



# *Skin Deep*

## *Managing Cutaneous Infections*

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### In this article:

1. What therapies are effective in treating cellulitis?
2. How to handle severe and rapidly progressing infections.
3. What are the treatments for impetigo?

Skin infections are common outpatient problems. Cellulitis, folliculitis, and impetigo are the most frequently encountered bacterial skin infections in an office practice. Erysipelas, furuncles, and carbuncles are also common (Table 1). Necrotizing fasciitis (also known as flesh-eating disease) is a rapidly progressive, often fatal soft tissue infection that requires immediate surgical intervention. As treatment of cutaneous infections varies depending on diagnosis and severity, physicians must be able to recognize these entities and manage them appropriately.

### What is cellulitis?

Cellulitis is an infection of the dermis and subcutaneous tissues. It is often a consequence of trauma, resulting from direct inoculation of microorganisms through breaks in the skin, and, therefore, most commonly occurs on the extremities. Classic features of cellulitis include erythema, swelling, pain or tenderness, and warmth over the infected area (Figure 1).

Table 1

#### Skin infections

- Cellulitis:** Infection of the dermis and deep tissues.
- Erysipelas:** Infection of the superficial skin.
- Folliculitis:** Inflammation of a hair follicle.
- Furuncle:** Abscess (boil) originating from hair follicle.
- Carbuncle:** A confluence of furuncles.
- Impetigo:** Vesicles and bullae on exposed areas typically honey-crusted.

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Figure 1. Cellulitis in the lower half of a leg. Source: Fitzpatrick TB, Johnson RS, Poano MK, et al: *Colour Atlas and Synopsis of Clinical Dermatology*. Second Edition. McGraw-Hill Inc., 1992, p. 373.

Regional lymphadenopathy may also be present. Fever and other constitutional symptoms are not uncommon.

By far, the most common microbial etiologies of cellulitis are *Staphylococcus aureus* and *Streptococcus pyogenes* (group A streptococcus). These microbes can not be distinguished reliably from one another based on clinical presentation. Other beta-hemolytic streptococci may cause cellulitis, especially in the presence of Type 2 diabetes, lymphedema, or recent saphenous venectomy. Less commonly, gram-negative bacteria may be implicated. More unusual causes of cellulitis may be ascer-

tained by history (e.g., cat bites and *Pasteurella multocida*; freshwater injury and *Aeromonas hydrophila*) and require specific therapy. Blood cultures are rarely positive with cellulitis. Cultures of affected skin are only positive in 25% to 30% of cases. Therapy is usually empiric because of the low rate of organism recovery.

## Is oral therapy useful?

Oral therapy is appropriate for patients who have uncomplicated cellulitis. Either cloxacillin, 500 mg orally four times daily, or a first-generation cephalosporin such as cephalexin, 500 mg orally four times daily, is appropriate first-line therapy. There is no reliable evidence that either drug is superior. One study of cellulitis in adults suggested more treatment failures with cephalexin compared with cloxacillin, but was limited by its retrospective design and small numbers.<sup>1</sup> Amoxicillin-clavulanate; oral second- and third-generation cephalosporins; azithromycin; and the newer fluoroquinolones, such as moxifloxacin, are also effective. Some of these treatments have demonstrated equivalence to cephalexin in clinical trials.<sup>2-4</sup> However, the ease of administration of these drugs is offset by an unnecessarily broad spectrum of activity, and increased cost.

## When is parenteral therapy used?

Parenteral therapy is indicated for patients with bacteremia, severe or complicated infections, those who are unable to tolerate oral medications, and patients who have not responded to appropriate oral antibiotics. Rapidly advancing infection, hypotension, or other signs of sepsis and significant comorbid conditions are indications for hospitalization. Either cefazolin, 1 g to 2 g intravenously every eight hours, or cloxacillin, 1 g to 2 g intravenously every six hours, is reasonable initial therapy. Data supporting the efficacy of intravenous ceftriaxone for treatment of skin infections are limited.<sup>5</sup> Also, the spectrum of



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activity provided is much broader than required. Outpatient therapy, using once daily cefazolin with probenecid, or twice daily cefazolin alone, is an alternative approach for patients who do not require hospital admission, but would benefit from parenteral therapy.<sup>6-8</sup> Probenecid is contraindicated in patients with known sensitivity, blood dyscrasias, uric acid stones, and those taking high-dose acetylsalicylic acid. Additional coverage for gram-negative pathogens (e.g., with a fluoroquinolone or aminoglycoside) may be appropriate in people who have diabetes or who are immunocompromised. Oral step-down therapy can be instituted when signs and symptoms improve, provided the patient can tolerate oral medications.

Duration of therapy depends on the individual's response, as there are no data on which to base recommendations. In general, therapy for cellulitis can be safely discontinued in most patients a few days after complete resolution of symptoms; a longer treatment course (of 10 to 14 days, or occasionally more) may be more appropriate for complicated or severe cases. Patients with edematous limbs (secondary to lymphedema or venous insufficiency) may be prone to recurrences and, in some instances, may benefit from long-term antimicrobial prophylaxis.

## What does periorbital or orbital cellulitis look like?

A red, swollen eyelid may be due to either periorbital (preseptal), or orbital cellulitis. Anatomically, periorbital cellulitis does not involve the orbit proper, and often results from local trauma to the lid; vision and extraocular movements are usually intact. Therapy directed towards *S. aureus* and *S. pyogenes* usually leads to a successful outcome. *Haemophilus influenzae*, once a common cause of this disease in chil-

dren, is rare, but should be considered in unimmunized children.

Orbital cellulitis requires more aggressive therapy as it can be a sight-threatening disease. It usually results from direct extension of bacteria from an adjacent sinus infection, and is, therefore, caused by respiratory pathogens and anaerobes. Proptosis, painful eye movements, decreased visual acuity, or pupillary dilation should lead to suspicion of orbital, rather than periorbital, cellulitis. Computed tomography scanning of the orbit is often required to distinguish between the two. Broad-spectrum antibiotics with activity against the likely pathogens (such as a second- or third generation cephalosporin with clindamycin or metronidazole, or a broad-spectrum beta-lactam/beta-lactamase inhibitor combination) are indicated, and an urgent ophthalmology consultation should be obtained, as surgical intervention may be required.



For a good move  
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## What should I know about skin and soft tissue infections?

Necrotizing fasciitis and myositis are severe and rapidly progressive infections of skin and soft tissues with a high mortality rate.

Group A *streptococcal* necrotizing fasciitis may affect otherwise healthy individuals; predisposing factors include varicella in children, and possibly nonsteroidal anti-inflammatory use. Hallmarks of this disease are pain and tenderness out of proportion to physical findings. Alternate diagnoses, such as musculoskeletal injury or venous thrombosis, are often entertained. Patients may initially be hemodynamically stable, but the disease may progress rapidly and can be fatal. Clinical suspicion is the key to diagnosis. Affected individuals require urgent surgi-

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cal debridement and a combination of high-dose parenteral penicillin and clindamycin. Based on observational studies, intravenous immune globulin appears to improve survival.<sup>9</sup>

## What is erysipelas?

Erysipelas, caused almost exclusively by group A *streptococci*, primarily affects infants and the elderly. The disease is heralded by the abrupt onset of a raised, well-demarcated, fiery red lesion, most commonly on the extremities, and less often on the face. It is accompanied by constitutional symptoms and leukocytosis. The characteristic facial rash is a butterfly lesion, involving both the cheeks and the nose (Figure 2). Bullae may subsequently develop, with desquamation five to 10 days following the onset of illness. This is a generally benign, but uncomfortable, disease that responds well to treatment with oral penicillin (300 mg to 600 mg orally four times daily). More severely ill patients may require hospitalization and parenteral therapy. Alternatives for penicillin-allergic patients include a first-generation cephalosporin or a macrolide.

## Folliculitis, furuncles, and carbuncles

### Folliculitis

Folliculitis refers to superficial inflammation of a hair follicle due to physical or chemical injury or infection. It is manifested by a painless or mildly tender pustule surrounding a hair shaft. The condition is usually self-limited and requires no antimicrobial therapy. Occasionally the inflammation may extend deeper or be surrounded by an area of cellulitis, in which case a course of antibiotics (as for cellulitis) may be appropriate. *Pseudomonas aeruginosa* contamination of whirlpool water can cause "hot tub" folliculitis, which may affect many individuals simultaneously, but again requires no specific antimicrobial therapy and usually resolves



Figure 2. Erysipelas of the periorbital skin and left cheek. Source: Fitzpatrick TB, Johnson RS, Poano MK, et al: *Colour Atlas and Synopsis of Clinical Dermatology*. Second Edition. McGraw-Hill Inc., 1992, p. 371.



Figure 3. Furuncle. Source: Fitzpatrick TB, Johnson RS, Poano MK, et al: *Colour Atlas and Synopsis of Clinical Dermatology*. Second Edition. McGraw-Hill Inc., 1992, p. 93.

within several days.

### Furuncles

Furuncles are small abscesses (boils) due to *S. aureus* that surround a hair follicle (Figure 3). They are tender, erythematous masses that occur in areas that are exposed to friction. Furuncles typically rupture and drain spontaneously. Antibiotics are not usually indicated in this condition. If medical attention is required, simple

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incision and drainage of the lesion is generally sufficient.

## Carbuncles

Carbuncles are formed by aggregation of multiple furuncles, most commonly on the neck, back, and thighs (Figure 4). On examination, they appear as large, erythematous lesions, punctuated by boils and multiple areas of spontaneous drainage. Treatment is surgical, although antibiotics are appropriate for surrounding cellulitis.

Folliculitis, furuncles, and carbuncles may be problematic if they recur frequently. Prolonged courses of systemic antibiotics offer little benefit.<sup>10</sup> One very small study demonstrated that intermittent intranasal application of mupirocin ointment, twice daily for five consecutive days each month, can significantly reduce the recurrence rate of *S. aureus* skin infections.<sup>11</sup> However, mupirocin resistance can develop.

## What is impetigo and what can I do about it?

Impetigo (*impetigo contagiosa*) is common between the ages of two and five. Painless vesicles or bullae develop on exposed areas, rupture, and then develop a characteristic honey-crusted appearance (Figure 5) before completely resolving without scar formation. Both *S. aureus* and *S. pyogenes* are implicated in the disease.

Antibiotics have been a mainstay of therapy for impetigo for many years. Cloxacillin and cephalexin are effective and inexpensive, as is erythromycin, which has become the preferred oral agent.<sup>12</sup> More recently, topical antimicrobial agents have supplanted erythromycin as the treatment of choice. Mupirocin, 2% ointment applied three times daily, is as effective as oral erythromycin, and is associated with fewer adverse effects.<sup>13</sup> Mupirocin also offers an advantage if erythromycin-resistant isolates of *S. aureus* are prevalent.<sup>14</sup> Fusidic acid cream is also effective



Figure 4. Carbuncle on the back of the neck. Source: Hall, JC: *Sauer's Manual of Skin Diseases*. Eighth Edition. Lippincott Williams & Wilkins, Philadelphia, 2000, p. 151.



Figure 5. Impetigo on the face. Source: Fitzpatrick TB, Johnson RS, Poano MK, et al: *Colour Atlas and Synopsis of Clinical Dermatology*. Second Edition. McGraw-Hill Inc., 1992, p. 83.

and well tolerated.<sup>15</sup>

## Optimizing outcomes

Skin infections are commonly encountered in ambulatory care. Many can be easily and effectively managed with oral or topical antimicrobial agents. It is

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important to recognize conditions for which antibiotics are not indicated, and those for which parenteral therapy or hospitalization is required. Immediate recognition of serious skin infections, such as necrotizing fasciitis and orbital cellulitis, are essential to optimize outcomes. CME

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## Take-home message

- Oral drugs, such as cloxacillin, 500 mg qid, or cephalexin, also 500 mg qid, can be used to treat patients with uncomplicated cellulitis.
- Parenteral therapy is indicated for patients with bacteremia, severe or complicated infections, those who are unable to tolerate oral medications, and those who do not respond to oral antibiotics.
- Orbital cellulitis requires very aggressive therapy and possibly surgical intervention.
- Erysipelas can be treated with oral penicillin.
- Antibiotics are not very useful for the treatment of folliculitis, furuncles, or carbuncles.
- The preferred treatment for impetigo is a topical antimicrobial agent, such as mupirocin.