Skin Infections in Athletes: Prevention, Treatment, and Isolation Precautions

Aaron Sinclair, MD
University of Kansas School of Medicine – Wichita
Department of Family and Community Medicine
Wesley Family Medicine Residency

Disclosures
• None

Learning Objectives
• Identify skin infections that require removal from athletic participation.
• Explore options for prevention of contagious skin infections in athletes.
• Briefly review treatment plans for contagious skin infections in athletes.
• Identify when athletes can safely return to competition with specific contagious skin infections.

Common Sports Infections

Bacteria
• Impetigo
• Erysipelas
• Abscess (Carbuncle/Furuncle)
• Folliculitis

Viral
• Herpes
• Warts
• Molluscum contagiosum

Fungal
• Ringworm
• Tinea Versicolor

College Athletes – Skin Infections

Common Infections - Bacterial

**Impetigo**
- **Typical causative agents:**
  - *Staphylococcus aureus*,
  - *Streptococcus pyogenes*
- **Infectious Transmission Potential:**
  - Highly infectious
  - Direct contact
- **Diagnosis:**
  - Based on appearance of honey crusts and superficial ulcerations
- **Cultures:**
  - Exudate from beneath the skin crust should be obtained for culture and sensitivity testing in athletes
- **Treatment:**
  - Mupirocin ointment is the treatment of choice for small areas of impetigo and is as effective as oral antibiotics.
  - Gentle debridement of crusts using antibacterial soap and a washcloth.
- **Prevention:**
  - Avoid direct contact/exposure
  - Restriction of sharing towels, clothes and equipment
  - Appropriate sterilization of the sports environment – including the locker room, clothing, equipment on a daily basis
- **Return to sports:**
  - NFHS recommends treatment for presumed MRSA etiology.
  - Removed from practice and competition for 72 hours of oral antibiotics
  - All lesions are considered infectious until each one has a well adherent scab and then may be covered with a bioocclusive dressing

### Table 9-1 -- Antimicrobial Therapy for Impetigo

<table>
<thead>
<tr>
<th>Antibiotic Therapy</th>
<th>Adults (Dosage)</th>
<th>Children (Dosage)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dicloxacillin</td>
<td>250 mg 4 times per day PO</td>
<td>12 mg/kg/day in 4 divided doses PO</td>
<td>—</td>
</tr>
<tr>
<td>Cephalaxin</td>
<td>250 mg 4 times per day PO</td>
<td>25 mg/kg/day in 4 divided doses PO</td>
<td>—</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>250 mg 4 times per day PO</td>
<td>40 mg/kg/day in 4 divided doses PO</td>
<td>Some strains of <em>S. aureus</em> and <em>S. pyogenes</em> may be resistant</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>100-450 mg 3 times per day PO</td>
<td>10-20 mg/kg/day in 3 divided doses PO</td>
<td>—</td>
</tr>
<tr>
<td>Amoxicillin/clavulanic acid</td>
<td>125/125 mg 2 times per day PO</td>
<td>25 mg/kg/day of amoxicillin component in 2 divided doses PO</td>
<td>—</td>
</tr>
<tr>
<td>Mupirocin ointment</td>
<td>Apply to lesions 3 times per day</td>
<td>Apply to lesions 3 times per day</td>
<td>For patients with limited number of lesions</td>
</tr>
</tbody>
</table>


---

**Erysipelas (aka cellulitis)**
- **Typical causative agents:**
  - Group A streptococci
- **Infectious Transmission Potential:**
  - Highly infectious
  - Direct contact
- **Diagnosis:**
  - Rash rapidly increase in size, forming a tense, red, hot, uniformly elevated, shining patch with an irregular outline and a sharply defined, raised border
- **Cultures:**
  - Difficult to obtain the causative agent
  - Needle aspiration vary from yields a pathogen in ≤5 to 40%
  - Culture of punch biopsy specimens yields a pathogen in 20 - 30% of cases
Common Infections - Bacterial

**Erysipelas (aka cellulitis)**

- **Treatment:**
  - Oral Antibiotics
- **Prevention:**
  - Skin hygiene
  - Avoid direct contact/exposure
  - Restriction of sharing towels, clothes and equipment
    - Appropriate sterilization of the sports environment – including the locker room, clothing, equipment on a daily basis.
- **Return to sports:**
  - Removed from practice and competition for 72 hours of oral antibiotics
  - All lesions are considered infectious until each one has a well adherent scab and then may be covered with a bio occlusive dressing

### Table 9.1 – Antimicrobial Therapy for Erysipelas/Cellulitis

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nafcillin</td>
<td>1-2 gm every 4 hr IV</td>
<td>Parenteral drug of choice; inactive against MRSA</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>1 gm every 8 hr IV</td>
<td>25-40 mg/kg/day in 3 divided doses PO, 10-20 mg/kg/day in 3 divided doses PO</td>
</tr>
<tr>
<td>Ceftriaxime</td>
<td>600 mg/kg every 8 hr IV</td>
<td>25 mg/kg/day in 4 divided doses PO, resistant to and emergence of resistance in erythromycin-resistant strains</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>150 mg every 12 hr IV</td>
<td>For penicillin-allergic patients, except those with immediate hypersensitivity reactions</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>600 mg every 8 hr IV</td>
<td>250-450 mg 3 times per day PO</td>
</tr>
<tr>
<td>Dicloxacillin</td>
<td>500 mg 4 times per day PO</td>
<td>Oral agent of choice for methicillin susceptible strains</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>500 mg 4 times per day PO</td>
<td>25 mg/kg/day in 4 divided doses PO</td>
</tr>
<tr>
<td>TMP/SMZ</td>
<td>1 or 2 double-strength tablets 2 times per day PO</td>
<td>12 mg/kg (based on TMP) in either divided doses IV or 2 divided doses PO, Bactericidal; efficacy poorly documented</td>
</tr>
</tbody>
</table>

**Adapted from Premier guidelines for the diagnosis and management of skin and soft tissue infections, Clin Infect Dis 41:1373-1406, 2005. Habif: Clinical Dermatology, 5th ed.**

**Folliculitis**

- **Typical causative agents:**
  - Staphylococcus aureus
- **Infectious Transmission Potential:**
  - Highly infectious
  - Direct contact
- **Diagnosis:**
  - Painless or tender pustule with resultant inflammation of the hair follicle caused by infection, chemical irritation, or physical injury.
  - Cultures:
  - Complete scraping of the pustule with scalpel, transferred to culture medium.
  - **Treatment:**
    - Oral antibiotics – TMP/SMZ first line
  - **Prevention:**
    - Avoid direct contact/exposure
    - Restriction of sharing towels, clothes and equipment
    - Appropriate sterilization of the sports environment – including the locker room, clothing, equipment on a daily basis
  - **Return to sports:**
    - NFHS recommends treatment for presumed MRSA etiology.
    - Removed from practice and competition for 72 hours of oral antibiotics AND infection is resolving.
Common Infections - Bacterial

Abscess (Carbuncle/Furuncle)

- Typical causative agents:
  - Staphylococcus aureus (most common by far)
  - Others: aerobic - E. coli, P. aeruginosa, S. faecalis
  - anaerobic - Bacteroides, Lactobacillus, Peptococcus, Peptostreptococcus

- Infectious Transmission Potential:
  - Highly infectious
  - Direct contact
  - Athletic bags, wrestling bags, equipment?

- Diagnosis:
  - Walled-off collection of pus that is a painful, firm, or fluctuant mass
  - May have been preceded by cellulitis

- Cultures:
  - Complete scraping of the pustule with scalpel

- Treatment:
  - Incision and drainage
  - Oral antibiotics

- Prevention:
  - Avoid direct contact/exposure
  - Restriction of sharing towels, clothes and equipment
  - Appropriate sterilization of the sports environment – including the locker room, clothing, equipment on a daily basis

- Return to sports:
  - NFHS recommends treatment for presumed MRSA etiology.
  - Removed from practice and competition for 72 hours of oral antibiotics AND infection is resolving.

Common Infections - Fungal

Ringworm

- Typical causative agents:
  - Trichophyton rubrum
  - Trichophyton tonsurans

- Infectious Transmission Potential:
  - Highly infectious
  - Direct contact

- Diagnosis:
  - Capitis – generally round, gray, scaly hyperkeratotic plaques with associated alopecia
  - Corporis – circular or ring-shaped, scaly, raised plaque with irregular erythematous borders and often central clearing
  - Pedis – interdigital spaces initially, often malodorous, scaling, burning pain

- Cultures:
  - If in doubt, skin scraping with KOH preparation and microscopic examination

Common Infections - Fungal

**Ringworm**

- **Treatment:**
  - Capitis – oral antifungals +/- topical antifungal shampoo
  - Corporis - oral antifungals or topical antifungal for at least one week after lesion resolution
  - Pedis – topical antifungals

- **Prevention:**
  - Restriction of sharing towels, clothes and equipment
  - Appropriate sterilization of the sports environment – including the locker room, clothing, equipment on a daily basis
  - Sandals in the locker room to prevent Pedis exposure

- **Return to sports:**
  - Capitis – 14 days of treatment
  - Pedis – no restrictions
  - Corporis – 72 hours of topical or oral antifungal treatment & occlusive cover

**Tinea Versicolor**

- **Typical causative agents:**
  - Malassezia furfur

- **Infectious Transmission Potential:**
  - Very low transmission rates vs not contagious

- **Diagnosis:**
  - Based on appearance, classically hypopigmented, thought hyperpigmented scary macules and patches may occur.

- **Cultures:**
  - If in doubt, skin scraping with KOH preparation showing spaghetti/meatballs appearance.

**Prevention:**

- **None**

**Return to sports:**

- **No restrictions**

---

**TABLE 13-3 - Summary of Treatment Regimens for Tinea Capitis, Tinea Corporis, Tinea Cruris, and Tinea Pedis**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Agent</th>
<th>Dose, Frequency</th>
<th>Duration of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinea capitis</td>
<td>Griseofulvin</td>
<td>15-25 mg/kg/day, qd</td>
<td>6-12 wk</td>
</tr>
<tr>
<td></td>
<td>Itraconazole</td>
<td>200 mg, qd</td>
<td>2-4 wk</td>
</tr>
<tr>
<td></td>
<td>Fluconazole</td>
<td>500 mg/kg/day, qd</td>
<td>1-6 wk</td>
</tr>
<tr>
<td></td>
<td>Ketoconazole</td>
<td>500 mg, qd</td>
<td>1-4 wk</td>
</tr>
<tr>
<td>Tinea corporis</td>
<td>Terbinafine 1% cream</td>
<td>Topical, qd-bid</td>
<td>2-4 wk</td>
</tr>
<tr>
<td>and tinea cruris</td>
<td>Ketoconazole 2% cream</td>
<td>Topical, qd</td>
<td>2-4 wk</td>
</tr>
<tr>
<td></td>
<td>Clotrimazole 1% cream</td>
<td>Topical, qd</td>
<td>2-4 wk</td>
</tr>
<tr>
<td></td>
<td>Griseofulvin</td>
<td>500 mg orally, qd</td>
<td>2-4 wk</td>
</tr>
<tr>
<td></td>
<td>Itraconazole</td>
<td>200 mg orally, qd</td>
<td>2 wk</td>
</tr>
<tr>
<td></td>
<td>Terbinafine</td>
<td>250 mg orally, qd</td>
<td>1 wk</td>
</tr>
<tr>
<td></td>
<td>Fluconazole</td>
<td>250 mg orally, weekly</td>
<td>2-4 wk</td>
</tr>
<tr>
<td>Tinea pedis</td>
<td>Ketoconazole 2% cream</td>
<td>Topical, qd</td>
<td>6-6 wk</td>
</tr>
<tr>
<td></td>
<td>Clotrimazole 1% cream</td>
<td>Topical, qd</td>
<td>6-6 wk</td>
</tr>
</tbody>
</table>

---

Habif: Clinical Dermatology, 5th ed. Figure 13-27 Tinea versicolor.

Habif: Clinical Dermatology, 5th ed. Figure 13-73 Tinea versicolor.

Common Infections - Viral

Warts (Verruca)
- Typical causative agents: Human Papilloma Virus
- Infectious Transmission Potential: Not highly contagious
- Direct contact
- Showers/locker rooms act as reservoirs
- Diagnosis: Based on appearance of flesh-colored papules that often appear grouped. Flatter lesions tend to be brown
- If there is doubt, a no. 15 blade can be used to scrape off any hyperkeratotic debris and reveal thrombosed capillaries, often called seeds
- Cultures: Can be sent to pathology for confirmation

Herpes
- Typical causative agents: Herpes Simplex Virus – 1, Herpes Simplex Virus – 2
- Infectious Transmission Potential: Highly infectious
- Direct contact
- Diagnosis: Usually clinical, sudden appearance of multiple characteristic vesicular lesions on an inflammatory, erythematous base
- Cultures: Alcohol-wiped vesicle should be gently "unroofed" with a sterile needle. The vesicular fluid can be removed with a sterile cotton swab and placed in viral culture medium.
- Positive in roughly 7-25% of patients

Common Infections - Viral

Warts (Verruca)
- Treatment:
  - Duct Tape
  - Salicylic Acid
  - Imiquinod
  - Cryotherapy
  - Surgical Removal
  - 5-Flourouracil
  - Many More
- Prevention:
  - Wear sandals in locker rooms to prevent plantar warts
- Return to sports:
  - NCAA and NFHS require them to be covered but do not require treatment prior to participation.
  - Face lesions should be covered with a mask or curetted.

Herpes
- Treatment:
  - Famciclovir
  - Acyclovir
  - Valacyclovir
- Prevention:
  - Wrestlers with HSV-1 infection should consider alerting the team for potential prophylactic antivirals as lesions are contagious prior to vesicle formation.
- Return to sports:
  - NCAA guidelines: No systemic symptoms (fever, malaise, etc.), no new blisters for 72 hours, all lesions must be dried and with a firm adherent crust, antivirals for 120 hours before the competition and during the competition, lesions can not be covered to allow for participation.
Common Infections - Viral

**Molluscum Contagiosum**

- Typical causative agents:
  - Poxvirus
- Infectious Transmission Potential:
  - Not highly contagious but can be transmitted by skin to skin contact
  - Water to skin contact
  - Incubation period one week to six months
- Diagnosis:
  - Based on appearance of skin-colored papules (1-5 mm) with a characteristic umbilicated center
- Cultures:
  - Exudate from beneath the skin crust should be obtained for culture and sensitivity testing in athletes

### Prophylaxis:

- Acyclovir 200 mg po bid

### Treatment:

- 0.7% cantharidin solution
- Cryotherapy with liquid nitrogen
- Imiquimod 5% cream
- Curettage

### Prevention:

- Avoid sharing towels
- Bandage well – gas permeable membranes

### Return to sports:

- NCAA requires curettage or surgical removal of molluscum lesions before returning to competition.
- Solitary lesions may be covered with a gas-permeable membrane before returning to competition.
- The NFHS allows return to competition 24 hours after curettage of the lesions.

Special Considerations

**Bacterial Infections**

- MRSA outbreaks should result in MRSA screening with intranasal mupirocin and daily body washes with a chlorhexidine 4% solution for five days.

**All Infections**

- Guidelines are developed and strictly followed for basketball, wrestling and football but should be considered recommendations for all others.
- Scabies and Lice require a 24 hour return to play guidelines post treatment.
Caring for high school or college athletes

Updates/resource on the web – typically yearly

- [http://www.kshsaa.org/Public/Wrestling/PDF/SkinLesionForm.pdf](http://www.kshsaa.org/Public/Wrestling/PDF/SkinLesionForm.pdf)

Skin Hygiene: Recommendations for the athlete

- Clean (antibacterial and antifungal) and dry wrestling mats daily with 10% bleach solution
- Wash headgear, knee pads, and clothing after every practice
- Wash workout clothes and towels after each use
- Athletes shower immediately after workouts/competitions consider washing with selenium containing shampoo's
- Skin checks daily by the athlete and weekly by trainer, coach, or physician
- Cover any abrasions/scrapes/scratches to decrease entry
- Hold competitor out of competition until non-communicable
- Consider Kenshield creams
- Hold infected wrestlers out until non-infectious
- Use Liquid soap instead of bars
- Refrain from sharing towels, razors, uniforms, headgear, etc.
- Air out wrestling rooms
- Keep Finger nails trimmed to decrease abrasions and scratches

References

- DeLee: DeLee and Drez's Orthopaedic Sports Medicine, 3rd ed. Figure 3G-11 Molluscum contagiosum
- Rakel: Textbook of Family Medicine, 8th ed. Figure 33-36 Impetigo on back and buttocks of child showing honey crusts.