### SKIN AND SOFT TISSUE INFECTIONS IN PEDIATRICS

#### SKIN INFECTIONS

<table>
<thead>
<tr>
<th>Skin abscess, boils, furuncles</th>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
|                               | *Staphylococcus aureus*  
Methicillin sensitive (MSSA)  
Methicillin resistant (MRSA) | Incision and drainage is the mainstay of therapy.  
Note: needle aspiration is inadequate.  
**1st line (for suspected and documented MSSA infection):**  
Oral agents  
**Cloxacillin** 50-100 mg/kg/d in 4 doses (max dose: 2 g/d)  
OR  
**Cephalexin**  
*Mild to moderate infections*: 25-50 mg/kg/d in 3-4 doses  
*Severe infections*: 75-100 mg/kg/d in 3-4 doses (max dose: 4 g/d)  
Parenteral agents  
**Oxacillin**  
*Mild to moderate infections*: 100-150 mg/kg/d IV/IM in 4 doses (max dose: 4 g/d)  
*Severe infections*: 150-200 mg/kg/d IV/IM in 4-6 doses (max dose: 12 g/d)  
OR | | Incision and drainage is the mainstay of therapy. Note: needle aspiration is inadequate.  
May treat patients with incision and drainage only and in outpatient setting if there is no diabetes or immunosuppression, and boil or abscess is <5 cm in diameter.  
Oral therapy plus I&D may be effective in abscess >5 cm in diameter and in multiple abscesses.  
Antibiotic therapy is recommended for abscesses with the following conditions: severe or extensive disease (eg, involving multiple sites of infection) or rapid progression in presence of cellulitis; presence of systemic inflammatory response syndrome (SIRS), such as temperature >38°C or <36°C, tachypnea >24 breaths per
<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dosage Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cefazolin</strong></td>
<td><strong>Mild to moderate infections:</strong> 50 mg/kg/d IV/IM in 3-4 doses (max dose: 3 g/d)</td>
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<tr>
<td></td>
<td><strong>Severe infections:</strong> 100-150 mg IV/IM in 3-4 doses (max dose: 6 g/d)</td>
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<tr>
<td></td>
<td><strong>Duration of treatment:</strong> 5-10 days</td>
</tr>
<tr>
<td><strong>2nd line (for suspected MRSA infections):</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Oral agents</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Clindamycin</strong></td>
<td>PO 10-30 mg/kg/d in 3-4 doses (max 1.8 g/d)</td>
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<tr>
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<td>OR</td>
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<tr>
<td><strong>Cotrimoxazole</strong></td>
<td>8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)</td>
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<td>OR</td>
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<tr>
<td><strong>Doxycycline</strong></td>
<td>2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)</td>
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<tr>
<td></td>
<td>OR</td>
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<tr>
<td><strong>Linezolid</strong></td>
<td><strong>Mild to moderate infections:</strong></td>
</tr>
<tr>
<td></td>
<td>minute, tachycardia &gt;90 beats per minute, or white blood cell count &gt;12,000 or &lt;4,000 cells/μL; associated comorbidities or immunosuppression; extremes of age abscess in areas difficult to drain (e.g., face, hand and genitalia), associated septic phlebitis; lack of response to I&amp;D alone.</td>
</tr>
<tr>
<td></td>
<td>If no response after 2-3 days with oral antibiotics, look for complications and consider:</td>
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<tr>
<td></td>
<td>Incision and drainage: culture abscess and blood</td>
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<tr>
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<td>Empirical antibiotic therapy using parenteral agents (in absence of specific culture and sensitivity data select an agent with activity against MRSA) follow up culture and sensitivity results.</td>
</tr>
<tr>
<td></td>
<td>Systemic agents should be used in patients who are toxic, who have extensive disease, or who have associated cellulitis.</td>
</tr>
<tr>
<td>Age Group</td>
<td>Dosage</td>
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<tr>
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<tr>
<td>&lt;12 y</td>
<td>30 mg/kg/d in 3 doses</td>
</tr>
<tr>
<td>≥12 y</td>
<td>1200 mg/d in 2 doses</td>
</tr>
</tbody>
</table>

**Severe infections**: Same (max dose: 1.2 g/d)

Duration of treatment: 7-10 days

**Parenteral agents**

**Clindamycin** 25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)  
OR

**Vancomycin** 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)  
OR

**Linezolid**  
*Mild to moderate infections*  
<12 y: 30 mg/kg/d in 3 doses  
≥12 y: 1200 mg/d in 2 doses  
**Severe infections**: Same

Duration of treatment: 7-10 days

An antibiotic active against MRSA is recommended for any of the following:  
- Patients with carbuncles or abscesses who have failed initial recommended antibiotic treatment against MSSA  
- Those with markedly impaired host defenses, or  
- Those with SIRS and hypotension

Doxycycline is not recommended for age <8 y; bacteriostatic; limited recent clinical experience.
### Recurrent furunculosis

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
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</thead>
<tbody>
<tr>
<td><strong>S. aureus</strong> (MSSA and MRSA) <em>Staphylococcus aureus</em> infection presenting as recurrent furunculosis (abscesses, boils) in an otherwise healthy host.</td>
<td><strong>For decolonization:</strong> &lt;br&gt; If patient and physician wish to attempt decolonization, patient should have no active skin infections and is otherwise a healthy host. &lt;br&gt; Need to culture multiple sites, ie, nose, throat, and inguinal area skin. Nares-only culture missed 48% of colonized individuals. &lt;br&gt; Avoid systemic antibiotics. &lt;br&gt; <strong>Mupirocin</strong> ointment in anterior nares and under fingernails bid x 7d PLUS <strong>Chlorhexidine</strong> 4% shower daily x 7d &lt;br&gt; One report indicates that bleach baths (tub of warm water with 1/4 cup of 6% sodium hypochlorite (household bleach) for 15 minutes, is as effective as use of chlorhexidine shower body washes.</td>
<td>Some strains of MRSA, particularly the CA-MRSA, produce a toxin named Panton-Valentin leukocidin (PVL) and are associated with severe infections. PVL is a virulence factor of <em>S. aureus</em> which correlates with chronic recurrent furunculosis. Topical decolonization is considered if patient has 2 or more episodes in 1 year or other household members develop infection. Intermittent bathing with chlorhexidine 4% or dilute bleach baths/6% sodium hypochlorite (1/4 cup of bleach in a quarter-filled bathtub or 13 gallons water or 1 tsp bleach in 1 gallon of water) for 15 minutes 3x a week can be used to significantly reduce skin load of <em>S. aureus</em> Systemic antibiotics is recommended for the treatment of furuncles and boils.</td>
</tr>
</tbody>
</table>
Only a modest positive effect in a prospective, randomized single-blinded controlled trial.

of active infection ONLY and is not routinely recommended for decolonization.

Recommended intranasal preparation of mupirocin is not available locally. Some local experts use topical mupirocin for nasal decolonization.

<table>
<thead>
<tr>
<th>Folliculitis</th>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus (most common)</td>
<td>Usually self-limiting; no therapy indicated. Hot packs for comfort. Incision and drainage is the mainstay of therapy. <strong>1st line:</strong> Topical antibiotic therapy for mild cases of folliculitis Could use mupirocin ointment if staphylococcal etiology. <strong>Oral agents</strong> <strong>Cloxacillin</strong> 50-100 mg/kg/d in 4 doses (max dose: 2 g/d) OR</td>
<td>Folliculitis is infection of the hair follicle with purulent exudate in the epidermis. Hot tub folliculitis is almost always caused by <em>P. aeruginosa</em>, is usually self-limited and no treatment is indicated. Systemic therapy in cases of large and multiple lesions should be treated with Penicillinase resistant antibiotics (cloxacillin or cephalixin).</td>
<td></td>
</tr>
</tbody>
</table>
| **Cephalexin**  
*Mild to moderate infections*: 25-50 mg/kg/d in 3-4 doses;  
*Severe infections*: 75-100 mg/kg/d in 3-4 doses (max dose: 4 g/d)  
Duration of treatment: 7-10 days |

### Staphylococcal scalded skin syndrome

<table>
<thead>
<tr>
<th><strong>Etiology</strong></th>
<th><strong>Preferred Regimen</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
</table>
| Result of colonization of skin or mucosa by strain of *S. aureus* producing an exfoliative toxin Pathogen may be MSSA or MRSA | **1st line:**  
*Oral agent:*  
**Cloxacillin** 50-100 mg/kg/d in 4 doses (max dose: 2 g/d)  
*Parenteral agents*  
**Oxacillin**  
*Mild to moderate infections*: 100-150 mg/kg/d IM/IV in 4 doses (max, 4 g/d)  
*Severe infections*: 150-200 mg/kg/d in 4-6 doses (max dose: 12 g/d)  
OR  
**Cefazolin**  
*Mild to moderate infections*: 50 mg/kg/d IM/IV in 3-4 doses (max dose: 3 g/d) | Staphylococcal Scalded Skin Syndrome (SSSS) is a superficial infection of the skin caused by a strain of *S. aureus* that produces an exfoliative toxin.  
Skin biopsy is needed to differentiate SSSS from TEN.  
Culture nose, vagina, or other suspected site of colonization by toxigenic strain of *S. aureus*. |
### Severe infections:

100-150 mg in 3-4 doses (max dose: 6 g/d)  

Duration of treatment: 7-10 days for MSSA

#### 2nd line (if MRSA is suspected):

**Oral agent**  
**Clindamycin** PO 10-30 mg in 3-4 doses (max 1.8 g/d)

**Parenteral agents**  
**Clindamycin** 25-40 mg/kg/d in 3-4 doses (max dose: 2.7 g/d)  

OR  
**Vancomycin** 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)

An antibiotic active against MRSA is recommended for the following:  
- Patients who have failed initial recommended antibiotic treatment against MSSA  
- Those with markedly impaired host defenses  
- Those with SIRS and hypotension

<table>
<thead>
<tr>
<th>Impetigo and ecythma</th>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| **Impetigo**  
*Streptococcus* sp. (Group A causes honey crust impetigo) (Group B, C, G are less common) | 1st line:  
Mupirocin ointment 2% tid  
OR | Impetigo can be either bullous or nonbullous.  
Topicals can be used for patients with limited number of lesions and appropriate for |
Methicillin-susceptible *Staphylococcus aureus* bullous impetigo:

Suspected or confirmed methicillin-resistant *Staphylococcus aureus* bullous impetigo:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Duration of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fusidic acid</strong></td>
<td>2% cream bid</td>
<td>7-12 days</td>
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<tr>
<td><strong>Oral agents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cloxacillin</strong></td>
<td>50-100 mg/k/d in 4 doses (max dose: 12 g/d)</td>
<td>7 days</td>
</tr>
<tr>
<td><strong>Cephalexin</strong></td>
<td><em>Mild to moderate infections</em>: 25-50 mg/kg/d in 3-4 doses (max dose: 4 g/d)</td>
<td>7 days</td>
</tr>
<tr>
<td></td>
<td><em>Severe infections</em>: 75-100 mg/kg/d in 3-4 doses (max dose: 4 g/d)</td>
<td></td>
</tr>
<tr>
<td><strong>Oral agents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clindamycin</strong></td>
<td>30-40 mg/k/d in 3-4 doses (max 1.8 g/d)</td>
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<tr>
<td></td>
<td>OR</td>
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</table>

those with mild, localised areas of impetigo, no more than 3 areas of impetigo or an area of infection <5 cm.

Oral antibiotics are indicated for patients with more extensive areas of infection (those with multiple lesions) if infection is not resolving or is worsening, or those with systemic symptoms; and those with non-bullous impetigo in multiple family members, child care groups, or athletic teams.

Bullous impetigo is caused by strains of *S. aureus* that produce a toxin that cleaves the dermal-epidermal junction to form fragile, thin roofed vesicopustules. These lesions may rupture, creating crusted, erythematous erosions, often surrounded by a collar of the roof’s remnants.

Nonbullous impetigo can be caused by β-hemolytic streptococci or *S. aureus*, or both in combination. Impetigo begins as erythematous papules that rapidly evolve
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose/Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cotrimoxazole</strong></td>
<td>8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)</td>
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<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td><strong>Doxycycline</strong></td>
<td>2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)</td>
</tr>
<tr>
<td><strong>Duration of treatment</strong></td>
<td>7 days</td>
</tr>
</tbody>
</table>

An antibiotic active against MRSA is recommended for the following:

- Patients who have failed initial recommended antibiotic treatment against MSSA
- Those with markedly impaired host defenses
- Those with SIRS and hypotension

Echthyma is a consequence of neglected impetigo, and *S. aureus* and/or streptococci may be the cause. Lesions begin as vesicles that rupture, resulting in circular, erythematous ulcers with adherent crusts, often with surrounding erythematous edema. *Streptococcus pyogenes* infection manifests as “honey crust” lesions or “punched out” ulcers (echthyma). Unlike impetigo, echthyma heals with scarring.
Most frequently occurs in children in hot, humid environments.

Gram stain and culture of the pus or exudates from skin lesions of impetigo and ecthyma are recommended to help identify whether *S. aureus* and/or a GABHS is the cause.

Oral therapy for ecthyma and impetigo should be a 7-day regimen with an agent active against *S. aureus* unless cultures yield streptococci alone (when oral penicillin is the recommended agent).
## Erysipelas

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Streptococcus pyogenes</em> (Groups A, B, C, G) is the major cause</td>
<td><strong>1st line:</strong> Penicillin is the drug of choice except in patients with penicillin allergy</td>
<td>Erysipelas is an unusual type of streptococcal infection involving the skin and sometimes the adjacent mucous membranes. It is an elevated erythematous lesion, sometimes exhibiting blebs filled with yellowish fluid, which may crust over after rupture. These infections cause rapidly spreading areas of erythema, swelling, tenderness, and warmth, sometimes accompanied by lymphangitis and inflammation of the regional lymph nodes. The skin surface may resemble an orange peel (<em>peau d'orange</em>) due to superficial cutaneous edema surrounding hair follicles and causing skin dimpling because the follicles remain tethered to the underlying dermis. Usually, can clinically distinguish between red indurated demarcated</td>
</tr>
<tr>
<td></td>
<td><strong>Parenteral therapy</strong></td>
<td></td>
</tr>
</tbody>
</table>
| | **Penicillin G**  
*Mild to moderate infections:* 100,000-150,000 u/kg/d in 4 doses (max dose: 8 MU/d)  
*Severe infections:* 200,000-300,000 u/kg/d in 6 doses (max dose: 24 MU/d)  
OR | |
| | **Cefazolin**  
*Mild to moderate infections:* 25-50 mg/kg/d in 3 doses (max dose: 3 g/d)  
*Severe infections:* 100-150 mg/kg/d in 3 doses (max dose: 6 g/d)  
**If penicillin or cephalosporin allergic; with Severe infections:** | |
| | **Erythromycin** 20 mg/kg/d IV in 4 doses (max dose: 4 g/d) (drug of choice)  
OR | |
Vancomycin 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)

Treat IV until afebrile; then may shift to oral agents as outpatient; oral agents are used also as out-patient therapy for less ill patients.

Oral agents
Penicillin VK 25-30 mg/kg/d in 3-4 doses (max dose: 2 g/d)
OR

Amoxicillin 25-50 mg/kg/d in 3 doses (max dose: 1.5 g/d)
OR

Cephalexin
Mild to moderate infections: 25-50 mg/kg/d in 3-4 doses
Severe infections: 75-100 mg/kg/d in 3-4 doses (daily adult dose, 4 g/d)

If penicillin allergic:
Azithromycin
Children ≥6 months 10 mg/kg PO on day 1 (max dose 500 mg/d) followed by 5 mg/kg on days 2-5 od (max dose: 250 mg/d)
OR

Clindamycin PO 30-40 mg/kg/d in

Erysipelas is an unusual type of streptococcal infection involving the skin and sometimes the adjacent mucous membranes. It is an elevated erythematous lesion, sometimes exhibiting blebs filled with yellowish fluid, which may crust over after rupture.

These infections cause rapidly spreading areas of erythema, swelling, tenderness, and warmth, sometimes accompanied by lymphangitis and inflammation of the regional lymph nodes.

The skin surface may resemble an orange peel (peau d’orange) due to superficial cutaneous edema surrounding hair follicles and causing skin dimpling because the follicles remain tethered to the underlying dermis.

Usually, can clinically distinguish between red indurated demarcated inflamed skin of erysipelas (S. pyogenes) from the abscess
<table>
<thead>
<tr>
<th>For erysipelas involving the face:</th>
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<tbody>
<tr>
<td><strong>1st line:</strong> Parenteral therapy</td>
</tr>
<tr>
<td><strong>Vancocycin</strong> 40-60 mg/kg/d IV in 4 divided doses (max dose: 4 g/d)</td>
</tr>
<tr>
<td><strong>2nd line:</strong> Parenteral therapy</td>
</tr>
<tr>
<td><strong>Linezolid</strong></td>
</tr>
<tr>
<td><em>Mild to moderate infections:</em></td>
</tr>
<tr>
<td>&lt;12 y: 30 mg/kg/d in 3 doses</td>
</tr>
<tr>
<td>≥12 y: 1200 mg/d in 2 doses</td>
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<tr>
<td><em>Severe infections:</em> same</td>
</tr>
</tbody>
</table>

Duration of treatment: 7-10 days or until the patient is afebrile for 3-5 days; 5 days for Azithromycin

Bedside ultrasound may be helpful in detection of deep *S. aureus* abscess (es). If in doubt, treat for both. Community-associated MRSA can mimic erysipelas; look for loculated purulence.

Mixed infection (Strep. and Staph.) is rare. If *S. aureus* is present, need incision and drainage.

Sudden onset of rapidly spreading red edematous tender plaque-like skin on the face in an otherwise healthy host.

*S. aureus* erysipelas of the face can mimic streptococcal erysipelas of an extremity.

If erysipelas-like on the face, must treat as if MRSA is present.
### Cellulitis (purulent)

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most cases of cellulitis are attributed to <em>S. aureus</em>.</td>
<td><strong>1st line (empiric therapy to cover for <em>S. aureus</em>):</strong>&lt;br&gt;Oral agents&lt;br&gt;<em>Cloxacillin</em> 50-100 mg/kg/d PO in 4 doses (max dose: 2 g/d)&lt;br&gt;Parenteral agents&lt;br&gt;<em>Oxacillin</em> 100-150 mg/kg/d IV/IM in 4 doses (max dose: 4 g/d)&lt;br&gt;Severe infections: 150-200 mg/kg/d IV/IM in 4-6 doses (max dose: 12 g/d)&lt;br&gt;OR&lt;br&gt;<em>Cefazolin</em>&lt;br&gt;Mild to moderate infections: 50 mg/kg/d in 3 doses (max dose: 3 g/d)&lt;br&gt;Severe infections: 100-150 mg in 3 doses (max dose: 6 g/d)</td>
<td>Cellulitis refers to infection involving the deeper dermis and subcutaneous fats.&lt;br&gt;For purulent cellulitis, (eg, cellulitis associated with purulent drainage or exudate in the absence of a drainable abscess), empirical therapy for <em>S. aureus</em> is recommended and empirical therapy for infection due to β-hemolytic streptococci is likely unnecessary.</td>
</tr>
<tr>
<td></td>
<td>Duration of treatment: 7-10 days is recommended but should be individualized on the basis of the patient’s clinical response</td>
<td>An antibiotic active against MRSA is recommended for the following:</td>
</tr>
</tbody>
</table>
2nd line (For suspected/confirmed MRSA):

**Oral agents**
- **Clindamycin**: 30-40 mg/kg/d in 3-4 doses (max 1.8 g/d)
  OR
- **Cotrimoxazole**: 8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)
  OR
- **Doxycycline**: 2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)

**Parenteral agents**
- **Clindamycin**: 25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)
  OR
- **Vancomycin**: 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)
  OR
- **Linezolid**
  *Mild to moderate infections:*
  - <12 y: 30 mg/kg/d in 3 doses
  - ≥12 y and adults: 1200 mg/d in 2 doses
  *Severe infections: same*

Duration of treatment: 7-10 days is recommended but should be individualized on the basis of the patient’s clinical response

- Patients with carbuncles or abscesses who have failed initial recommended antibiotic treatment against MSSA
- Those with markedly impaired host defenses
- Those with SIRS and hypotension
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</tr>
</thead>
<tbody>
<tr>
<td>Usually caused by beta-hemolytic streptococci (e.g. group A, B, C, G streptococci) and MSSA</td>
<td><strong>1st line (empiric therapy to cover both strep and staph):</strong>&lt;br&gt;&lt;br&gt;&lt;b&gt;Oral agents&lt;/b&gt;&lt;br&gt;&lt;br&gt;&lt;b&gt;Cephalexin&lt;/b&gt;&lt;br&gt;&lt;i&gt;Mild to moderate infections:&lt;/i&gt; 25-50 mg/kg/d in 3-4 doses&lt;br&gt;&lt;i&gt;Severe infections:&lt;/i&gt; 75-100 mg/kg/d in 3-4 doses (max dose: 4 g/d)&lt;br&gt;OR&lt;br&gt;&lt;b&gt;Amoxicillin-clavulanic acid&lt;/b&gt;&lt;br&gt;7:1 formulation 25-45 mg/kg/d (amoxicillin component) in 2 doses (max dose: 1.75 g/d)&lt;br&gt;4:1 formulation: 20-40 mg/kg/d PO (amoxicillin component) in 3 doses (max dose: 1.5g)&lt;br&gt;&lt;br&gt;&lt;b&gt;Parenteral agents&lt;/b&gt;&lt;br&gt;&lt;b&gt;Cefazolin&lt;/b&gt;&lt;br&gt;&lt;i&gt;Mild to moderate infections:&lt;/i&gt; 50 mg/kg/d in 3 doses (max dose: 3 g/d)&lt;br&gt;&lt;i&gt;Severe infections:&lt;/i&gt; 100-150 mg in 3 doses (max dose: 6 g/d)&lt;br&gt;OR</td>
<td>Non-purulent cellulitis is defined as cellulitis with intact skin and no evidence of purulent discharge.</td>
</tr>
</tbody>
</table>
### Ampicillin/sulbactam

*Mild to moderate infections:* 100-200 mg/kg/d in 4 doses (max dose: 4 g/d)

*Severe infections:* 200 mg/kg/d (ampicillin component) in 4 doses (max dose: 8 g/d)

Duration of treatment: 7-10 days is recommended but should be individualized on the basis of the patient’s clinical response.

### 2nd line:

#### Oral agents

**Clindamycin** 30-40 mg/kg/d in 3-4 doses (max 1.8 g/d)

OR

**Cotrimoxazole** 8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)

PLUS

**Amoxicillin** 25-50 mg/kg/d in 3 doses (max dose: 1.5 g/d)

OR

Empirical coverage for CA-MRSA is recommended in patients who do not respond to B-lactam therapy and may be considered in those with systemic toxicity.

An antibiotic active against MRSA is recommended for the following:

- Patients who have failed initial recommended antibiotic treatment against MSSA
- Those with markedly impaired host defenses
- Those with SIRS and hypotension
**Skin and Soft Tissue Infections**

### National Antibiotic Guidelines

- **Doxycycline** 2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)
  PLUS
- **Amoxicillin** 25-50 mg/kg/d in 3 doses (max dose: 1.5 g/d)

**Parenteral agents**

- **Clindamycin** 25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)
  OR
- **Vancomycin** 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)
  OR
- **Linezolid**
  *Mild to moderate infections:*
  - <12 y: 30 mg/kg/d in 3 doses
  - ≥12 y and adults: 1200 mg/d in 2 doses
  *Severe infections:* same

Duration of treatment: 7-10 days is recommended but should be individualized on the basis of the patient's clinical response.

Trimethoprim-sulfamethoxazole and doxycycline should not be used as a single agent in the initial treatment of cellulitis because their activity against β-hemolytic streptococci is not well defined. If coverage for both β-hemolytic streptococci and CA-MRSA is desired, may combine Cotrimoxazole or a tetracycline with a β-lactam (eg, amoxicillin).
### Non-infected burns

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Wide spectrum of potential pathogens: eg, gram-positive cocci, gram-negative bacilli, and fungi. | **1st line:**  
**Silver sulfadiazine** cream  
Mixture of silver nitrate and sodium sulfadiazine | Silver sulfadiazine  
Minor adverse effects:  
Sulfonamide allergy  
Steven Johnson's Syndrome  
Some believe drug impairs re-pithelialization of the burn wound; silver is toxic to keratinocytes and fibroblasts.  
Transient leukopenia; probably due to margination of WBCs in the wound rather than bone marrow suppression. Resolves spontaneously.  
Not facial burns for fear of eye irritation or injury. |
|                                                                         | **2nd line:**  
Topical antimicrobials                                                                   |                                                                                               |
| **Stage I (epidermis) and II A and B wounds (partial thickness, superficial and deep):** | **Silver nitrate** 0.5% solution  
Anti-tetanus prophylaxis is indicated                                                          | Silver nitrate solution  
Messy. Turns skin black.  
Activity vs Gram-negative bacteria less broad than silver sulfadiazine cream.  
Hyponatremia and hypochloremia can occur  
Rarely, Methemoglobinemia can occur. |


<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| *Streptococcus pyogenes*  
*Enterobacter sp.*  
*Staphylococcus aureus*  
*Staphylococcus epidermidis*  
*Enterococcus faecalis*  
*Escherichia coli*  
*Pseudomonas aeruginosa*  
Fungi (rare) and Herpes virus (rare) | **1st line:**  
**Oxacillin**  
*Mild to moderate infections:* 100-150 mg/kg/d IV/IM in 4 doses (max dose: 4 g/d)  
*Severe infections:* 150-200 mg/kg/d IV/IM in 4-6 doses (max dose: 12 g/d)  
PLUS  
**Ceftazidime**  
*Mild to moderate infections:* 90-150 mg IV/IM in 3 doses (max dose: 3 g/d)  
*Severe infections:* 200-300 mg IV/IM in 3-4 doses (max dose: 6 g/d) | Ideal care is in dedicated burn unit.  
Gram positive organisms prevail in the early postburn period: *Staph* (CONS and *S. aureus*), *Micrococcus*, *Strep*, *Pediococcus*, and *Enterococcus*.  
These then are replaced by fungi (Candida) and gram negative bacteria: *P. aeruginosa*, *E. coli*, *Enterobacter cloacae*, *Klebsiella pneumonia* and *Serratia marcescens*.  
*Acinetobacter* are also found more often in patients with more severe burns and comorbidities.  
Gram positive cocci, including *S. aureus* and MRSA were the most common causes of burn infections in patients with relatively small burns <30% of BSA. |
| **2nd line:**  
**Vancomycin** 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)  
PLUS  
**Meropenem** 60-120 mg/kg/d in 3 divided doses (max dose: 6 g/d) OR  
**Vancomycin** 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d) | **Vancomycin**  
40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d)  
**Meropenem** 60-120 mg/kg/d in 3 divided doses (max dose: 6 g/d) OR  
**Vancomycin** 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d) |
PLUS Cefepime

**Mild to moderate infections:** 100 mg in 2 doses (max dose: 4 g/d)

**Severe infections:** 100-150 mg in 2-3 doses (max dose: 6 g/d)

Gram positive cocci and gram negative bacteria esp. *P. aeruginosa* were common causes in patients with extensive burns >30% of BSA.

Other complications of concern in critically ill burn patient: *S. aureus* toxic shock syndrome (TSS), suppurative phlebitis, pneumonia.

An antibiotic active against MRSA is recommended for the following:
- Patients who have failed initial recommended antibiotic treatment against MSSA
- Those with markedly impaired host defenses
- Those with SIRS and hypotension

<table>
<thead>
<tr>
<th>Puncture wound</th>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
|                | *S. aureus*, *Streptococcus* sp., mixed flora | **1st line:** Oxacillin
  *Mild to moderate infections:* 100-150 mg/kg/d IV/IM in 4 doses (max dose: 4 g/d)
  *Severe infections:* 150-200 mg/kg/d | Refer to WHO prevention and management of wound infection. |
IV/IM in 4-6 doses (max dose: 12 g/d)

**2nd line:**

**Clindamycin** 25-40 mg/kg/d in 3-4 doses (max dose: 2.7 g/d)
ADD

**Amikacin** 15 -22.5 mg/kg/d in 1-3 doses (max 1.5 g/d)
PLUS

**Ceftazidime**
*Mild to moderate infections:* 90-150 mg IV/IM in 3 doses (max dose: 3 g/d)
*Severe infections:* 200-300 mg IV/IM in 3 or 4 doses (max dose: 6 g/d)
OR

**Piperacillin-Tazobactam**
*Severe infections:* 240-300 mg/kg/d of piperacillin component in 3-4 doses (max dose: 16g of piperacillin/d)
Lower dose is recommended for patients <6 months of age: 150-300 mg/kg/d in 3-4 doses (max dose: 16 g of piperacillin per day)
Lower dose is recommended for patients <6 months of age: 150-300 mg/kg/d in 3-4 doses (max dose: 16g of piperacillin per day)

Use clindamycin instead of oxacillin if anaerobes or MRSA are suspected.

Any evidence of deep infection, especially if it persists or develops more than 72h after injury and particularly in children, is a strong indication for exploration and addition of an anti-pseudomonal agent.

If *P. aeruginosa* infection is highly considered (ie wound is associated with nail through rubber-soled footwear), add amikacin and ceftazidime or piperacillin-tazobactam.
<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymicrobial (microbial flora dependent on nature of the trauma):</td>
<td><strong>Uncomplicated, mild or moderate, afebrile patient:</strong></td>
<td>Debridement of wound may be indicated.</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em> (MSSA, MRSA)</td>
<td><strong>1st line:</strong></td>
<td>Obtain culture and sensitivity, check gram stain.</td>
</tr>
<tr>
<td><em>Streptococcus</em> sp. (aerobic and anaerobic)</td>
<td><em>Oral agents</em></td>
<td>Give tetanus prophylaxis and vaccine if indicated.</td>
</tr>
<tr>
<td><em>Enterobacteriaceae</em></td>
<td><strong>Cephalixin</strong></td>
<td>An antibiotic active against MRSA is recommended for the following:</td>
</tr>
<tr>
<td><em>Clostridium perfringens</em></td>
<td><em>Mild to moderate infections:</em> 25-50 mg/kg/d in 3-4 doses</td>
<td>• Patients who have failed initial recommended antibiotic treatment against MSSA</td>
</tr>
<tr>
<td><em>Clostridium tetani</em></td>
<td><em>Severe infections:</em> 75-100 mg/kg/d in 3-4 doses (max dose: 4 g/d)</td>
<td>• Those with markedly impaired host defenses</td>
</tr>
<tr>
<td><em>Pseudomonas</em> sp. (water exposure)</td>
<td><strong>2nd line (For suspected/confirmed MRSA):</strong></td>
<td>• Those with SIRS and hypotension</td>
</tr>
<tr>
<td><em>Aeromonas</em> sp.</td>
<td><em>Clindamycin</em></td>
<td></td>
</tr>
<tr>
<td><em>Acinetobacter</em> species</td>
<td>30-40 mg/kg/d in 3-4 doses (max 1.8 g/d)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>OR</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Cotrimoxazole</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>Dosage</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Doxycycline</strong></td>
<td>2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)</td>
<td></td>
</tr>
<tr>
<td><strong>Linezolid</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Mild to moderate infections:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12 y</td>
<td>30 mg/kg/d in 3 doses</td>
<td></td>
</tr>
<tr>
<td>≥12 y and adults</td>
<td>1200 mg/d in 2 doses</td>
<td></td>
</tr>
<tr>
<td><em>Severe infections:</em></td>
<td>1200 mg/d in 2 doses</td>
<td></td>
</tr>
<tr>
<td>If Gram-negative bacilli are suspected:</td>
<td></td>
<td></td>
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<tr>
<td>PLUS</td>
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</tr>
<tr>
<td>Amoxicillin-clavulanic acid</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Mild to moderate infections:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:1 formulation</td>
<td>25-45 mg/kg/d</td>
<td></td>
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<tr>
<td>4:1 formulation</td>
<td>20-40 mg/kg/d</td>
<td></td>
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<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ciprofloxacin</strong></td>
<td>20-30 mg/kg/d in 2 doses (PO max dose: 1.5 g/d)</td>
<td>Ciprofloxacin has been used most extensively in children</td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If S. aureus are erythromycin-resistant in vitro, may have inducible resistance to clindamycin; make sure lab checks if using the latter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Complicated, severe, febrile patient</strong></td>
<td>and adolescents and appears to be well tolerated, effective and does not appear to cause arthropy.</td>
<td></td>
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<tr>
<td>----------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>1st line:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parenteral agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Piperacillin-Tazobactam</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Severe infections:</em> 240-300 mg of piperacillin component in 3 doses (max dose: 16 g/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower doses are recommended for patients &lt;6months of age: 150-300 mg/kg/d in 3-4 doses (max dose: 16g of piperacillin /d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLUS</td>
<td></td>
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<tr>
<td><strong>Vancomycin</strong> 40-60 mg/kg/d IV in 4 divided doses (max dose: 4 g/d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2nd line:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parenteral agents</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Meropenem</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Severe infections:</em> 60-120 mg/kg/d in 3 doses (max dose: 6 g/d)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PLUS

**Vancomycin** 40-60 mg/kg/d IV in 4 divided doses (max dose: 4 g/d)

OR

**Linezolid**

*Mild to moderate infections:*

- **<12 y:** 30 mg/kg/d IV in 3 doses
- **≥12 y and adults:** 1200 mg/d IV in 2 doses

*Severe infections: same*

PLUS

**Ciprofloxacin** 20-30 mg/kg/d IV in 2-3 doses (max dose: 1.2 g/d)

---

### Post-operative wound infection (non-GI tract, non-GU tract surgery)

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Non-GI Tract, non-GU tract surgery: skin flora  
S. aureus  
*Streptococcus* sp. (Group A, B, C, G) | **Mild to moderate infections**  
(without sepsis; afebrile patients):  
Oral agents  
1st line:  
**Clindamycin** 30-40 mg/kg/d in 3-4 doses (max 1.8 g/d)  
OR | Surgical site infections require prompt and wide opening of the surgical incision.  
Antimicrobial therapy is recommended for deep incisional surgical site infections if systemic signs of sepsis are present, if source control is incomplete or in immunocompromised patients. |
**Cotrimoxazole** 8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)

2nd line:

**Linezolid**

*Mild to moderate infections:*

- **<12 y:** 30 mg/kg/d in 3 doses
- **≥12 y and adults:** 1200 mg/d in 2 doses

*Mild to moderate infections:* same

**Severe infection: with sepsis; febrile patients**

Parenteral agents

1st line:

**Clindamycin** 25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)

2nd line:

**Vancomycin** 45-60 mg/kg/d IV in 3-4 doses (max dose: 4 g/d)

**OR**

**Linezolid**

*Mild to moderate infections:*

- **<12 y:** 30 mg/kg/d IV in 3 doses
- **≥12 y and adults:** 1200 mg/d IV in 2 doses

In patients who have had clean operations, antimicrobial therapy should cover gram-positive organisms.

An antibiotic active against MRSA is recommended for the following:

- Patients who have failed initial recommended antibiotic treatment against MSSA
- Those with markedly impaired host defenses or
- Those with SIRS and hypotension
### Severe infections: same

PLUS

**Ciprofloxacin** 20-30 mg IV in 2-3 doses (max dose: 1.2 g/d)

PLUS

**Metronidazole** 30 mg/kg/d in 3-4 doses (max dose: 4 g/d)

---

#### Post-operative wound infection (GI tract or GU tract surgery)

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GI Tract or GU Tract surgery: skin flora, GI and vaginal flora</td>
<td><strong>Mild infection:</strong></td>
<td>In patients who have had procedures on the GI or GU tract, antimicrobial therapy should cover both gram-positive and gram-negative organisms.</td>
</tr>
<tr>
<td><em>S. aureus</em> (MSSA, MRSA)</td>
<td>Oral agents</td>
<td>If with skin incision, usually remove sutures to drain wound, obtain culture and sensitivity, and pack wound.</td>
</tr>
<tr>
<td>Coliform species: eg, <em>E. coli</em></td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td>Bacteroides species: eg, <em>B. fragilis</em></td>
<td><strong>Amoxicillin-clavulanic acid</strong></td>
<td></td>
</tr>
<tr>
<td>Other anaerobic bacteria</td>
<td>Mild to moderate infections</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7:1 formulation: 25-45 mg/kg/d (amoxicillin component) PO in 2 doses (max dose: 1.75 g/d)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:1 formulation: 20-40 mg/kg/d (amoxicillin component) PO in 3 doses (max dose: 1.5 g)</td>
<td></td>
</tr>
</tbody>
</table>
If *S. aureus* (MRSA) is suspected:

PLUS

**Cotrimoxazole** 8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)

2nd line:

**Amoxicillin-clavulanic acid**
*Mild to moderate infections:*
7:1 formulation: 25-45 mg/kg/d (amoxicillin component) PO in 2 doses (max dose: 1.75 g/d)
4:1 formulation: 20-40 mg/kg/d (amoxicillin component) PO in 3 doses (max dose: 1.5 g)

If *S. aureus* (MRSA) is suspected:

PLUS

**Clindamycin** 30-40 mg/kg/d in 3-4 doses (max 1.8 g/d)

**Severe infection:**

Parenteral agents

1st line:

**Piperacillin-Tazobactam**
*Severe infections:* 240-300 mg/kg/d of piperacillin component in 3 doses

An antibiotic active against MRSA is recommended for the following:
- Patients with carbuncles or abscesses who have failed initial antibiotic treatment
- Those with markedly impaired host defenses
- Those with SIRS and hypotension
Skin and Soft Tissue Infections
National Antibiotic Guidelines

(daily adult dose, 16 g/d)
Lower doses are recommended for patients <6 months of age: 150-300 mg/kg/d in 3-4 doses (max dose: 16g of piperacillin /d)
PLUS
Vancomycin 40-60 mg/kg/d in 3-4 doses (max dose: 4 g/d)

OR

Ceftriaxone 100 mg/kg/d in 1 or 2 doses (max dose: 4 g/d)
PLUS
Metronidazole 30 mg/kg/d in 3-4 doses (max dose: 4 g/d)
PLUS
Vancomycin 40-60 mg/kg/d in 3-4 doses (max dose: 4 g/d)

OR

Cefotaxime 100-200 mg/kg/d in 3-4 doses (max dose: 12 g/d)
PLUS
Metronidazole 30 mg/kg/d in 3-4 doses (max dose: 4 g/d)
PLUS
Vancomycin 40-60 mg/kg/d in 3-4 doses (max dose: 4 g/d)
### Skin and Soft Tissue Infections

#### 2nd line:

**Vancomycin** 40-60 mg/kg/d in 3-4 doses (max dose: 4 g/d)
PLUS
**Meropenem** 60-120 mg/kg/d in 3 doses (max dose: 6 g/d)

OR

**Linezolid**
- <12 y: 30 mg/kg/d in 3 doses
- ≥12 y and adults: 1200 mg/d in 2 doses
PLUS
**Meropenem** 60-120 mg/kg/d in 3 doses (max dose: 6 g/d)

---

### Wound infection, soil contaminated

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
**Penicillin G**
*Mild to moderate infections*: 100,000-150,000 u/kg/d in 4 doses (max dose: 8 MU/d)
*Severe infections*: 200,000-300,000 u/kg/d in 6 doses (max dose: 24 MU/d)
PLUS | |
### CAT, DOG AND MAMMAL BITE

**Bite wound from cat**

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| *Pasteurella* species **Staphylococcus aureus** *Bacteroides* sp. *Fusobacterium* sp., EF-4 *Capnocytophaga* s Group A Strep | **1st line:** **Oral agent**  
*Amoxicillin-clavulanic acid*  
*Mild to moderate infections*  
7:1 formulation: 25-45 mg/kg/d (amoxicillin component) PO in 2 doses (max dose: 1.75 g/d)  
4:1 formulation: 20-40 mg/kg/d (amoxicillin component) PO in 3 doses (max dose: 1.5 g) | Cleaning, irrigation and debridement are most important.  
Preemptive early antimicrobial therapy for 3-5 days is recommended for patients who are immunocompromised; are asplenic; have advanced liver disease; have preexisting or resultant edema of the affected area; have moderate to severe |
### Parenteral agent

**Ampicillin/sulbactam**

*Mild to moderate infections:* 100-200 mg/kg/d in 4 doses (max dose: 4 g/d)  
*Severe infections:* 200 mg/kg/d (ampicillin component) in 4 doses (max dose: 8 g/d)

**2nd line:**

**Clindamycin**

30-40 mg/kg/d PO in 3-4 doses (max 1.8 g/d)  
25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)

OR

**Metronidazole** 30 mg/kg/d in 3-4 doses (max dose: 4 g/d)

PLUS

**Cefuroxime axetil** 20-30 mg/kg/d  
PO in 2 doses (max 1 g/d)  
OR  
**Doxycycline** 2-4 mg/kg/d PO/IV in 1-2 doses (max dose: 200 mg/d)

Injuries, especially to the hand or face; or have injuries that may have penetrated the periosteum or joint capsule.

Culture and treat empirically.

80% get infected, *Pasteurella multocida* infection develops within 24 h.

Observe for osteomyelitis.

*P. multocida* is resistant to dicloxacillin, Cephalexin and clindamycin. Many strains appear susceptible to azithromycin but no clinical data.

Consider rabies and tetanus post-exposure prophylaxis and vaccination.
### Dog bite

Only 5% of dog bite wounds get infected. Treat only if the bite is severe or patient presents with co-morbidity (e.g., diabetes).

<table>
<thead>
<tr>
<th>Clinical Setting/Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Bacteroides</em> sp.</td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Fusobacterium</em> sp., EF-4</td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Capnocytophaga</em> sp.</td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus sp.</em></td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Bacteroides</em> sp.</td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Fusobacterium</em> sp., EF-4</td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
<tr>
<td><em>Capnocytophaga</em> sp.</td>
<td><strong>1st line:</strong></td>
<td></td>
</tr>
</tbody>
</table>

**1st line:** Amoxicillin-clavulanic acid
875/125 mg PO bid or 500/125 mg PO tid

**2nd line:** Ampicillin/sulbactam 3g IV q6h

### Human bite

Etiology

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viridans streptococcus (100%)</td>
<td><strong>1st line:</strong> Oral agent</td>
<td>Cleaning, irrigation and debridement are most important.</td>
</tr>
<tr>
<td><em>Staphylococcus epidermidis</em> (53%)</td>
<td><strong>1st line:</strong> Amoxicillin-clavulanic acid</td>
<td>For clenched fist or hand injuries, X-rays should be obtained.</td>
</tr>
<tr>
<td><em>Corynebacterium</em> sp. (41%)</td>
<td><strong>1st line:</strong> Parenteral agent</td>
<td>For bites inflicted by hospitalized patients, consider aerobic Gram-negative bacilli.</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em> (29%)</td>
<td><strong>1st line:</strong> Amoxicillin-clavulanic acid</td>
<td></td>
</tr>
<tr>
<td><em>Eikenella</em> sp. (15%)</td>
<td><strong>1st line:</strong> Parenteral agent</td>
<td></td>
</tr>
<tr>
<td><em>Bacteroides</em> sp. (82%)</td>
<td><strong>1st line:</strong> Amoxicillin-clavulanic acid</td>
<td></td>
</tr>
<tr>
<td><em>Peptostreptococcus</em> sp. (26%)</td>
<td><strong>1st line:</strong> Parenteral agent</td>
<td></td>
</tr>
</tbody>
</table>

Cleaning, irrigation and debridement are most important.

For clenched fist or hand injuries, X-rays should be obtained.

For bites inflicted by hospitalized patients, consider aerobic Gram-negative bacilli.

**1st line:** Amoxicillin-clavulanic acid
7:1 formulation: 25-45 mg/kg/d (amoxicillin component) PO in 2 doses (max dose: 1.75 g/d)
4:1 formulation: 20-40 mg/kg/d (amoxicillin component) PO in 3 doses (max dose: 1.5 g)

**Parenteral agent:** Ampicillin/sulbactam
Mild to moderate infections: 100-
patients, consider aerobic Gram-negative bacilli.

<table>
<thead>
<tr>
<th>Antibiotic Combination</th>
<th>Dosage Details</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>200 mg/kg/d in 4 doses (max dose: 4 g/d)</strong>&lt;br&gt;Severe infections; 200 mg/kg/d (ampicillin component) in 4 doses (max dose: 8 g/d)</td>
<td>Duration of treatment: 5 days</td>
<td>lactamase inhibitor combinations, eg, ampicillin-sulbactam. Resistant to clindamycin, nafcillin/oxacillin, metronidazole, cephalexin/cefazolin, TMP/SMX and erythromycin.</td>
</tr>
<tr>
<td><strong>Piperacillin-tazobactam</strong>&lt;br&gt;Severe infections: 240-300 mg/kg/d (piperacillin component) in 3 doses (daily adult dose, 16 g/d)</td>
<td>Lower doses are recommended for patients &lt;6 months of age 150-300 mg/kg/d in 3-4 doses (max dose: 16 g of piperacillin/d)</td>
<td>Clenched fist (and other hand) bite wounds pose risk for deep infections (eg, bone, joint, tendon sheath) and require careful evaluation.</td>
</tr>
<tr>
<td><strong>For penicillin allergy</strong>&lt;br&gt;<strong>Clindamycin</strong>&lt;br&gt;30-40 mg/kg/d PO in 3-4 doses (max 1.8 g/d)</td>
<td>OR 25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)</td>
<td>X-ray would evaluate for fracture or foreign body. Potential risk of transmitting blood-borne pathogens if injury contaminated with another's blood.</td>
</tr>
<tr>
<td>OR <strong>Metronidazole</strong> 30 mg/kg/d in 3-4 doses (max dose: 4 g/d)</td>
<td>PLUS Review tetanus immunization status.</td>
<td></td>
</tr>
</tbody>
</table>
### Rat bite

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirillum minus</em></td>
<td><strong>Prophylaxis:</strong></td>
<td>Rabies post-exposure prophylaxis and vaccination is <em>not</em> indicated for rat bites.</td>
</tr>
<tr>
<td><em>Streptobacillus moniliformis</em></td>
<td>1st line: Amoxicillin 25-50 mg/kg/d in 3 doses (max dose: 1.5 g/d)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2nd line: Doxycycline 2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duration of treatment: 3 days</td>
<td></td>
</tr>
<tr>
<td><strong>Rat bite fever:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st line: Penicillin G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild to moderate infections: 100,000-150,000 u/kg/d in 4 doses (max dose: 8 MU/d)</td>
<td></td>
<td></td>
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<tr>
<td>Severe infections: 200,000-300,000 u/kg/d in 6 doses (max dose: 24 MU/d)</td>
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<tr>
<td>OR</td>
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</tbody>
</table>
Doxycycline 2-4 mg/kg/d in 1-2 doses (max dose: 200 mg/d)

2nd line:
Erythromycin
*Mild to moderate infections*: 50 mg/kg/d PO in 3-4 doses (max dose: 2 g/d)
*Severe infections*: 20 mg/kg/d IV in 4 doses (max dose: 4 g/d)

OR
Clindamycin
30-40 mg/kg/d PO in 3-4 doses (max 1.8 g/d)
25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)

Duration of treatment: 10-14 days

### Necrotizing fasciitis/gas gangrene

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
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</table>
| *Staphylococcus aureus* (CA-MRSA)             | **1st line:** Vancomycin 40-60 mg/kg/d IV in 4 doses (max dose: 4 g/d) PLUS Piperacillin-Tazobactam 240-300 mg/kg/d (piperacillin component) in 3-4 doses (max dose: 16 g of piperacillin/d) Lower dose is recommended for | Incision for exploration, drainage and debridement (include aerobic and anaerobic cultures if available in your setting) and resect all non-viable tissue.  
Infection extends into the fascial plane between muscle and subcutaneous fat with resulting necrotizing fasciitis. |
<p>| Group A streptococci                          |                                                        |                                                                          |
| <em>Clostridium sp.</em>                             |                                                        |                                                                          |
| <em>Clostridium perfringens</em> (most common)       |                                                        |                                                                          |
| <em>Clostridium septicum</em>                        |                                                        |                                                                          |
| <em>Clostridium tertium</em>                         |                                                        |                                                                          |</p>
<table>
<thead>
<tr>
<th>Patients &lt;6 months of age: 150-300 mg/kg/d in 3-4 doses (max dose: 16g of piperacillin/d)</th>
<th>Historically, <em>S. aureus</em> was not associated with necrotizing fasciitis, but CA-MRSA is now different and can cause the disease.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2nd line:</strong></td>
<td>Usually gas gangrene is preceded by a traumatic wound or surgery with contamination by Clostridial spores.</td>
</tr>
<tr>
<td><strong>Cefotaxime</strong> 100-200 mg/kg/d in 3-4 doses (max dose: 12 g/d)</td>
<td>Diagnosis is easily made by gram stain of necrotic tissue. X-ray, CT scan may show gas in involved tissue.</td>
</tr>
<tr>
<td>PLUS</td>
<td>Hyperbaric oxygen (HBO) is not recommended.</td>
</tr>
<tr>
<td><strong>Clindamycin</strong> 30-40 mg/kg/d PO in 3-4 doses (max 1.8 g/d)</td>
<td></td>
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<tr>
<td><strong>Penicillin plus clindamycin</strong> is recommended for treatment of documented group A streptococcal necrotizing fasciitis and clostridial myonecrosis</td>
<td></td>
</tr>
<tr>
<td><strong>Penicillin G</strong> <em>Mild to moderate infections</em>: 100,000-150,000 u/kg/d in 4 doses (max dose: 8 MU/d)</td>
<td></td>
</tr>
<tr>
<td><em>Severe infections</em>: 200,000-300,000 u/kg/d in 6 doses (max dose: 24 MU/d)</td>
<td></td>
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<tr>
<td>PLUS</td>
<td></td>
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<tr>
<td><strong>Clindamycin</strong> 30-40 mg/kg/d PO in 3-4 doses</td>
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</table>
### Pyomyositis

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
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</tr>
</thead>
<tbody>
<tr>
<td>S. aureus&lt;br&gt;Streptococcus sp. (Group A and others)&lt;br&gt;Gram-negative bacilli (rare)&lt;br&gt;Anaerobic bacteria (rarely Clostridium species)</td>
<td>1st line: &lt;br&gt;&lt;b&gt;Oxacillin&lt;/b&gt;&lt;br&gt;&lt;i&gt;Mild to moderate infections:&lt;/i&gt; 100-150 mg/kg/d IV/IM in 4 doses (max dose: 4 g/d)&lt;br&gt;&lt;i&gt;Severe infections:&lt;/i&gt; 150-200 mg/kg/d IV/IM in 4-6 doses (max dose: 12 g/d) or 100-150 mg/kg/d IV divided q4-6h (max dose: 12 g/d) OR &lt;br&gt;&lt;b&gt;Cefazolin&lt;/b&gt;&lt;br&gt;&lt;i&gt;Mild to moderate infections:&lt;/i&gt; 50 mg/kg/d in 3 doses (max dose: 3 g/d)&lt;br&gt;&lt;i&gt;Severe infections:&lt;/i&gt; 100-150 mg/kg/d in 3 doses (max dose: 6 g/d)</td>
<td>Magnetic resonance imaging (MRI) is the recommended imaging modality for establishing the diagnosis.&lt;br&gt;Computed tomography (CT) scan and ultrasound studies are also useful.&lt;br&gt;Appropriate cultures (blood and abscess) should be obtained. An antibiotic active against MRSA is recommended for the following: • Patients who have failed</td>
</tr>
</tbody>
</table>
### Decubitus ulcer

<table>
<thead>
<tr>
<th>Etiology</th>
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<tbody>
<tr>
<td><em>Streptococcus</em> sp.</td>
<td>1st line:</td>
<td>Debride necrotic tissue and use moist wound dressing.</td>
</tr>
</tbody>
</table>
| *S. aureus*               | **Superficial infection:**  
| \                            | Silver sulfadiazine 1% cream                           | Remove pressure if decubitus ulcer; elevate leg if venous stasis; evaluate for revascularization if arterial insufficiency. |
| *Enterobacteriaceae*      | **Severe local infection:**  
| \                            | *Piperacillin-Tazobactam*  
| \                            | Severe infections: 240-300 mg/kg/d (piperacillin component) in 3-4 doses (max dose: 16g of piperacillin/d).  
| \                            | Lower dose is recommended for patients <6 months of age: 150-300 mg/kg/d in 3-4 doses (max dose: 16g of piperacillin /d) | Do not use povidone iodine or chlorhexadine, both may damage granulation tissue and fibroblasts. |
| *P. aeruginosa*           |                                                        | Best method is surgically                                                                          |
| Anaerobic streptococci    |                                                        |                                                    |
| *B. fragilis*             |                                                        |                                                    |
Skin and Soft Tissue Infections
National Antibiotic Guidelines

### Clindamycin
- **2nd line:**
  - **Clindamycin** 25-40 mg/kg/d IV in 3-4 doses (max dose: 2.7 g/d)
  - PLUS
  - **Ceftazidime**
    - *Mild to moderate infections:* 90-150 mg IV in 3 doses (max dose: 3 g/d)
    - *Severe infections:* 200-300 mg IV in 3 or 4 doses (max dose: 6 g/d)
  - OR
  - **Ciprofloxacin**
    - 20-30 mg/kg/d PO in 2 doses (max dose: 1.5 g/d)
    - OR
    - 20-30 mg/kg/d IV in 2-3 doses (max dose: 1.2 g/d)

### Cat scratch disease

<table>
<thead>
<tr>
<th>Etiology</th>
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</table>
| *Bartonella henselae* | **1st line:**
  - **Lymphadenitis in immunocompromised patient:**
  - **Azithromycin**
    - Children ≥6 months 10 mg/kg PO on day 1 (max dose: 500 mg/d) followed by 5 mg/kg on days 2-5 od (max dose: 250 mg/d) | Self-limited regional lymphadenitis
  - Disease manifestations can include involvement of the central nervous system, eyes and viscera (liver, and spleen).
  - The optimal duration of therapy is not known but may be several weeks for systemic osteomyelitis.

Obtained deep tissue specimen for histology and culture. If osteomyelitis is suspected, also bone biopsy. Needle aspiration from the ulcer margin is acceptable.
**Skin and Soft Tissue Infections National Antibiotic Guidelines**

**Rifampicin** 20 mg/kg/d in 1-2 doses (max dose: 600 mg/d)  
**Cotrimoxazole** 8-12 mg/kg/d (TMP component) in 2 doses (max dose: 320 mg/d)  
Duration of treatment: 7-10 days

**2nd line:**  
**Lymphadenitis in immunocompetent patient:**  
No therapy, as the lymphadenitis spontaneously resolves.  
Complete resolution may take 2-6 months.

---

**TINEA CORPORIS, TINEA CRURIS, TINEA PEDIS**

<table>
<thead>
<tr>
<th>Tinea corporis, Tinea cruris (jock itch), Tinea pedis (athlete’s foot)</th>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Trichophyton rubrum</em></td>
<td>1st line:</td>
<td>Redder margins than centers creates impression of a ring.</td>
</tr>
<tr>
<td></td>
<td><em>T. mentagrophytes</em></td>
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<tr>
<td></td>
<td><em>Epidermophyton floccosum</em></td>
<td></td>
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<tr>
<td></td>
<td><em>Terbinafine 1% cream</em></td>
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</tbody>
</table>
for Tinea corporis, Tinea cruris, and interdigital Tinea pedis, apply bid x 1 week; for plantar Tinea pedis, apply bid x 2 weeks.

**2nd line:**
Topical
Imidazoles (clotrimazole, ketoconazole, etc.) apply bid x 2-4 weeks

Systemic
Terbinafine
<20 kg: 62.5 mg/d  
20-40 kg: 125 mg/d  
>40 kg: 250 mg/d

Fluconazole 3-6 mg/kg once a week x 2-4 weeks

Opposed to Tinea capitis, these infections can often be cured with topical therapy alone. Systemic therapy can be reserved for severe or refractory infection, recurrent infection, or in immunocompromised patients.

Serious but rare cases of hepatic failure have been reported in patients receiving terbinafine and should not be used in those with chronic or active liver disease.

---

**Tinea versicolor (Pityriasis versicolor)**

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
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</table>
| *Malassezia furfur* | **1st line:**  
Limited disease:  
**Ketoconazole** 2% shampoo daily for 3 days; can use 2-3 times a week for maintenance/prevention  
**Selenium sulfide** 2.5% shampoo, daily application while bathing for 1 week | Fine, scaly rash with patches of discolored skin with sharp borders commonly found on back, underarms, upper arms, chest, and neck.  
Skin may appear lighter than surrounding healthy skin; in African Americans, either hypo- or hyper-pigmentation |
to 2 weeks, can use 2-3 times a week for maintenance/prevention

**Extensive disease:**

**Fluconazole** 3-6 mg/kg x 1 dose, repeat in 14 days

**2nd line:**

**Itraconazole** 5-10 mg/kg/d PO in 2 doses x 7d

Rule out erythrasma.

Akapulco lotion (*Senna alata* extract): a meta-analysis (Tababa EJL, Genuino RF, and Salud-Gnilo CM, 2016 unpublished) showed that 50% Akapulco lotion was superior to placebo for tinea versicolor (mycologic cure and decrease in clinical activity). It appears to be as effective as 25% sodium thiosulfate and ketoconazole cream, but larger randomized trials with good follow-up rates are needed to confirm these findings.

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Trichophyton tonsurans</em></td>
<td><strong>1st line:</strong> <em>Terbinafine</em></td>
<td>Itchy, red, raised, scaly patches often sharply defined .</td>
</tr>
<tr>
<td><em>Microsporum canis</em> (NorthAmerica; other species elsewhere)</td>
<td>P: (age&gt;2y); weight-based dosing</td>
<td>Durations of therapy are for <em>T. tonsurans</em>; treat for approximately twice as long for <em>M. canis</em>. All agents have similar cure rates (60-100%) in clinical studies</td>
</tr>
<tr>
<td></td>
<td>&lt;20 kg: 62.5 mg PO in 1 dose x 2 weeks</td>
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<tr>
<td></td>
<td>20-40 kg: 125 mg PO in 1 dose x 2 weeks</td>
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<tr>
<td></td>
<td>&gt;40 kg: 250 mg PO in 1 dose x 2 weeks</td>
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<tr>
<td>Etiology</td>
<td>Preferred Regimen</td>
<td>Comments</td>
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<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sarcoptes scabiei (mite)</td>
<td><strong>Permethrin 5% cream</strong>&lt;br&gt;Apply to entire skin from chin down to and including toes and under fingernails and toenails. May require 30 g. Leave on 8-14 h. Repeat in 1-2 weeks. Safe for children age &gt;2 months. Reapply to hands after handwashing.</td>
<td>Treat close contacts. Wash and dry linens to prevent re-infection.</td>
</tr>
</tbody>
</table>

### Scabies
- Mite infestation of the skin that causes intense itching which is worse at night.
- Diagnosis is based on history and distribution of skin lesions. Sometimes, mites or eggs from scrapings of burrows are visible.
- Pruritus may persist for 2 weeks after mites are gone.
- Antihistamines may help reduce itching.
- Secondary streptococcal infections can occur.

Serious but rare cases of hepatic failure have been reported in patients receiving terbinafine and should not be used in those with chronic or active liver disease.

| 2nd line:  
Itraconazole 5 mg/kg/d x 4 weeks  
Fluconazole 6 mg/kg/d PO every week x 8-12 weeks (maximum of 150 mg PO every week for adults)  
Griseofulvin (microsize formulation) 10-20 mg/kg/d (child) until hair regrows. |
### Varicella-zoster virus infections

**Clinical syndromes:**
- Chickenpox
- Shingles (single dermatomal or multiple dermatomes)
- Disseminated VZV disease/organ involvement
- Emerging data suggests VZV may cause vasculopathy of cerebral, temporal, and other arteries. Suggested as possible cause of giant cell arteritis. Raises treatment possibilities. Need more data.

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Preferred Regimen</th>
<th>Comments</th>
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</thead>
</table>
| Varicella-zoster virus    | **1st line:**  
  **Immunocompetent host, chickenpox:**  
  **Child age 2-12 y**  
  *Mild to moderate disease:* no treatment  
  For patients at increased risk of moderate or severe varicella; chronic cutaneous or pulmonary diseases  
  **Acyclovir** 80 mg/kg/d PO in 4 doses (max dose: 3200 mg/d) (start within 24h of rash)  
  OR  
  **Valacyclovir** 60 mg/kg/d PO in 3 doses (max dose: 1 g/dose in 3 doses)  
  Duration of treatment: 5 days | Acyclovir slowed development and reduced number of new lesions and reduced duration of disease in children. Acyclovir decreased duration of fever, time to healing, and symptoms.  
  Prevention, post-exposure prophylaxis  
  Varicella-zoster immune globulin (VZIG) (125 units/10 kg [22 lbs] body weight IM up to a max of 625 units; minimum dose is 125 units) is recommended for post-exposure prophylaxis in susceptible persons at greater risk for complications (immunocompromised such as HIV, malignancies, pregnancy, and steroid therapy) as soon as possible after exposure (<96 h). |
| If VZIG is not available, IGIV can be used. Although licensed IGIV preparations contain antivaricella antibodies, the titer of any specific lot of IGIV is uncertain because IGIV is not tested routinely for IGIV antivaricella antibodies. The recommended IGIV dose for postexposure prophylaxis to varicella is 400 mg/kg, administered once IV. If varicella develops, initiate treatment quickly (<24h of rash) with acyclovir. Some would treat presumptively with acyclovir in high-risk patients. Susceptible children should receive vaccination. |
REFERENCES

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- Stevens CID: 1-43.
- Tabbeda EL, Ceruing RF, Salid-Gonz. Sena aralia (Akapulko) extract

- Gilmert, DN, Chambers, HF, Eliopoulos, GM, Saeed, MS, Block, Freedman, DO.

- Tabbeda EL, Ceruing RF, Salid-Gonz. Sena aralia (Akapulko) extract
- Gilmert, DN, Chambers, HF, Eliopoulos, GM, Saeed, MS, Block, Freedman, DO.

- References
  - Skin and Soft Tissue Infections National Antibiotic Guidelines
  - Topical antibiotics: very few indications for use: BPJ; Issue 64, P27.
  - Tabbeda EL, Ceruing RF, Salid-Gonz. Sena aralia (Akapulko) extract
  - Gilmert, DN, Chambers, HF, Eliopoulos, GM, Saeed, MS, Block, Freedman, DO.