**Common Infectious Skin Diseases**

Da-Ming Liao1，Chieh Chen 2

Department of Dental, Puli Christian Hospital1

Department of family medicine, Anshing clinic2

Corresponding author: Chieh Chen

guppy5230@yahoo.com.tw

Running title: infection skin disease

**Abstract**

Human skin infections including cellulitis, pustule rash, folliculitis, etc. are referred to as infectious skin illnesses. Skin infections can impact not just the skin but also the associated connective tissues. Skin redness, warmth, swelling, and discomfort are signs of cellulitis, an infection of the dermis and subcutaneous tissue. Worldwide, cellulitis is a prevalent infectious illness. This illness causes more than 650,000 hospital admissions in the US each year. The primary methods for diagnosing cellulitis are physical examination and medical history. Staphylococcus aureus and streptococci should be the main targets of treatment for uncomplicated cellulitis. If first-line antibiotic treatment is administered, and the outcome is not favorable, the possibility of drug-resistant microorganisms should be suspected, or conditions like low immunity, chronic kidney or liver disease, etc., in patients. People of any age can contract impetigo, however children under the age of five are most commonly affected. Impetigo typically spreads by physical touch. Research indicates that the yearly occurrence of impetigo in children under 4 years old is approximately 2.8%, but the yearly prevalence of pustular rash in children between 5 and 15 years old is 1.6%. Of them, non-vesicular impetigo is the most prevalent (making up 70%), and the majority are brought on by streptococcal and Staphylococcus aureus infections.

**Keywords**:Skin infections; Impetigo; Cellulitis; Soft tissue infections

**Introduction**

The human body's largest organ is the skin. It is in charge of preserving the body's internal organs and tissues, controlling body temperature, and preserving the equilibrium of water and electrolytes. Stimulation by the surrounding environment can cause a variety of sensations, including touch, tenderness, heat, and coldness. Skin health and maintenance are particularly important because sunlight exposure allows the skin to synthesis vitamin D[1]. Common skin diseases include cellulitis, erysipelas, folliculitis, carbuncle, furuncle, and others. Cellulitis is a dermal and subcutaneous infection. Staphylococcus aureus is the most common cause of bacterial infections rather than mechanical ones. Impetigo is an infection of tissue with ill-defined borders that is typically caused by staphylococci or streptococci; erysipelas is a superficial cellulitis with well-defined borders that is almost exclusively caused by streptococci; and both can cause cuticle hyperplasia and a bullous effect. A boil will develop from a profoundly infected hair follicle, necessitating drainage and often an incision for treatment [2]. Clinical symptoms are typically used to diagnose infections before practical treatment is applied. If antibiotics are required, the common choice is the ones that work against Gram-positive bacteria, such as fluoroquinolones, cephalosporins, penicillin, or macrolides. Children, diabetic patients or immune deficient individuals may need to take second- or third generation cephalosporins because they are more vulnerable to Gram-negative bacterial infections [3,4].

**Clinical manifestations of skin infection**

The most prevalent bacterial skin illness in young children, ages two to five, is impetigo. Seventy percent of instances are non-vesicular, and thirty percent of cases are vesicular. The brown scabs on the face and limbs of non-vesicular impetigo, also known as infectious impetigo, are a sign of Staphylococcus aureus or Streptococcus pyogenes infection[5,6]. Impetigo primarily affects the skin, though it can also result from eczema, herpes sores, or infections from bug bites[5]. Large, flaccid blisters are the hallmark of the sole Staphylococcus aureus-caused vesicular pustular rash, which typically affects the skin's intertriginous areas. Complications are infrequent and both types heal in 2-3 weeks without scarring[7]. Post-streptococcal glomerulonephritis is the most severe. Topical antibiotics such fusidic acid or doxycycline are used as part of the treatment. One typical skin illness is impetigo, with 33% of cases being travelers returning from oversea trips [8,9]. Bacterial infections resulting from scratching can cause skin and soft tissue infections, and there are two forms of pustule rash: vesicular and non-vesicular[10].

1.Bullous type: The patient develops a variety of sized blisters on their skin, the largest of which are larger than 1 cm. They frequently appear on the face, trunk, and in places where the skin joins itself, like beneath the skin. Small vesicles without surrounding erythema are often the first sign of bullous impetigo, appearing on the face, trunk, buttocks, perineum, or extremities. These vesicles quickly grow into translucent, flaccid bullae with a diameter of 1 to 5 cm. Bullae have a clear yellow fluid inside that turns murky and dark yellow later. They lack an erythematous ring and have clearly defined borders. Lesions that are not bullous heal more quickly than those that are. Although the illness is not linked to lymphadenopathy like non-bullous impetigo is, it may cause fever, diarrhea, and weakness [11,12].

2.Non-vesicular type: The epidermis develops red rashes or superficial pustules that burst to leave golden or light brown scabs. It is more common in children's limbs, nose, and mouth. Children will scratch the afflicted area, spreading the pus and infection. Primary pustule rash, bacterial skin infection, atopic dermatitis, contact dermatitis, fungal infection of the epidermis, diaper rash, insect bites, etc., can all cause scab rash. Excessive scratching can also cause scab rash. After the wound forms, bacteria will take advantage of the weakened and damaged epidermal mucosa to infect the site, resulting in secondary pustule rash[13]. Streptococcus pyogenes and Staphylococcus aureus are naturally present on healthy skin, especially in the nose, armpits, throat or perineum.

Being subjected to skin trauma, unhygienic environments or hot, humid climates, long-term care, malnutrition, diabetics, and weakened immune system are among the categories most susceptible to pustule rash. Staphylococcus aureus and Streptococcus pyogenes are the two common pathogenic bacteria that each causes pustule rash, though they can also co-infect together in the same area. A solitary red papule or plaque precedes the rapid formation of a blister in non-vesicular pustular rash. Easy to rupture, the blisters erode the skin before drying up and crusting over, sometimes causing itching. Usually, the scab rash permeates itself and covers the surrounding area. If treatment is not received, the infection typically resolves on its own in a few weeks without causing scars, but it frequently affects damaged regions of the body like the face or limbs. Newborns are most frequently affected with vesicular pustular rash, however older children and adults may also be affected [14,15].

Staphylococcus aureus is the causal agent of impetigo. Staphylococcal Scalded Skin Syndrome manifests in a localized form. Blisters on the surface become floppy and swiftly enlarge, displaying a clean and transparent surrounding and without redness. When blister ruptures, it forms a yellow scab that exudes fluid [16,17]. Symptoms can be classified as vesicular or non-vesicular depending on whether the pustule rash is primary or secondary. Early in the course of the illness, blisters emerge on the vesicular pustular rash, which progresses swiftly. Blisters will quickly become murky with fluids, and after they dry out, scabs will remain. The non-vesicular type appears as a red pimple or rash on the skin that breaks and leaves behind a light brown or golden scab that resembles dried honey. It can take longer than a week for either type of impetigo to heal or spread to other places of the body through scratching[18,19].

**Treatment of skin infections**

Impetigo is easily treated, despite the fact that it spreads easily by scratching. Oral antibiotics such cephalosporins or macrolides, amoxicillin/clavulanate such as Augmentin, antistaphylococcal penicillin, and topical ointments like fusidic acid or mupirocin (Bactroban) can all be used [20]. It will recover in one to two weeks. It is important to treat impetigo as soon as it is identified because, if left untreated, toxins generated by bacteria that enter the bloodstream might exacerbate into complications and cause acute nephritis [21]. 1.For pustules with an infection on a limited surface area of the body, topical antibiotics such fusidic acid and Bactroban are the preferred first-line therapy. 2.Oral antibiotics (such as macrolides, amoxicillin/clavulanate (Augmentin), cephalosporins, and antistaphylococcal penicillin) work well to treat pustule rash; erythromycin is less effective. 3.Treating pustules with topical disinfectants like hydrogen peroxide is not advised [22]. 4.Topical bacitracin, oral penicillin V, amoxicillin, and neomycin are not advised for the treatment of pustule rash. 5. Patients who have systemic ailments and a variety of chronic illnesses along with pustule rash should consider using oral antibiotics [23].

**Conclusion**

Impetigo occurs when the skin becomes infected with bacteria, usually either Staphylococcus aureus or Streptococcus pyogenes. These bacteria can infect the skin in 2 ways: through a break in otherwise healthy skin, such as a cut, insect bite or other injury; this is known as primary impetigo. Impetigo can separate to nonbullous impetigo and bullous impetigo. Nonbullous impetigo is the most common form in adults. Bullous impetigo causes thick, honey-colored crusts. This causes large blisters on the skin. Ecthyma is a more serious form that often results from untreated impetigo. History and physical exam are essential to the diagnosis of impetigo. Bacterial cultures can be used for confirmation of diagnosis and should be obtained if methicillin-resistant staph aureus (MRSA) is suspected or if an impetigo outbreak is present. A skin biopsy may be considered if the case is refractory [24,25]. Extensive infection can be treated with oral antibiotics. While several topical antibiotic preparations can be used, such as bacitracin, triple antibiotic ointment (polymixin B, neomycin, bacitracin), or gentamicin, mupirocin is often recommended.

**Reference**

1. McLafferty E, Hendry C, Farley A. The integumentary system: anatomy, physiology and function of skin. Nursing Standard 2012; 27(3): 35.
2. Nichols RL, Florman S. Clinical presentations of soft-tissue infections and surgical site infections. Clinical infectious diseases 2001; 33(Supplement\_2): S84-S93.
3. Subramaniam G, Girish M. Antibiotic resistance-A cause for reemergence of infections. The Indian Journal of Pediatrics 2020; 87(11): 937-944.
4. Stulberg DL, Penrod MA, Blatny RA. Common bacterial skin infections. American family physician 2002; 66(1): 119-125.
5. Romani L, Steer AC, Whitfeld MJ, Kaldor JM. Prevalence of scabies and impetigo worldwide: a systematic review. The Lancet infectious diseases 2015; 15(8): 960-7.
6. Koning S, van der Sande R, Verhagen AP, et al. Interventions for impetigo. Cochrane Database of Systematic Reviews 2012; (1):1-165.
7. Bowszyc-Dmochowska M, Hoang MP, Dmochowski M. Subcorneal and Intraepidermal Immunobullous Dermatoses. Hospital-Based Dermatopathology: An Illustrated Diagnostic Guide 2020: 349-397.
8. Salle R, Del Giudice P, Skayem C, Hua C, Chosidow O. Secondary Bacterial Infections in Patients with Atopic Dermatitis or Other Common Dermatoses. American Journal of Clinical Dermatology 2024: 1-15.
9. Bowen AC, Mahe A, Hay RJ, et al. The global epidemiology of impetigo: a systematic review of the population prevalence of impetigo and pyoderma. PloS one 2015; 10(8): e0136789.
10. Heal C, Gorges H, Van Driel ML, et al. Antibiotic stewardship in skin infections: a cross-sectional analysis of early-career GP’s management of impetigo. BMJ open 2019; 9(10): e031527.
11. Dollani LC, Marathe KS. Impetigo/staphylococcal scalded skin disease. Pediatrics in Review 2020; 41(4): 210-12.
12. Johnson MK. Impetigo. Advanced Emergency Nursing Journal 2020; 42(4): 262-9.
13. Mittal, S., Sarkar, R. Skin infections. In Concise Dermatology. CRC Press 2021:19-44.
14. Cole C, Gazewood JD. Diagnosis and treatment of impetigo. American family physician 2007; 75(6): 859-64.
15. Galindo E, Hebert AA. A comparative review of current topical antibiotics for impetigo. Expert opinion on drug safety 2021; 20(6): 677-83.
16. Leung AK, Barankin B, Leong KF. Staphylococcal-scalded skin syndrome: evaluation, diagnosis, and management. World Journal of Pediatrics 2018; 14: 116-120.
17. Brown J, Shriner DL, Schwartz RA, Janniger CK. Impetigo: an update. Int J Dermatol 2003; 42: 251-5.
18. Johnson MK. Impetigo. Advanced Emergency Nursing Journal 2020; 42(4): 262-269.
19. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft-tissue infections. Clinical Infectious Diseases 2005; 41(10): 1373-1406.
20. Cole C, Gazewood J. Diagnosis and treatment of impetigo. American family physician 2007; 75(6): 859-64.
21. Koning S, van der Wouden JC. Treatment for impetigo. Bmj 2004; 329(7468): 695-6.
22. Bandyopadhyay D. Topical antibacterials in dermatology. Indian journal of dermatology 2021; 66(2): 117-125.
23. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. Clinical infectious diseases 2014; 59(2): e10-e52.
24. Gahlawat G, Tesfaye W, Bushell M, et al. Emerging treatment strategies for Impetigo in endemic and nonendemic settings: A systematic review. Clinical Therapeutics 2021; 43(6): 986-1006.
25. Davidson L, Knight J, Bowen AC. Skin infections in Australian aboriginal children: a narrative review. Medical Journal of Australia 2020; 212(5): 231-7.

Table 1. Differential diagnosis of vesicular impetigo

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| Diagnosis | Diagnostic features |
| Bullous erythema multiforme | Distributed on the extensor side of extremities and consists of reddish-colored patches that produce large blisters or vesicles 1-5 centimeters in diameter. |
| Bullous lupus erythematosus | Widespread, itchy, small and large blisters on the skin, usually on the upper part of the trunk and proximal parts of the upper extremities. |
| Bullous pemphigoid | Small pimples (vesicles) and large pimples (bullae) that appear quickly and simultaneously on top of patches of extensively itchy, urticaria-like skin. |
| Herpes simplex virus | Clusters of vesicles rupture at the base of the rash and form an erosion covered by scab. It often occurs on the skin around the lips and usually accompanied with precursor symptom such as pain. |
| Insect bites | Large blisters, often accompanied by itchy pimples, can be seen in the area of the bite. |
| Pemphigus vulgaris | Large, non-itchy blisters, ranging in size from one centimeter to several centimeters, gradually appear and generalize. The blisters last for a few weeks and then begin to erode, producing hyperpigmentation, but no scarring. |
| Stevens-Johnson syndrome | Small and large blisters on the mucous membranes of the skin, mouth, eyes and genitals. Ulcerative oral inflammation with hemorrhagic scab as the most typical feature. |
| Thermal burns | Second-degree burns with blistering of the skin. |
| Toxic epidermal necrolysis | A Stevens-Johnson like disease of the mucous membranes of the skin which then becomes diffuse generalized epidermal peeling. |
| Varicella | Blisters first appear on the erythematous epidermis of the skin, usually starting from the trunk and gradually spreading to the face and limbs. When the thin-walled blisters burst and form scabs, new blisters continue to appear, resulting in blisters of different stages appearing in the same area at the same time. |

Table 2. Differential diagnosis of non-vesicular impetigo

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| Diagnosis | Diagnostic features |
| Atopic dermatitis | Chronic and recurrent itching lesions and abnormally dry skin are common in adults with lichenization, and affecting facial and extensor skin in children. |
| Candidiasis | Erythematous papules or red damp plaques, usually confined to the mucosal or abrasive areas. |
| Contact dermatitis | Allergic skin often itches in areas of contact with antigens. |
| Dermatophytosis | The skin defect appears as red scales with slightly raised borders or typical skin fungal disease, which may be blister-like, especially on the feet. |
| Discoid lupus erythematosus | Clear plaques infiltrate the hair follicles, resembling attached scales, and the exfoliated scaly epidermis looks like the hairy protrusions of a carpet. |
| Ecthyma | Crusted lesions that cover ulcers rather than erosions, which may persist for several weeks, leaving scarring as the infection extends into the dermis. |
| Herpes simplex virus | The vesicles on the base of the erythema rupture to form crust-covered erosions, usually on the lips and skin. |
| Insect bites | Papules are usually seen at the site of the bite, which can be painful and may have associated urticaria. |
| Pemphigus foliaceus | Occasional blisters may appear in serum and scabs, usually in a butterfly like distribution starting from the face, or erythema, scaling, scabbing, or occasional blisters may appear on the scalp, chest, and upper back. |
| Scabies | The lesion consists of a tunnel-shaped wound with small discrete blisters, usually in the crease of the finger, and is characterized by nighttime scratching. |
| Sweet’s syndrome | Sudden appearance of tender or painful plaques or nodules, and occasionally as blisters or pustules. |
| Varicella | Thin-walled vesicles at the base of the erythema spread from the trunk to the face and extremities. With new eruptions, the vesicles rupture and form scabs, with different stages of the lesion appearing simultaneously in specific areas of the body. |

Table 3. Medication, dosage and duration of treatment for impetigo

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| Antibiotics | Dosing and duration of treatment |
| Topical antibiotics: |  |
| Mupirocin 2% ointment (Bactroban) | Apply to lesions three times daily for three to five days. |
| Oral antibiotics: |  |
| Amoxicillin/clavulanate (Augmentin) | Adults: 250 to 500 mg twice daily for 10 days; Children: 90 mg per kg per day, divided to twice daily for 10 days. |
| Cefuroxime (Ceftin) | Adults: 250 to 500 mg twice daily for 10 days; Children: 90 mg per kg per day, divided to twice daily for 10 days. |
| Cephalexin (Keflex) | Adults: 250 to 500 mg four times daily for 10 days; Children: 90 mg per kg per day, divided to two to four times daily for 10 days. |
| Dicloxacillin (Dynapen) | Adults: 250 to 500 mg four times daily for 10 days; Children: 90 mg per kg per day, divided to two to four times daily for 10 days. |
| Erythromycin | Adults: 250 to 500 mg four times daily for 10 days; Children: 90 mg per kg per day, divided to two to four times daily for 10 days |