

Bacteria, Fungus, or Virus?

An Update on Infections of the Skin

Skin, Bones, Hearts, and Private Parts 2020

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Learning Objectives:

- Distinguish between the various types of bacterial, viral, and fungal skin and soft tissue infections utilizing a patient's clinical presentation and risk factors
- Develop a plan to manage common skin infectious using appropriate medications and diagnostic/therapeutic procedures
- Discuss prevention measures for skin and soft tissue infections where appropriate

Patient presents for evaluation of the following skin lesions.



Bacteria, Fungus, or Virus?

Impetigo/Ecthyma – Diagnostic Pearls

- **Impetigo** – highly contagious superficial skin infection primarily caused by – *S. aureus* (1-10% CA-MRSA)
- Lesions begin as vesicles or pustules that quickly transition to erosions with crusting, small inflammatory halos
- Face and extremities most common sites
- Mild LAD, no systemic symptoms
- **Ecthyma** – deeper dermal pyoderma
- Lesions are typically tender, edematous and heal with scarring
- LAD and systemic symptoms present
- Diagnostic testing – Gram stain, culture – recommended by IDSA 2014
- Typical cases – empiric treatment

Impetigo/Ecthyma – Treatment

- Practice Guidelines for Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by IDSA
<https://www.idsociety.org/practice-guideline/skin-and-soft-tissue-infections/>
- Topical treatment for limited impetigo
 - Mupirocin, Retapamulin – BID for 5 days
 - Soak to remove crust
- Oral for numerous impetigo, in outbreaks, and for all ecthyma
 - CA-MRSA – Doxycycline, Clindamycin, TMP/SMX – 7 days
 - MSSA - Dicloxacillin, Cephalexin – 7 days

Patient presents for evaluation of the following skin lesions.



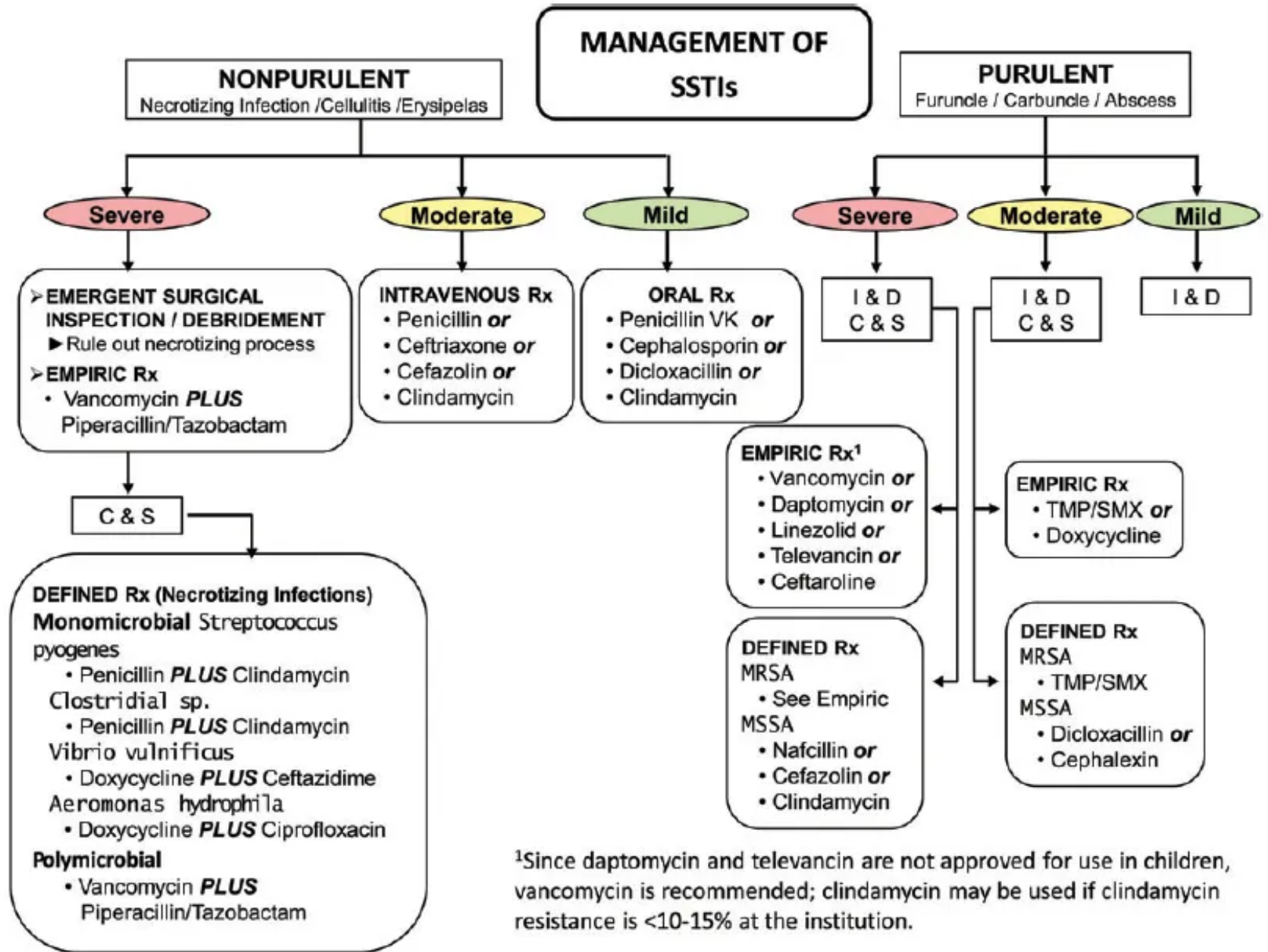
Bacteria, Fungus, or Virus?

Purulent Infections – Diagnostic Pearls

- Folliculitis – single follicle
- Furuncle – deeper, yet still one follicle
- Carbuncle – larger, often with fever, LAD, fatigue
- Gram stain and culture are ideal
- Mild, moderate, severe classifications
- Most purulent infections = *Staphylococcus aureus* (MSSA and MRSA)

Purulent Infections – Treatment

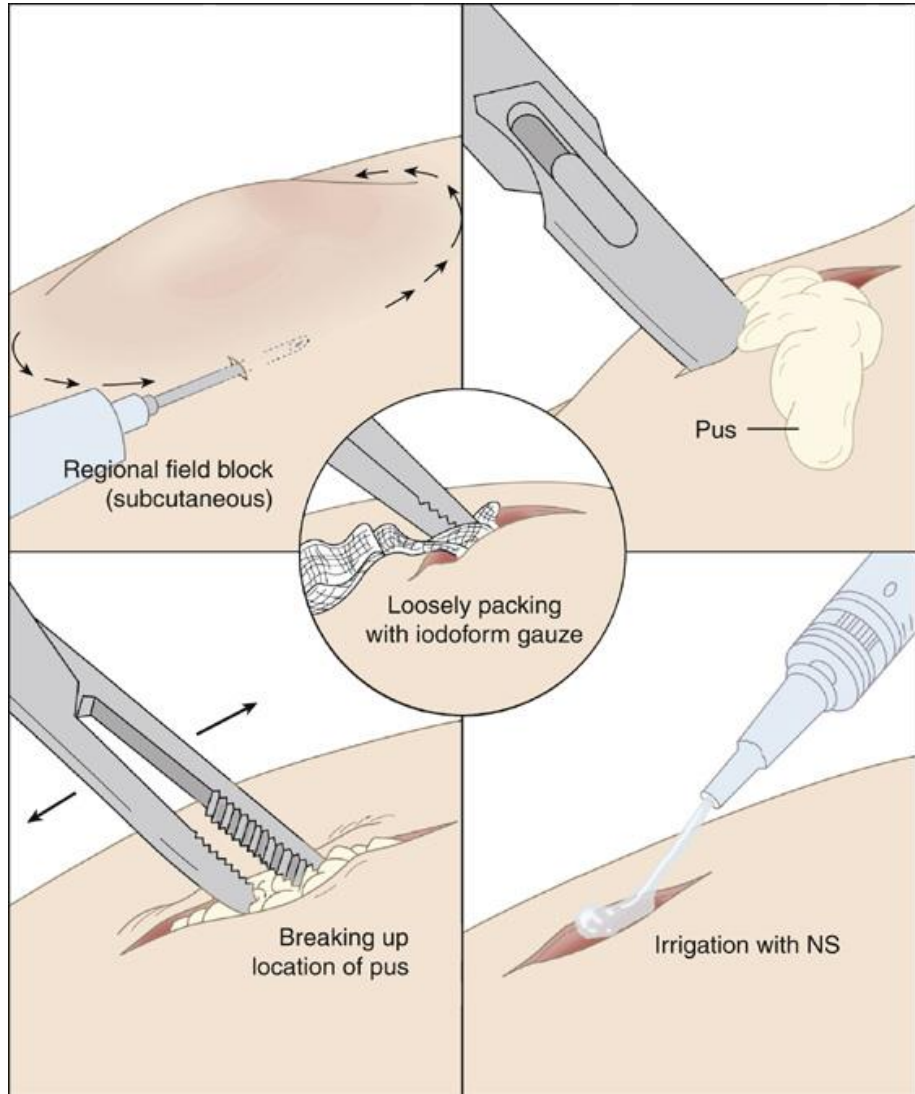
- Incision and Drainage
 - Warm, moist compresses
- Add on oral or parenteral antibiotics



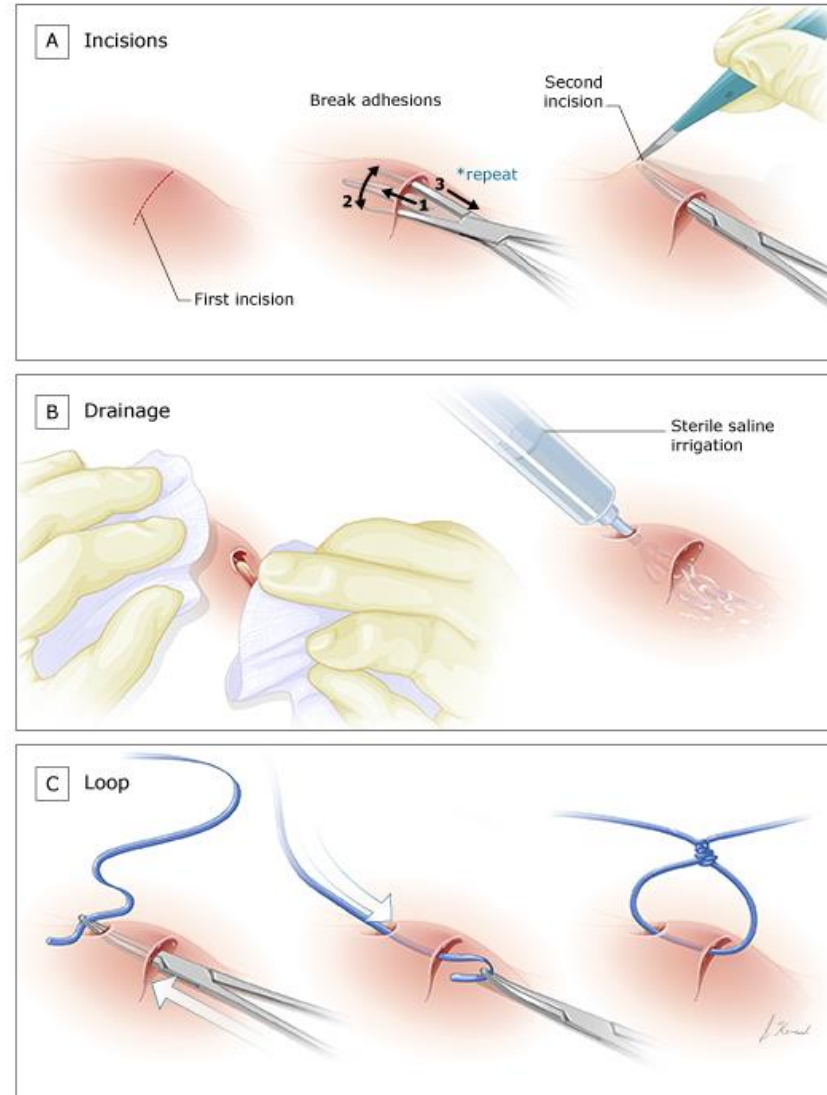
¹Since daptomycin and televancin are not approved for use in children, vancomycin is recommended; clindamycin may be used if clindamycin resistance is <10-15% at the institution.

Image source:
<https://www.idsociety.org/globalassets/idsa/practice-guidelines/practice-guidelines-for-the-diagnosis-and-management-of-skin-and-soft-tissue-infections-2014-update-by-the-infectious-diseases-society-of-america.pdf>

Traditional I&D and Loop Drainage Technique



Loop drainage technique for cutaneous abscesses



Addition of Antibiotics in Purulent Skin Infections per IDSA 2014

- Temp > 38 degrees C or < 36 degrees C
- Tachypnea > 24/min
- Tachycardia > 90 bpm
- WBC > 12,000 or < 4,000

- Immunosuppression
- Hypotension

Guidelines vs Actual Management of Skin and Soft Tissue Infections in the ED

Kamath RS, et al. OFID 2017

- 214 cases of SSTI in ED retrospectively analyzed at Michael E. DeBakey Veterans Affairs Medical Center, Houston
- Total number that were managed in accordance with IDSA 2014 guidelines in all 4 categories (site of treatment, choice of antibiotic, I&D of abscess, ordering cultures)

$$43/214 = 20.1\%$$

Systemic Antibiotics – New Data

Gottlieb, M et al. A Systematic Review and Meta-Analysis. Annals of Emergency Medicine Vol 73, No 1, January 2019.

- All randomized controlled trials comparing systemic antibiotics (MRSA coverage) vs placebo in the treatment of skin abscesses after I&D
- 4 studies, 16 clinical sites in US, ED and one outpt setting = 2,406 patients (4-44 yo)
- Most used TMP/SMZ, one used clindamycin
- Overall cure rate for abscesses after I&D was high in both groups
- Nearly 2-fold improvement in cure rates and a NNT of 14 for antibiotic groups
 - Reduced number of return visits and need for painful repeat I&D, return to work sooner, decreased incidence of new lesions, decreased rate of infections in household members

To Pack or Not to Pack

NO

- 5 cm or less
- Immunocompetent pt
- Less pain
- No change in cure rate
- No change in secondary interventions

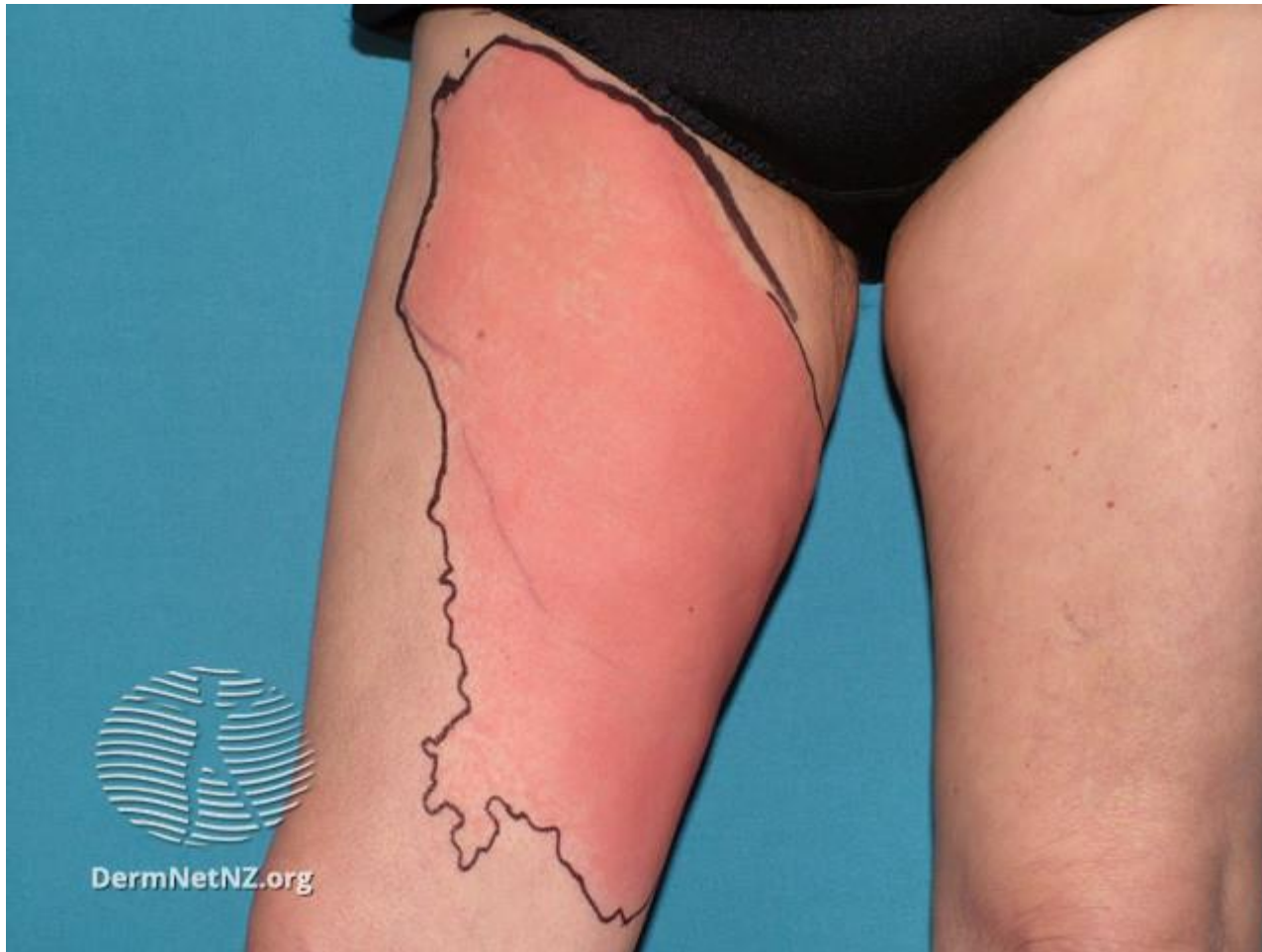
Maybe or YES

- Larger abscesses
- Consider the area
- Immunocompromised pts have not been studied

Recurrent Skin Abscesses

- Consider 5 day decolonization regimen:
 - Twice daily intranasal mupirocin
 - Daily chlorhexidine washes
 - Daily decontamination of personal items such as towels, sheets, and cloths for recurrent *S. aureus*
- Evaluate adult patients for neutrophil disorder if recurrent abscesses began in childhood
- Search for local causes – pilonidal cyst, hidradenitis suppurativa, foreign body

A patient presents for evaluation of the following skin lesions.



Bacteria, Fungus, or Virus?

Cellulitis/Erysipelas – Diagnostic Pearls

- Erysipelas – bright red, more superficial, raised border, well-demarcated margin, preceded by flu-like symptoms, burning at site
- Cellulitis – deeper location to subcutaneous tissues, non-elevated, poorly defined margins,
- Usually caused by *Streptococcus* A, B, C, G
- Bedside ultrasound best option for differentiating abscess from cellulitis

Cellulitis/Erysipelas – Treatment

- Mild and typical with no evidence of purulence or trauma
 - Oral dicloxacillin, cephalexin, clindamycin for 5 days
- Moderate infections with systemic signs
 - IV ceftriaxone, clindamycin, cefazolin, penicillin
- Severe
 - Vancomycin plus piperacillin-tazobactam or imipenem
 - Additional corticosteroids
 - Prednisone 40 mg daily for 7 days
- Immobilization and elevation
- Treat tinea pedis
- Watch for worsening
 - Consider marking borders
- MRSA more likely
 - Penetrating trauma
 - Illicit drug use
 - Known nasal colonization
 - Purulent drainage
- MRSA = Vancomycin

Recurrent Cellulitis

- Risk factors
 - Tinea pedis
 - Obesity
 - Venous insufficiency
 - Lymphedema
- Prophylactic abx if 3-4 episodes per year despite treating predisposing factors
 - Pen VK or erythromycin orally twice daily for 4-52 weeks

Risk for Atypical Organisms

- Immunosuppression
- Animal or human bites
- Sea or freshwater exposure to broken skin
- Exposure to animals, fish, or reptiles
- IVD use

Cat/Dog Bites – Identify pts at high risk

- Immunocompromised
- Asplenic
- Advanced liver disease
- Pre-existing or resultant edema of the affected area
- Moderate to severe injuries, especially to hand or face
- Injuries that penetrate the periosteum or joint capsule
- Deep puncture wounds
- 3-5 days of preemptive therapy
- Augmentin 875 mg twice daily
- Alternatives
 - Cefuroxime plus clindamycin/metronidazole
 - Imipenem/meropenem
 - Moxifloxacin
 - Doxycycline

FDA approves 5 new antibiotics for SSTI (2013)

- Ceftaroline – Beta-lactam
 - MRSA and Enterbacteriaceae coverage
 - IV, 5-14 days
- Dalbavancin - Lipoglycopeptide
 - Once weekly dosing (2 total doses)
- Oritavancin - Lipoglycopeptide
 - Single dose formulation
- Tedizolid
 - Oral and parenteral forms
- Telavancin
 - Black boxes – renal impairment, QT

Bacterial Infections

- Impetigo/Ecthyma
- Furuncle/Carbuncle/Abscess
- Cellulitis/Erysipelas

- Staphylococcal scalded skin/Scarlet fever/TSS
- Lyme
- Secondary syphilis
- Erythrasma

- Infectious Diseases Society of America (IDSA). Guidelines for skin and soft tissue infections, 2014.

<https://www.idsociety.org/practice-guideline/skin-and-soft-tissue-infections/>

Patient presents for evaluation of the following skin lesions.



Bacteria, Fungus, or Virus?

HPV – Diagnostic Pearls

- HPV 1, 2, 3, 4, 10, 27, 57
- Most common in children and young adults (nearly 50% affected), increasingly seen in patients with atopic dermatitis and decreased cell-mediated immunity
- Types – verruca vulgaris, plantaris, plana, filiform
- Clinical diagnosis
 - Thrombosed capillaries
 - Altered dermatoglyphics

HPV – Treatment

- Spontaneous remission in 50% by 1 year, 2/3 of patients in 2 years, especially children
- Treatment indicated
 - Pain/discomfort, functional impairment
 - Concern for cosmesis or social stigma
 - Persistent warts
 - Immunosuppression

HPV- Treatment

- Chemical or physical destruction
 - Salicylic acid – irritation and exfoliation, paints or plasters, applied daily after paring with occlusion for 3-4 months
 - Cryotherapy – every 2-3 weeks for 3 months, keep wart frozen for 15-30s
 - Combo of both
- Enhancement of local immune response
 - Imiquimod
 - Contact or intralesional immunotherapy
- Antiproliferative therapy
 - 5-FU
 - Bleomycin
 - Tretinoin

On the Horizon for Recalcitrant and Extensive Warts

- Intralesional or intramuscular HPV vaccine
 - Nofal A et al. Intralesional versus intramuscular bivalent human papillomavirus vaccine in the treatment of recalcitrant common warts, J Am Acad Dermatol vol 82, No 1, July 2019.
 - Waldman, Abigail MD; Whiting, Dennis PA-C; Rani, Monica MD; Alam, Murad MD, MSCI, MBA, HPV Vaccine for Treatment of Recalcitrant Cutaneous Warts in Adults A Retrospective Cohort Study. Dermatologic Surgery: [December 2019 - Volume 45 - Issue 12 - p 1739–1741](#)

Patient presents for evaluation of the following skin lesions.



Bacteria, Fungus, or Virus?

MCV – Diagnostic Pearls

- Benign, self-limited disease
- Caused by a pox virus
- Most common ages 1-4
- More common in pts with atopic dermatitis and with swimming
- In adolescents and adults, consider STIs and immunocompromised states
- Clinical diagnosis
 - Small, firm, pearly papules with a central depression
 - Core may be expressed, producing a white cheesy material
 - The lesions average 2 to 5 mm in size and are usually painless, but may become inflamed, red, and swollen
 - Distribution typically face, trunk, limbs

MCV – Treatment

- Treatment is for cosmesis and to prevent spreading
- Destructive therapies most common
 - Curettage – most successful, least number of visits, greatest parent satisfaction
 - Cantharidin
 - Cryotherapy
- Patience
 - 50% completely resolved 1 year
 - 70% at 18 months
 - BOTE sign “Beginning of the end”
 - Clinical erythema and swelling of the lesion when regression phase begins
- Other therapies not proven superior to destructive therapies
 - Imiquimod
 - KOH
 - Salicylic acid
 - Retinoids





Verrica develops a solution for common warts



Del Rosso JQ, Kircik L. Topical Cantharidin in the Management of Molluscum Contagiosum: Preliminary Assessment of an Ether-free, Pharmaceutical-grade Formulation. *J Clin Aesthet Dermatol.* 2019;12(2):27–30.

Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6415708/>



14-year-old male presents for evaluation of red circular rash on his body that he noticed after soccer practice yesterday

- Pt states he doesn't feel sick, but the rash might be a little itchy
- He is unaware of any family or friends that are ill or have rashes
- The soccer coach will not let him play or practice until he gets "checked out"

Bacteria, Fungus, or Virus?

PR – Diagnostic Pearls

- Self-limiting skin condition
- Reactivation of HHV-6/7
- Typically presents in 10-35 year old pts
- Herald patch appears first on trunk in 90% of cases (lasts for 2 weeks in isolation)
- Prodromal symptoms – malaise, nausea, headache, URI, concentration difficulty, ST, body aching
- Secondary eruption on trunk in Langer lines and to proximal extremities (lasts for up to 12 weeks)
- All lesions have scaling and are typically pruritic
- Some medication associated with PR-like eruption



PR – Treatment

- Self-limited = watchful waiting
- Treat options
 - Oral antihistamines
 - Oral or topical corticosteroids
 - Acyclovir (maybe)
 - Phototherapy also hastens resolution
- No benefit to macrolides

Viral Infections

- HPV
- Molluscum
- Viral exanthems
 - Erythema infectiosum
 - Roseola
 - Herpangina/HFM
 - Pityriasis rosea
- Herpes
 - Simplex
 - Zoster

6-year-old male presents for evaluation of this pruritic eczematous rash on his torso

- It developed over the past week as an initial small circular lesion that has spread



Bacteria, Fungus, or Virus?

Tinea Corporis – Diagnostic Pearls

- Usually presents as annular, scaly plaques
- At risk groups
 - Contact sports
 - Domestic animal contact
 - Warm, humid climates
 - DM, immunodeficiency
- Typical organisms
 - *M. canis*
 - *T. rubrum*, *mentagrophytes*, *tonsurans*
- Diagnostic options
 - KOH
 - Wood's lamp
 - Culture
 - Biopsy

Tinea Corporis – Treatment

- Topical antifungals
 - Azoles
 - Econazole
 - Oxiconazole – comes as a lotion forms for more hairy areas
 - Allylamines
 - Terbinafine
 - Naftifine
- Oral antifungals
 - Terbinafine
 - Itraconazole
- Twice a day application of topicals for 4-6 weeks generally
- Keep skin cool and dry
- Avoid combination products with steroids and antifungals
- Topical nail lacquers modestly effective
 - Efinaconazole
 - Tavaborole

Majocchi's granuloma

- Perifollicular lesions
- *T. rubrum*, *T. mentagrophytes*
- Systemic therapy needed



Patient presents for evaluation of the following skin lesions.



Bacteria, Fungus, or Virus?

Onychomycosis – Diagnostic Pearls

- Most often occurs in adults
 - Nail injury increases risk
- *T. rubrum* most frequent dermatophyte
- Common clinical manifestations
 - Nail discoloration
 - Subungual hyperkeratosis
 - Onycholysis
 - Nail plate splitting and destruction
- Diagnostic testing
 - KOH - screen
 - Fungal culture & PCR – identify the organism before treatment

Onychomycosis – Treatment

- Mild to moderate disease (<50% nail involvement) with no matrix involvement
 - Ciclopirox
 - Efinaconazole
 - Tavaborole
- Established and severe disease
 - Terbinafine – preferred
 - 250 mg orally once a day for 6 weeks for fingernails and 12 weeks for toenails
 - Measure transaminases before initiating therapy
 - Itraconazole
 - 200 mg per day for 12 weeks for toenails
 - 200 mg twice a day for 1 week with second “pulse” 3 weeks later for fingernails

Devices to Treat Nail Fungus

- Laser
- Drilling
- Photodynamic therapy
- Plasma therapy

12-year-old AA male patient presents for evaluation of the following skin lesions.

- 4 week duration
- Non-pruritic
- Coincided with summer sports activities and increased perspiration
- No other family members with rash
- No recent travel or exposure to pets

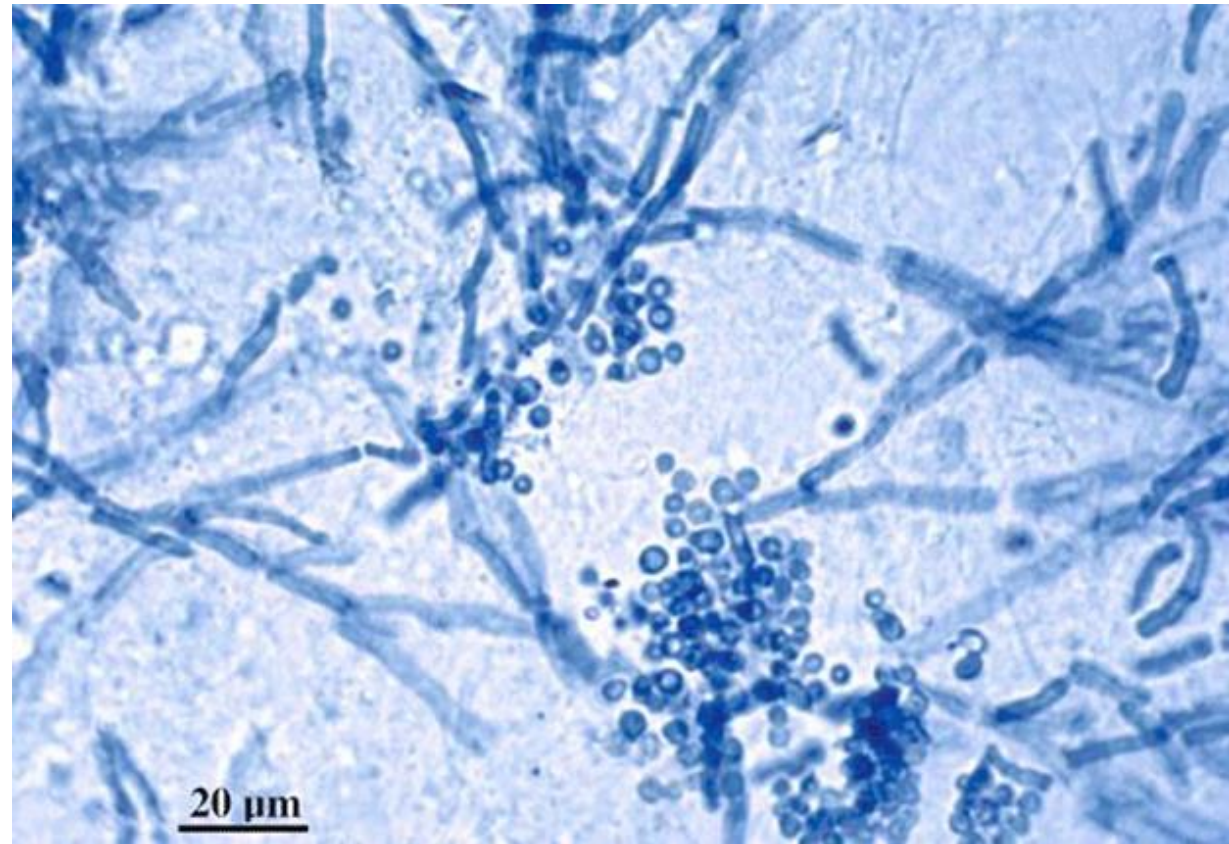
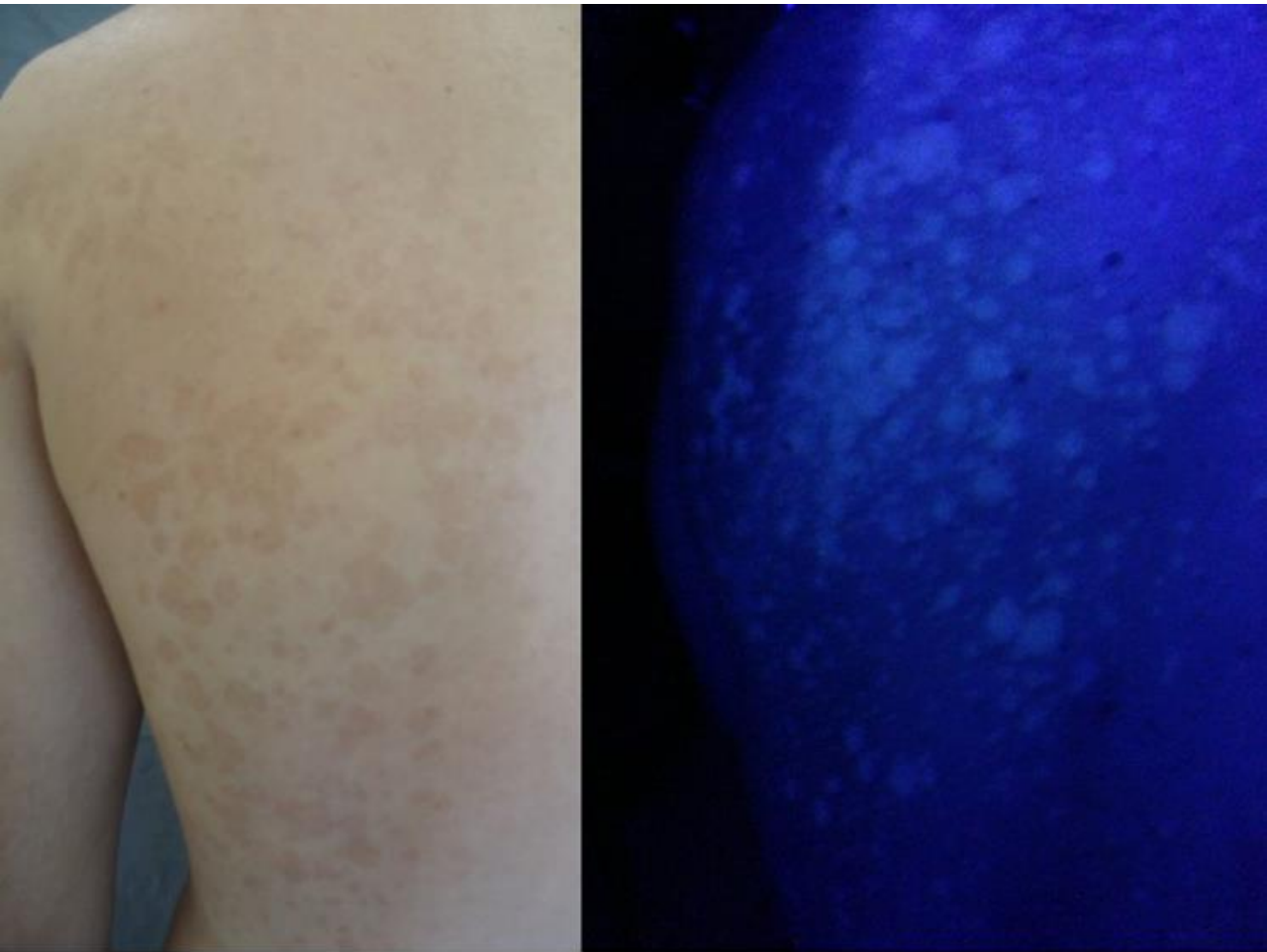
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Pityriasis Versicolor – Diagnostic Pearls

- Superficial fungal infection caused by *Malassezia* species of yeast in stratum corneum
- Flourishes in hot and humid environments
- Increased sebum production facilitates growth
- Hyper or hypo pigmented circles or ovals with fine scale
 - Evoked scale sign
- Trunk, neck and upper arms
- KOH
 - Sticks and stones
 - Spaghetti and meatballs
- Wood's light
 - Greenish-yellow fluorescence

After Stretch





https://www.researchgate.net/figure/Patients-dorsum-with-pityriasis-versicolor-caused-by-Malassezia-fur-fur-with_fig3_323228320

<https://step1.medbullets.com/dermatology/112070/tinea-versicolor>

Pityriasis Versicolor – Treatment

- Topical treatments effective and well-tolerated
 - Shampoos and lotions – apply to affected area for 5-10 minutes then wash off, twice a day for 7-14 days, then once a month
 - Zinc pyrithione
 - Selenium sulfide
 - Ketaconazole
- May take considerable time and maintenance
- Recalcitrant or recurring consider oral therapy
 - Fluconazole 300 mg weekly for 2-4 weeks
 - NOT terbinafine
 - NOT ketaconazole

Fungal Infections

- Dermatophytoses
 - Tinea corporis
 - Onychomycosis
- Pityriasis versicolor

- Candidiasis
- Majocchi granuloma
- Sporotrichosis

Selected References/Resources

- Practice Guidelines for Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by IDSA
<https://www.idsociety.org/practice-guideline/skin-and-soft-tissue-infections/>
- Gupta, AK, et al. Fungal Skin Infections. *Pediatrics in Review* 2017;38;8.
- Lipner, SR, Scher, RK, Onychomycosis Treatment and Prevention of Recurrence, *J Am Acad Dermatol*, Vol 80, No 4, April 2019.
- Rush, J, Dinulos, JG, Childhood skin and soft tissue infections: new discoveries and guidelines regarding the management of bacterial soft tissue infections, molluscum contagiosum, and warts, *Curr Opin Pediatr* 201, 28:250-257.
- Ibrahim, F, Khan R, Pujalte, GA, Bacterial Skin Infections, *Prim Care Clin Office Pract* 42 (2015) 485-499.