August 1-5, 2022

GRAND | HYATT
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PRIMARY CARE HAWAII CONFERENCE
CARING FOR THE ACTIVE AND ATHLETIC PATIENT

Infectious Disease in the Active and Athletic Patient

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Kaiser Permanente Fontana Sports Medicine

No disclosures to report

Goals

- Recognize the important role that infections play in sports
- Identify and treat cutaneous infections, including those with bacterial, viral, and fungal etiologies
- Identify and treat "non-cutaneous" or systemic infections
- Understand appropriate return to play strategies
- Understand the simple, but important ways to help prevent infectious disease in sports

Importance

- Most infections are contagious
- The close proximity of athletes to each other is a key risk factor
- The close contact involved in many sports also puts certain athletes at risk
- Exhaustive exercise increases the risk and severity of some viral illnesses

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Importance

- Even relatively mild systemic infections can dramatically decrease an athlete's performance
- Cutaneous infections can be severely limiting, and can be disqualifying
- Both systemic and cutaneous infections have decimated entire teams

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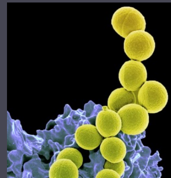
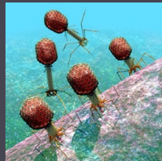
Cutaneous Infections

- **Bacterial**
  - Cellulitis/Abscesses
  - Impetigo
  - Folliculitis
  - Otitis externa
  - Conjunctivitis
  - Hand infections
  - Corynebacteria infections

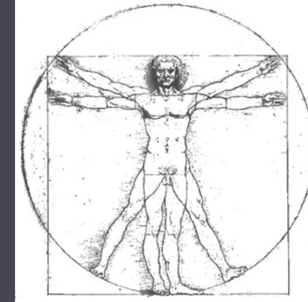


- **Viral**
  - HSV
  - molluscum
  - warts



- **Fungal**
  - tinea

Non-cutaneous Infections



- **Mononucleosis**
- **URI and other viral syndromes (Covid-19)**
- **GI infections**
- **Bloodborne pathogens**

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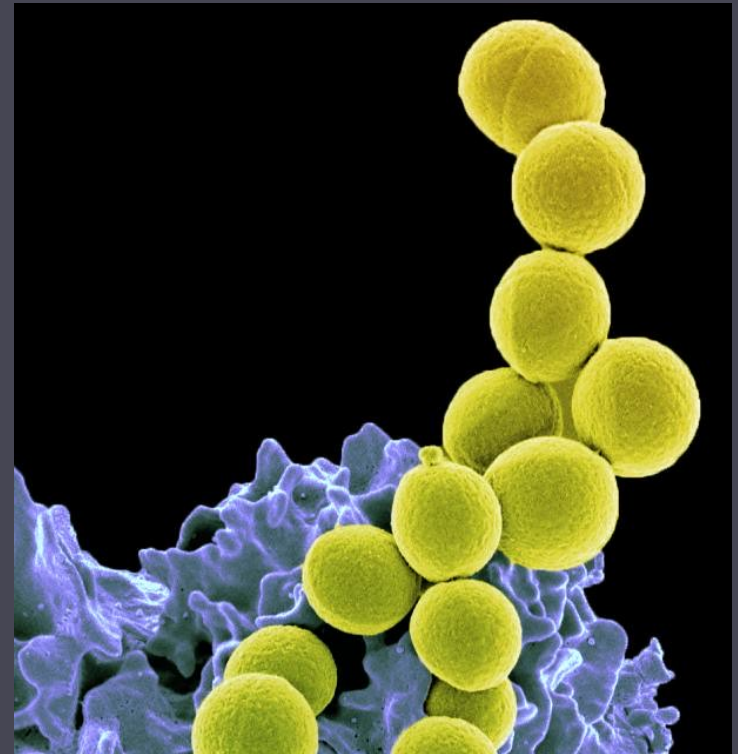
Cutaneous Infections

- **Bacterial**
  - Cellulitis/Abscesses
  - Impetigo
  - Folliculitis
  - Otitis externa
  - Conjunctivitis
  - Hand infections
    - paronychia
    - felons
  - Corynebacteria infections



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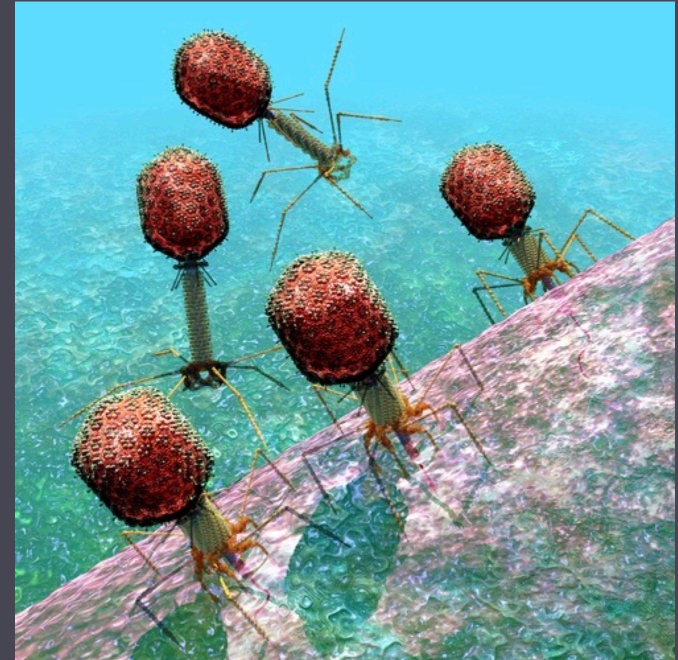
Cutaneous Infections

- **Viral**
  - Herpesvirus infections
    - Herpes Gladiatorum
    - Herpes Zoster
    - Herpetic Whitlow
  - Molluscum contagiousum
  - Warts



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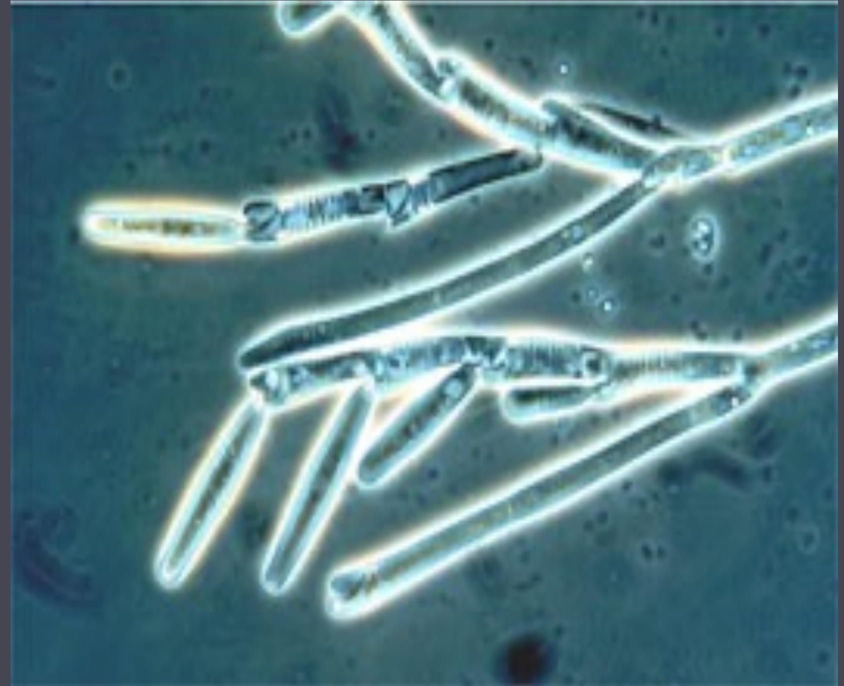
Cutaneous Infections

- **Fungal**
  - Tinea capitis
  - Tinea corporis
  - Tinea cruris
  - Tinea pedis



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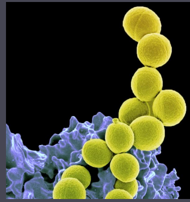

Bacterial Cutaneous Infections

- Cellulitis/Abscesses
  - can occur just about anywhere there is skin
  - athletes are particularly susceptible due to abrasions and physical contact
  - *Staph aureus* and *Strep pyogenes* are the most common pathogens
  - be wary of *Pseudomonas, Aeromonas,* and *Vibrio* in water athletes
  - MRSA is becoming more prevalent

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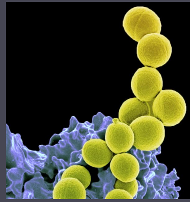

Cellulitis

- Treatment
  - Cephalexin 250-500mg po qid for 5-14 days
  - Dicloxacillin 250-500mg po qid for 5-14 days
  - Amox-Clavulanate 875/125 po bid for 5-14 days
  - Macrolides (erythromycin, azithromycin, clarithromycin)
  - Quinolones (moxifloxacin, levofloxacin)

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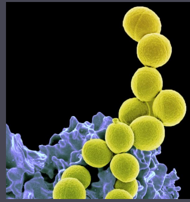
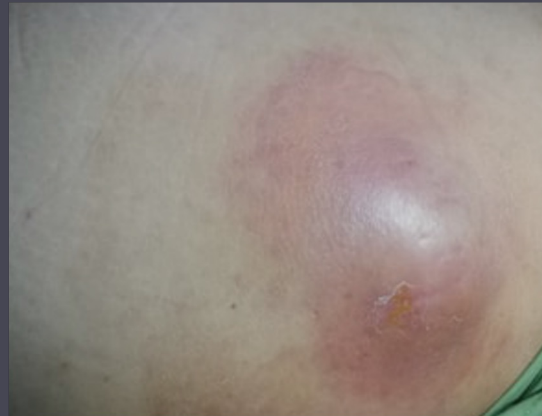


Abscesses

- Treatment
  - Incision and drainage
  - pack with packing gauze
  - oral antibiotics for mild-moderate cases
  - IV antibiotics for severe cases



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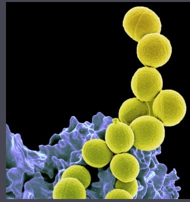
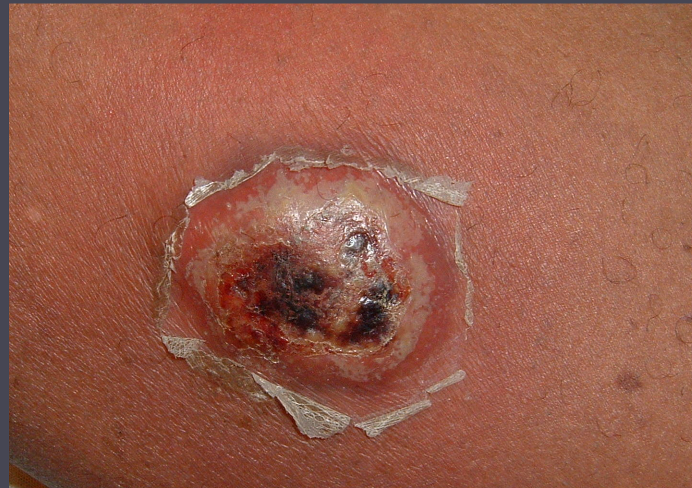


Bacterial Cutaneous Infections

- MRSA infections
  - now account for about 30% of all *Staph* infections
  - about 20% of cases in sports require IV antibiotics
  - suspect abscesses/boils and all non-healing infections initially treated with beta-lactams



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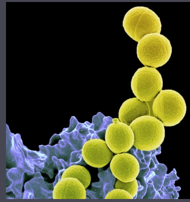
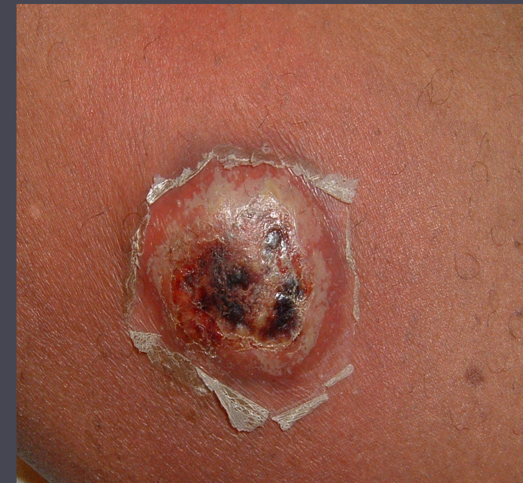


MRSA Infections

- Treatment
  - Oral antibiotics
    - Trimethoprim-sulfamethoxazole (Bactrim/Septra)
    - Clindamycin
    - Rifampicin
    - Tetracycline/doxycycline/minocycline
  - IV antibiotics
    - Vancomycin
    - Linezolid (Zyvox) -- PO or IV
  - For recurrences in patients with known carrier status, treat with intranasal mupirocin (Bactroban)



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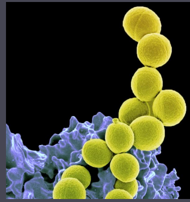

Bacterial Cutaneous Infections

- Impetigo
  - superficial skin infection, usually produced by *Staph aureus* and β-hemolytic *Strep*
  - bullous and nonbullous (more common)
  - vesicles on erythematous base with honey-crusted lesions; vesicles often progress to pustules
  - most common in children and young adults
  - more often in warm, humid environments

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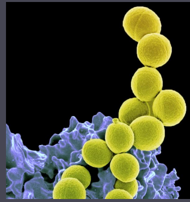
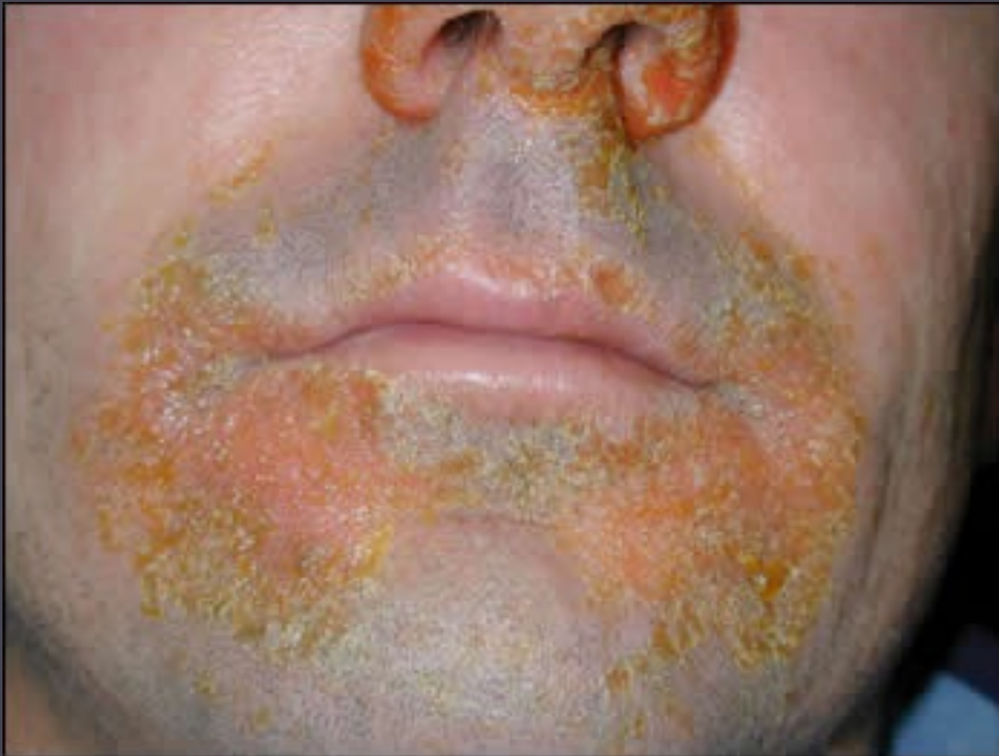
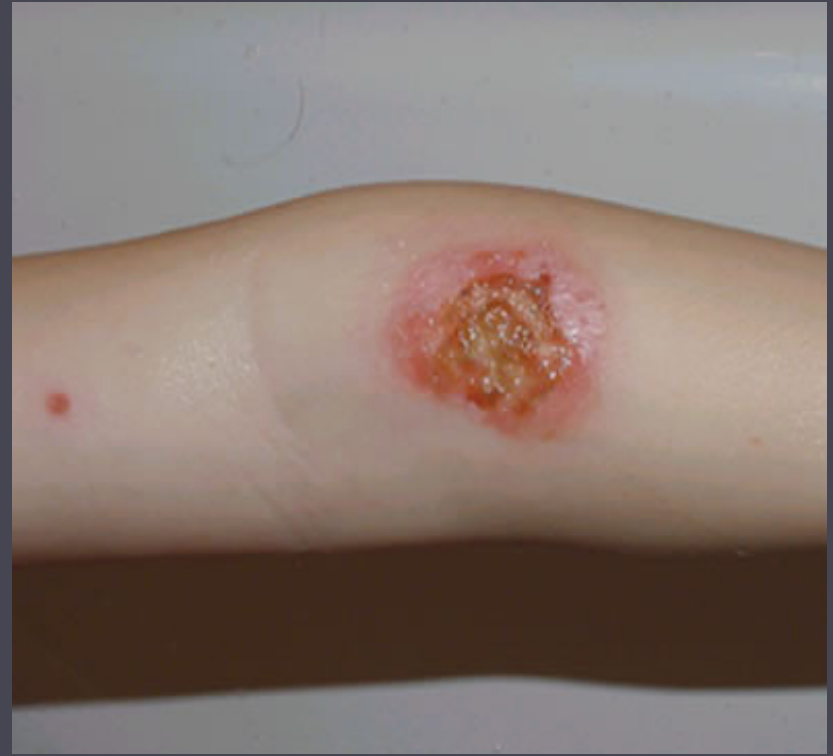


Impetigo





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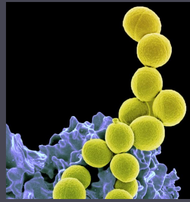
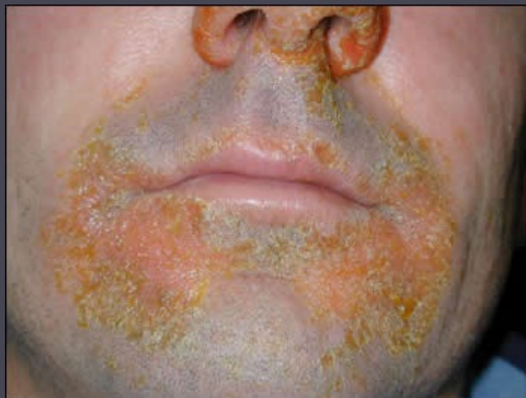
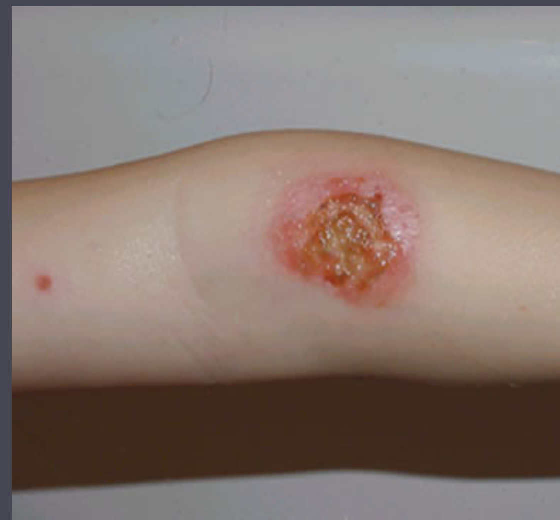


Impetigo

- Treatment
  - Mupirocin ointment tid for 7-10 days
  - oral cephalexin or dicloxacillin q6hrs for 7-10 days if more widespread
  - Prevent spread!





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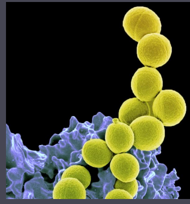
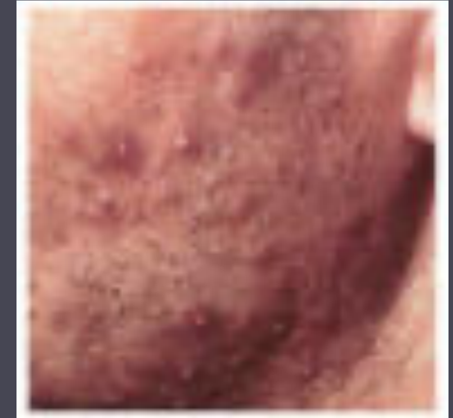
Bacterial Cutaneous Infections





- Folliculitis
  - infection of hair follicles
  - usually caused by *Staph aureus*
  - "hot tub" folliculitis often caused by gram-negative bugs
  - usually occurs in areas of friction, especially in shave areas
  - can progress to abscesses

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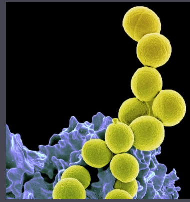

Folliculitis

- Treatment
  - most cases with heal spontaneously in 5-10 days
  - warm compresses can help
  - oral dicloxacillin/cephalexin for 7-14 days
  - incision and drainage for fluctuant lesions
  - astringents can help with prevention
  - decrease/avoid shaving
  - use *clean* blades when you do shave

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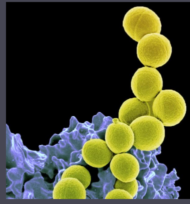
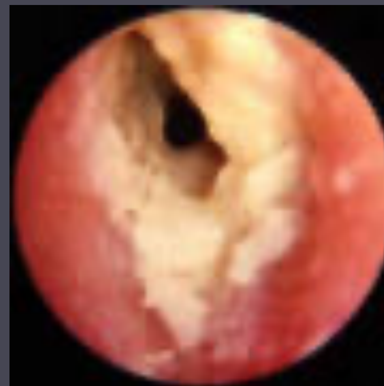
Bacterial Cutaneous Infections



- Ear infections (Otitis externa)
  - increased risk for athletes training in hot, humid weather, and especially ***water sports***
  - also occurs with use of foreign objects (Q-tips)
  - culprit often mixed flora with *Pseudomonas*
  - red, edematous ear canal with significant pain



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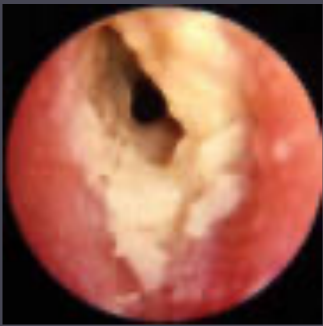
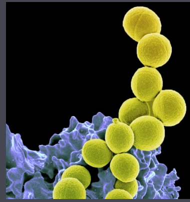


Otitis Externa



- Treatment
  - Cortisporin Otic drops tid-qid for ~10 days
    - use suspension if tympanic membrane is ruptured
    - otherwise, use the solution
    - may need to use ear wick if canal is extremely swollen
  - For severe/resistant cases, an oral quinolone (e.g. ciprofloxacin) may be used
  - Consider possibility of **fungal** otitis externa if not improving with treatment

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Conjunctivitis

- Majority are viral, but bacterial causes are usually Staph or Strep
- Highly transmissible, so contact sport athletes should be kept out until resolved
- Treatment options for 5-7 days
  - Erythromycin ointment
  - Trimethoprim-polymyxin B drops
  - Ciprofloxacin or ofloxacin drops (contact lens wearers)

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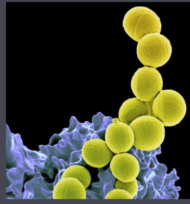
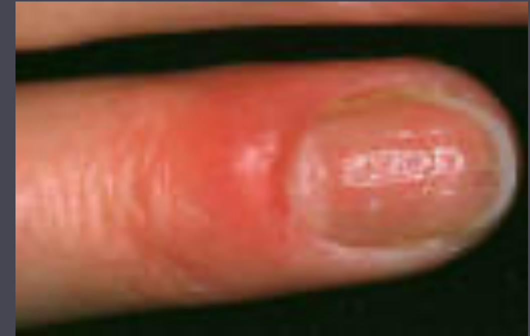
Bacterial Cutaneous Infections





- Hand Infections
  - Paronychia
    - infection around the nail folds
    - may be acute (*Staph*) or chronic (fungal)
    - treat acute cases with warm compresses, I&D if abscess is present; nail removal if subungual abscess or ingrown nail is present
    - oral antibiotics covering Staph (e.g. cephalexin or dicloxacillin) for 7-10 days if suppurative

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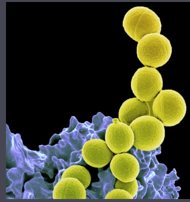
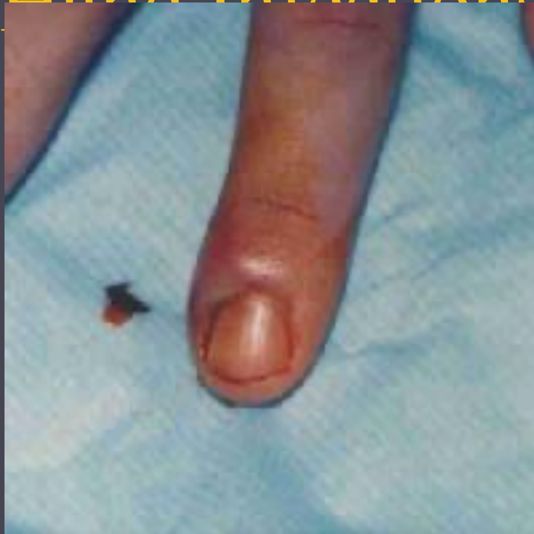
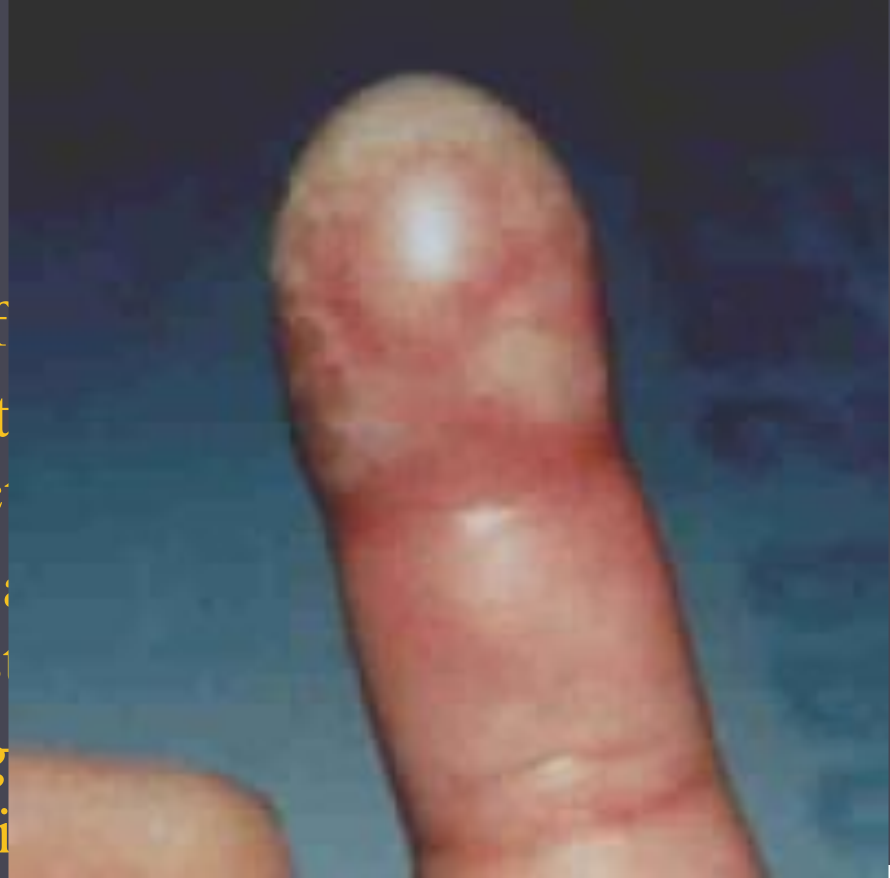


Bacterial Cutaneous Infections

- Hand Infections





  - ...on of
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    foreign body or ost
  - treatment is with g
    oral or IV antibioti
  - hand surgery consult is usually the best idea

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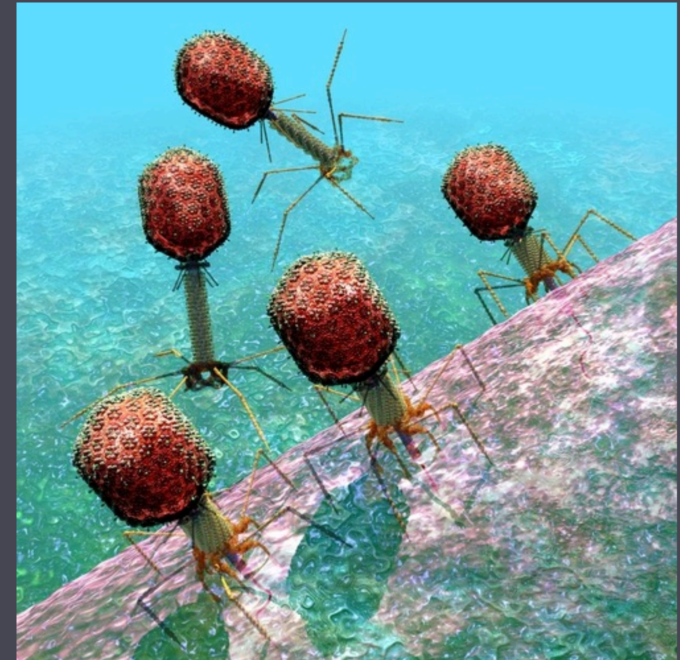
Viral Cutaneous Infections

- Herpesvirus infections
    - Herpes Gladiatorum
    - Herpes Zoster
    - Herpetic Whitlow
- Molluscum contagiousum
- Warts



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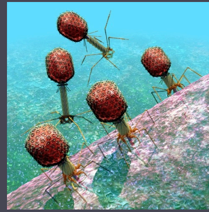
Viral Cutaneous Infections



- Herpes Gladiatorum
  - caused by either HSV-1 or HSV-2
  - affects about 2-8% of high school and collegiate wrestlers
  - HSV incubation period is 5-10 days
  - skin lesions improve in 2-21 days
  - "groups of vesicles on an erythematous base"
  - stinging/burning pain of herpes
  - may have associated fever and malaise

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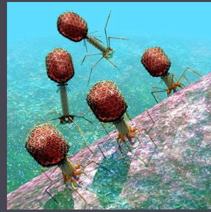
Viral Cutaneous Infections



- Herpes
  - caus
  - affec
    colle
  - HSV
  - skin
  - “gro s base”
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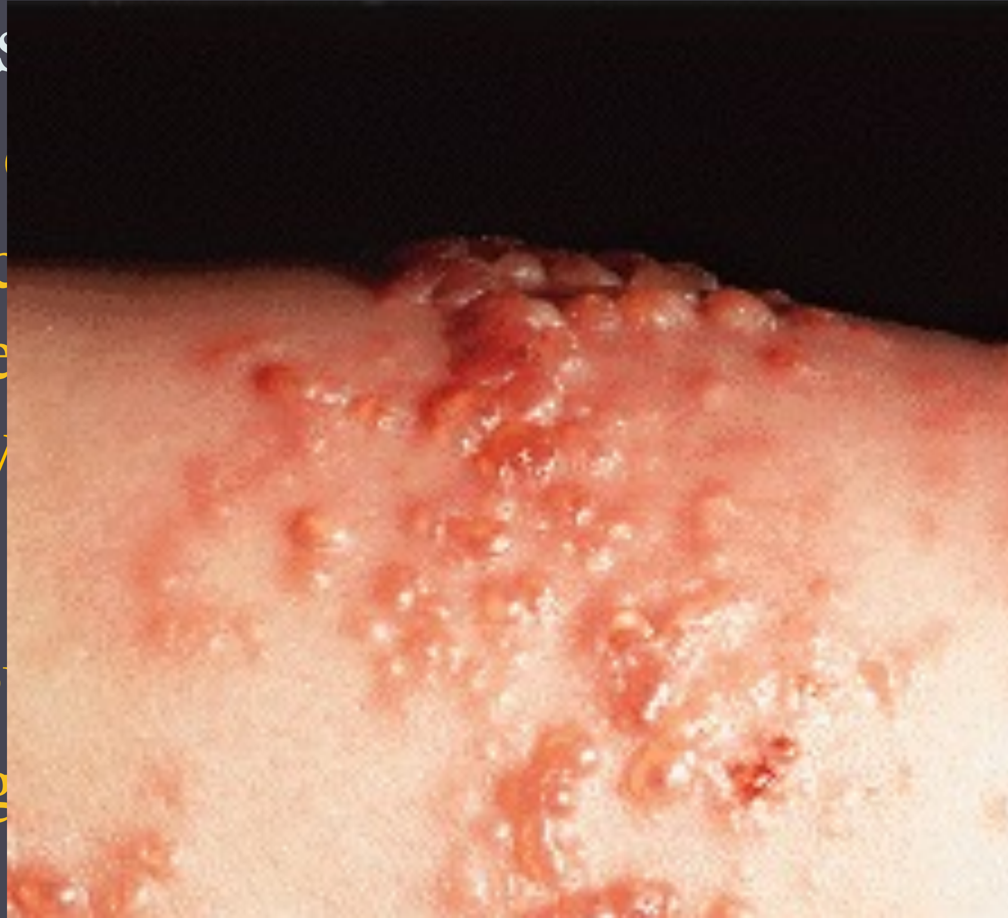
  - may e



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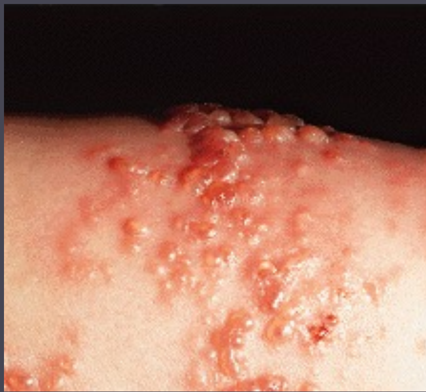
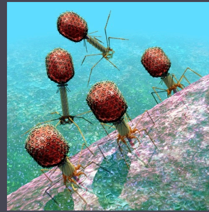


Herpes Gladiatorum



- Treatment
  - – oral acyclovir can shorten the time course, but must be started early
  - – valacyclovir can decrease the risk of recurrence
    - 7-10 days of treatment
  - – benzoyl peroxide + aggressive drying can reduce the risk of secondary bacterial infection
  - – lesions must be crusted over for at least 72 hours and covered before return to play
    - At least 5 days of antiviral treatment to return

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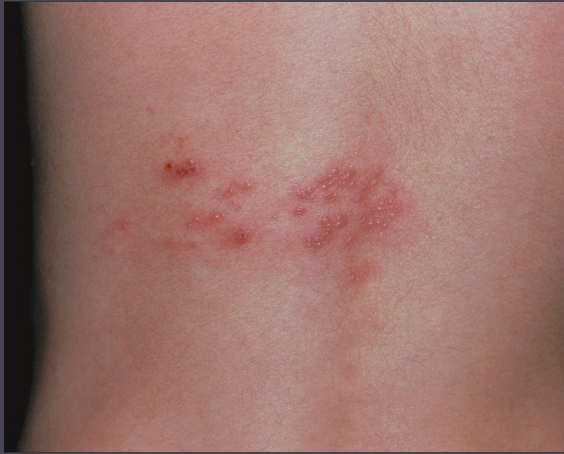
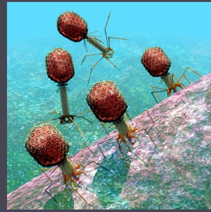


Herpes Zoster



- Similar to herpes gladiatorum, but forms along a dermatomal pattern
- Antiviral therapy with 72 hours of symptoms
- Associated with more pain from neuritis
- Analgesics initially for neuritis pain
- Tricyclic antidepressants may be added for refractory neuropathic pain

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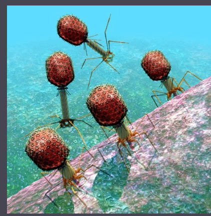
Viral Cutaneous Infections



- Herpetic Whitlow
  - infection of the hand (usually one or more fingers) caused by HSV-1 and HSV-2
  - often appears very similar to paronychia or felon
  - axillary lymphadenopathy symptoms and constitutional are not uncommon
  - distal pulp space is swollen but soft
  - characteristic vesicles are present
  - self-limited; oral acyclovir may be helpful if systemic symptoms are present

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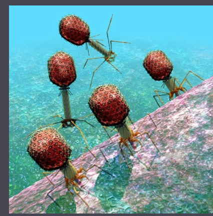
Viral Cutaneous Infections



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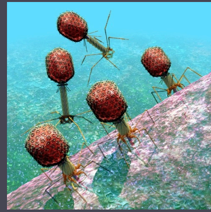

Viral Cutaneous Infections

- Molluscum Contagiosum
  - “umbilicated skin-colored papules” 2-4mm
  - caused by a poxvirus
  - risk factors include close contact, skin abrasion, swimming pools and hot tubs
  - frequently self-limited, but liquid nitrogen or electrocautery can hasten resolution

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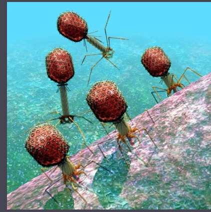

Viral Cutaneous Infections

- Molluscum Contagiosum
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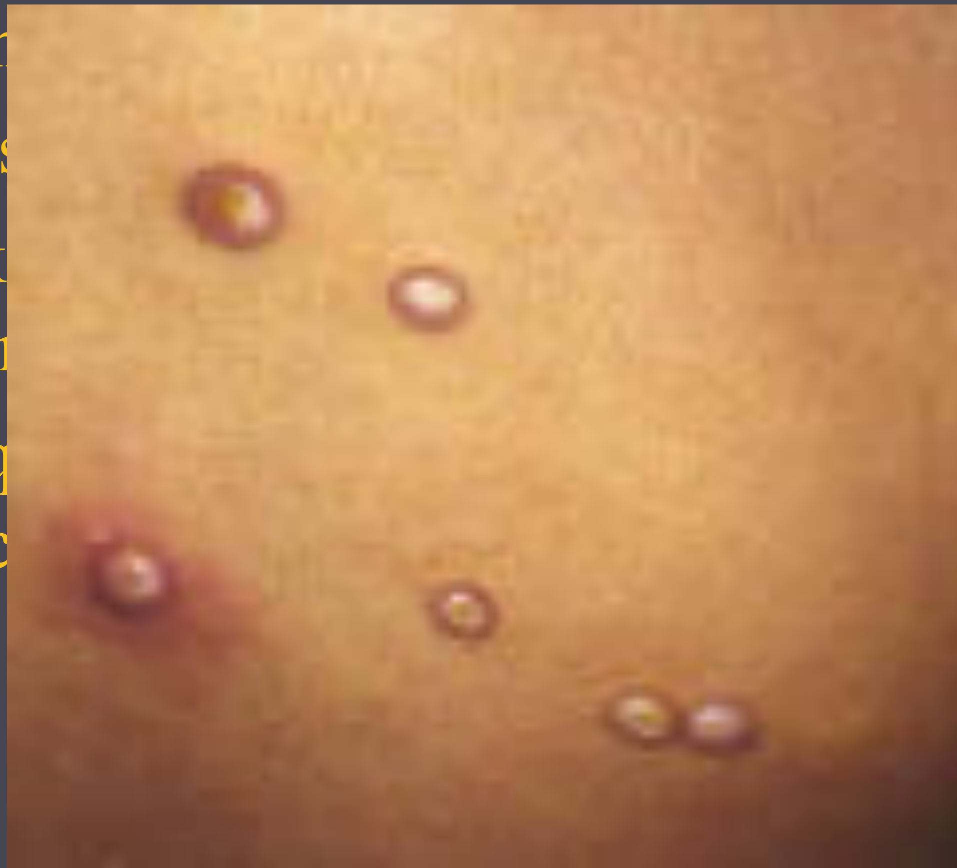
  - caus
  - risk in abrasion, swi
  - freq trogen or elec



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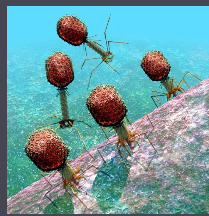
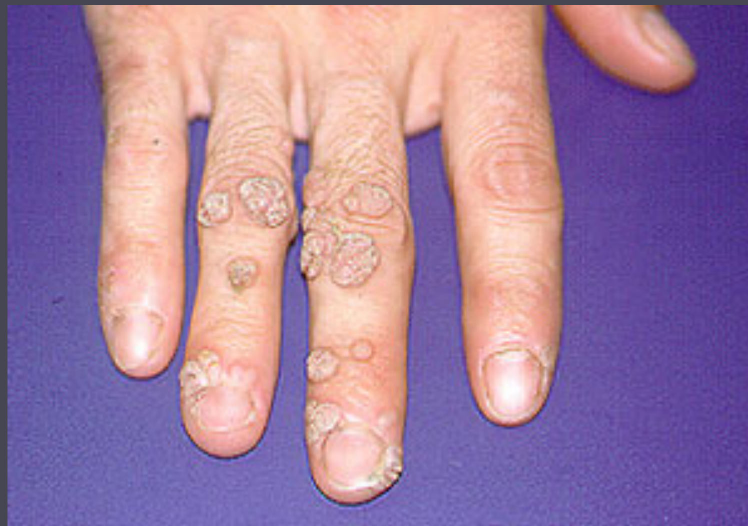
Viral Cutaneous Infections



- Warts (verrucae)
  - caused by papillomaviruses
  - increased in sports involving calluses
  - treat with cryodestruction or topical salicyclic acid
  - surgical removal can be done for refractory cases



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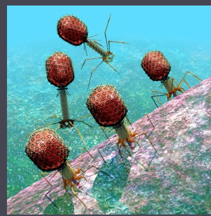
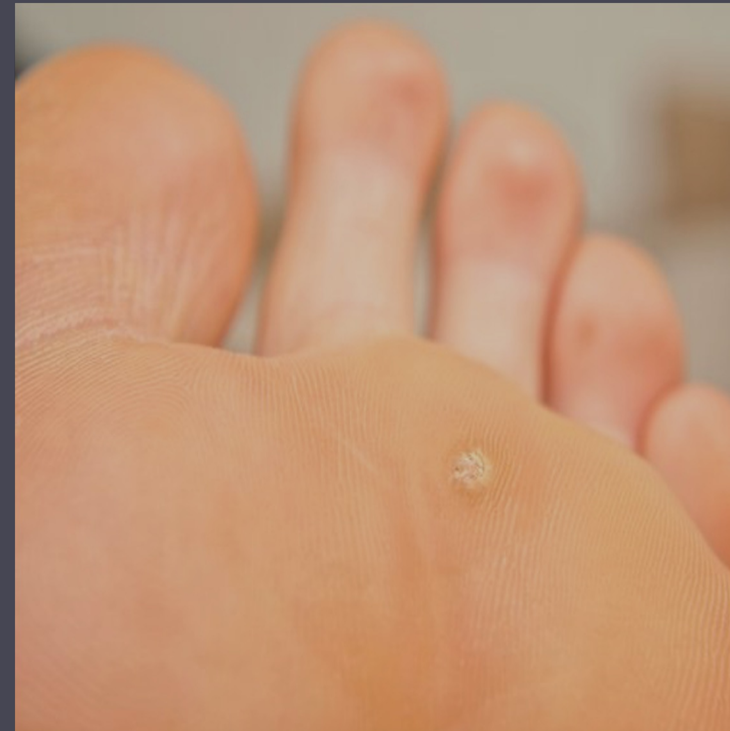
Viral Cutaneous Infections

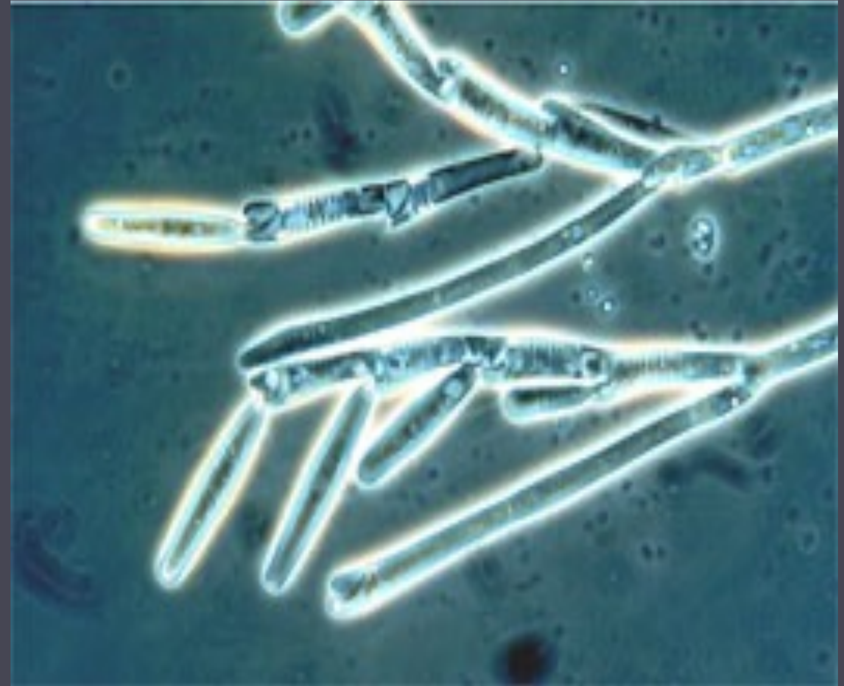


- Plantar warts
  - can be significantly limiting to runners and other athletes
  - similar treatments to other warts, but can be more stubborn
  - laser
  - intralesional immunotherapy
  - duct tape?
    - 6 days, 1 day off, repeated weekly



Cutaneous Infections

- **Fungal**
  - Tinea capitis
  - Tinea corporis
  - Tinea cruris
  - Tinea pedis



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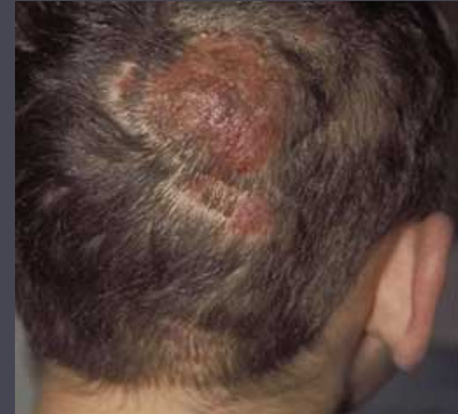
Fungal Cutaneous Infections



- Tinea Capitis
  - "ringworm" of the scalp
  - typically round patches of scale, usually with associated bald patches
  - 90% caused by *Trichophyton tonsurans*
  - oral agents are the treatment of choice:
    - Griseofulvin for 6-12 weeks
    - Itraconazole 3-5mg/kg/day for 6 weeks
    - Terbinafine (Lamisil) for 2-4 weeks

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Fungal Cutaneous Infections

- Tinea Corporis

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Fungal Cutaneous Infections

- Tinea Cruris
  - "jock itch" is characterized by crescent-shaped large, well-marginated erythematous plaques in the crural folds that burn and itch
  - typically caused by *Microsporum, Trichophyton, and Epidermophyton*
  - treated with topical antifungals bid for 2-3 weeks (e.g. ketoconazole or terbinafine)
  - educate patients about preventive measures

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Fungal Cutaneous Infections

- Tinea Pedis
  - "athlete's foot" is characterized by itching, burning, scaling, eruptions on the foot, usually between toes
  - skin may be macerated
  - vesicles may be present
  - various *Trichophyton* species are common, resulting in variations in appearance

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Tinea Pedis

Tinea Pedis

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Tinea Pedis

A.D.A.M.

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Fungal Cutaneous Infections

- Tinea Pedis
  - treat with topical antifungal creams bid for 2-4 weeks; may mix with mild topical steroid cream initially
  - Burow's solution soaks often helpful
  - oral agents are an option for tough cases, and for cases with extensive nail involvement
  - nystatin is ***not*** effective for dermatophyte infections

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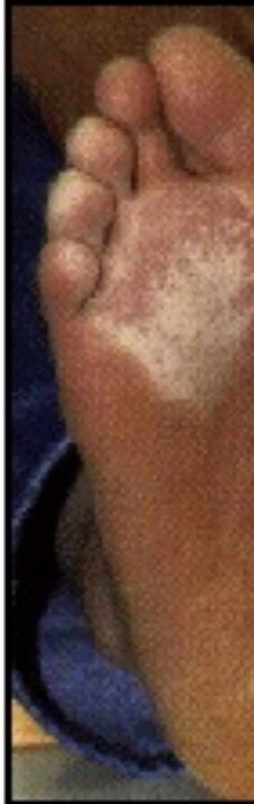
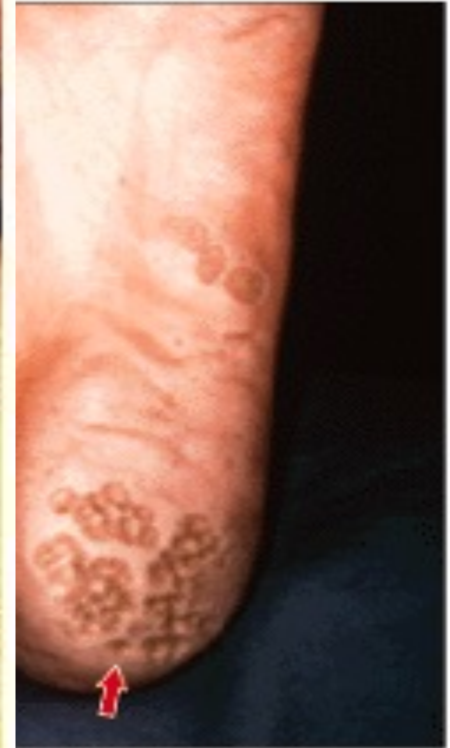
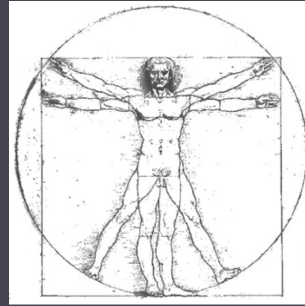
Corynebacterium Infections

- Can often ... or plantar





Non-cutaneous Infections



- Athletes are subject to many of the same infections as the general population
- Infection incidence and severity appear to increase with severe exertion
- Prevention is of utmost importance

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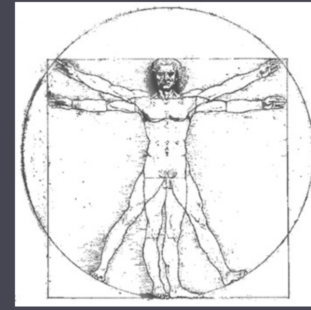
Non-cutaneous Infections



- Mononucleosis
- Upper respiratory infections and other viral syndromes
- Gastrointestinal infections
- Bloodborne pathogens

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Mononucleosis

- Signs & Symptoms
  - syndrome of malaise, headache, fatigue, anorexia, and myalgias
  - exam findings include tonsillar enlargement, cervical lymphadenopathy, soft palate petechiae, and splenomegaly
  - may also have atypical lymphocytosis and elevated liver function tests

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Mononucleosis

- Typically caused by Epstein-Barr virus
- Incubation period of 30-45 days
- Self-limited illness, but complications include splenomegaly with splenic rupture
- Return to play recommendations vary, but all athletes should be withheld for at least 3 weeks

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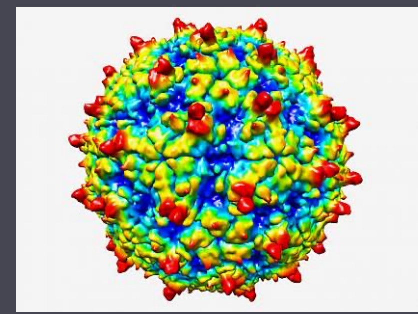
Non-cutaneous Infections



- Upper respiratory infections
  - usually include illnesses of infectious rhinitis, pharyngitis, sinusitis, and bronchitis
  - there is increased risk of URIs with longer running, and with high-intensity exercise
  - *moderate* exercise may decrease the risk of URIs
  - "above the neck rule"

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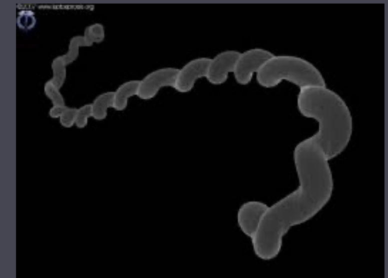
Non-cutaneous Infections

- Gastrointestinal infections
  - beware of "weird" organism infections in water athletes
    - *Leptospirosis*
    - *Giardiasis*
    - *Cryptosporidiosis*



  - the primary concern of treatment is hydration
    - oral fluids for mild dehydration
    - IV fluids for more pronounced dehydration or metabolic disturbances
  - oral antibiotics for nonviral pathogens

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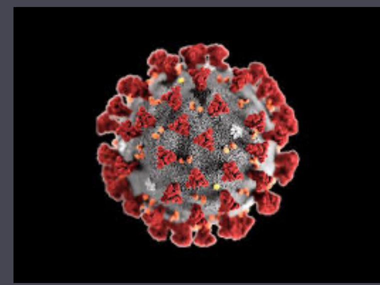
Non-cutaneous Infections

- Bloodborne pathogens
  - HIV
    - the asymptomatic HIV+ athlete can still perform at a very high level, but there may be risks to extreme training and overtraining
    - (almost) no confirmed HIV transmissions in sports to date
  - Hepatitis
    - some patients can tolerate sports quite well
    - clinical signs and symptoms should guide return to play

COVID-19



- There is a strong correlation with physical activity and better Covid-19 outcomes
- Myocarditis incidence estimated at 0.5-3%
- Symptoms to look for:
  - Chest pain
  - Shortness of breath out of proportion to URI
  - Palpitations
  - Syncope

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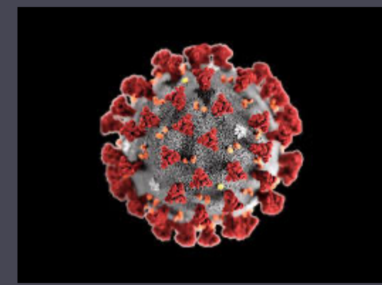
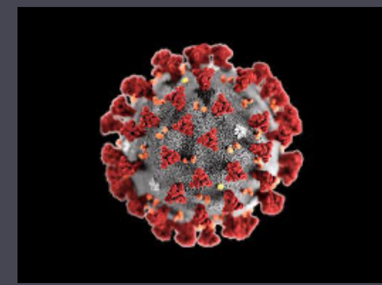
COVID-19



- **Aymptomatic** or **mild** cases
  - Should be improving for a minimum of 1 day prior to return to physical activity progression
  - 3 day return to play after resolution of symptoms
  - Masking for 10 days from symptom onset
  - Monitor for chest pain, shortness of breath out of proportion to URI, palpitations, or syncope

COVID-19



- **Moderate** symptoms
    - $\geq$ 4 days of fever > 100.4
    - $\geq$ 1 week of myalgia, chills, lethargy, or non-ICU hospital stay
  - Physician evaluation
  - EKG
  - 5 day return to play, after a minimum of 1 day of symptom resolution
  - Masking for 10 days from symptom onset
- **Severe** symptoms
  - 3-6 months, with a Cardiology clearance

Prevention

- Athletes should minimize contact with people who are obviously ill
  - this may include avoiding crowds, travel and young children
  - masking and distancing
- Keep intertriginous areas and feet dry as much as possible
- Shower after all events, and before events that involve close skin contact (e.g. wrestling)
- WASH YOUR HANDS!

Prevention

Prevention

- Keep clothing, equipment, and facilities sanitary
- Assure that athletes' immunizations are up-to-date
- Avoid overtraining, sleep deprivation, and improper nutrition
- Safeguard the water supply

Prevention

- The athletes should be advised that it is their responsibility to report all wounds and injuries in a timely manner, including those recognized before the sporting activity.
- Post event consideration should include reevaluation of any wounds sustained during the sporting event.
- The care provider managing an acute blood exposure must follow the guidelines of universal precautions.

Prevention

Vaccines

Prevention

Vaccines

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Conclusions

- Infections play a major role in sports.
- Infections can be either cutaneous, or more systemic, and can have a number of different etiologies.
- While prompt recognition and treatment of infections is very important, prevention is by far the most critical step in this aspect of sports medicine.

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