazole</td>
<td>Spray powder</td>
</tr>
<tr>
<td>Lotrimin Ultra</td>
<td>Butenafine</td>
<td>Cream</td>
</tr>
<tr>
<td>Micatin Cream/Powder</td>
<td>Miconazole</td>
<td>Various</td>
</tr>
<tr>
<td>Tinactin Cream/Powder</td>
<td>Tolnaftate</td>
<td>Various</td>
</tr>
</tbody>
</table>
Treatment Options

- Product selection
  - Butenafine or terbinafine
    - Potential shorter duration of action
  - Clotrimazole and miconazole
    - Similar efficacy to other agents
- Dosage forms
  - Creams, ointments, or solutions allow for good penetration into the skin
  - Choose based on patient compliance or daily routines
- Patient history
- Proper selection based on active ingredient
- Refer to a physician when necessary
Patient Counseling

- Describe proper application of the product
- Explain expected duration of therapy
- Provide information to help minimize recurrent infections
  - Proper care of infected site
  - Appropriate laundry technique
  - Minimize use of occlusive clothing
  - Avoidance of certain risky behaviors
- Reiterate when to see a primary care physician
Conclusion

- Fungal infections are relatively common, especially in high risk patients
- Fungal infections can occur on various parts of the body based on the infecting organism
- Some fungal infections cannot be treated at home
- Many topical medications are available to help eradicate fungal infections
- Proper product selection is important to maximize therapy
- Pharmacists should refer to a physician when appropriate
Questions?
References