



PRIMARY CARE HAWAII CONFERENCE

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Kauai, Hawaii

Infectious Disease in the Active and Athletic Patient

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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

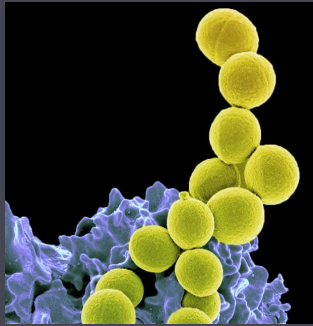
- Most infections are contagious
- The close proximity of athletes to each other is a key risk factor
- The close contact involved in many sports also puts certain athletes at risk
- Exhaustive exercise increases the risk and severity of some viral illnesses

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

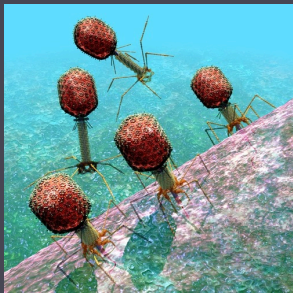
Cutaneous Infections

Non-cutaneous Infections



- **Bacterial**

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



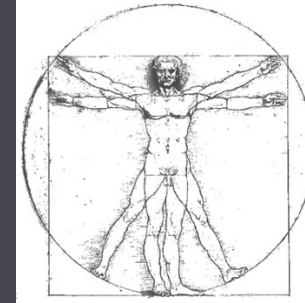
- **Viral**

- HSV
- molluscum
- warts



- **Fungal**

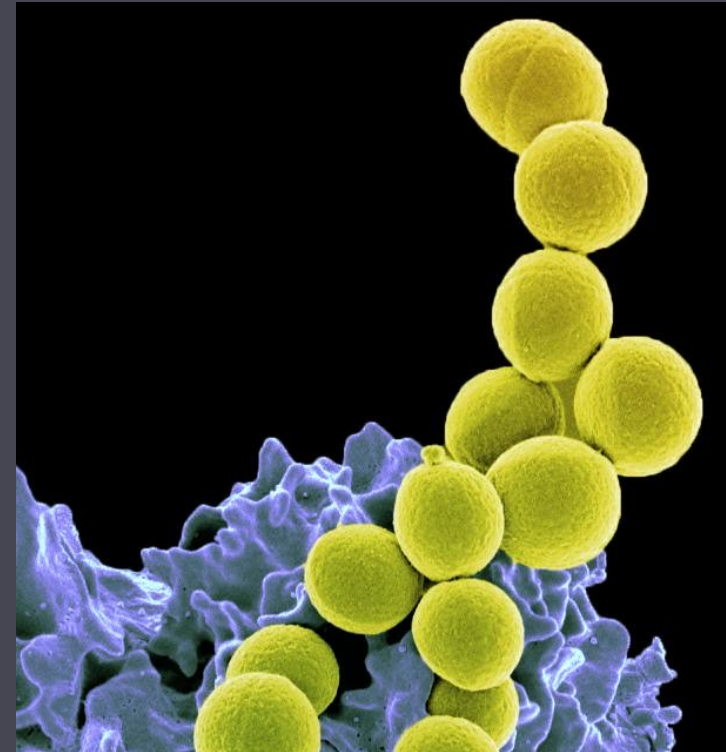
- tinea



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

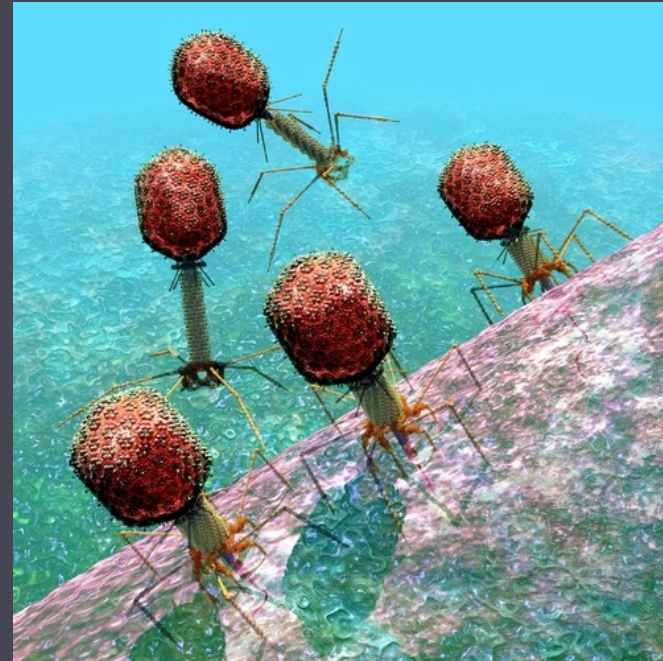
Cutaneous Infections

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



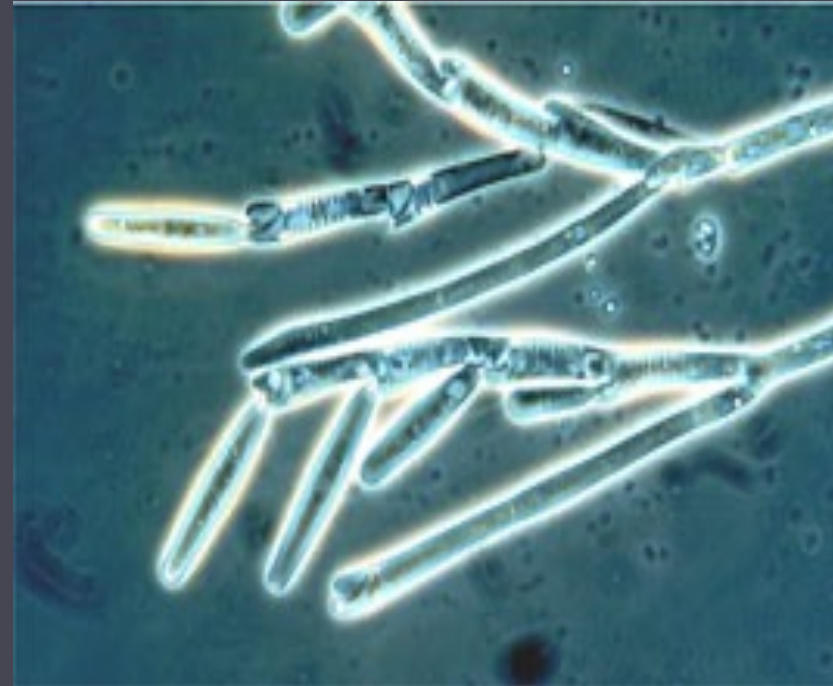
Cutaneous Infections

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

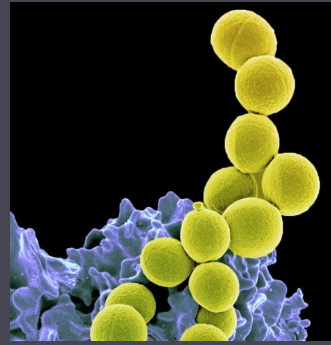


Cutaneous Infections

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

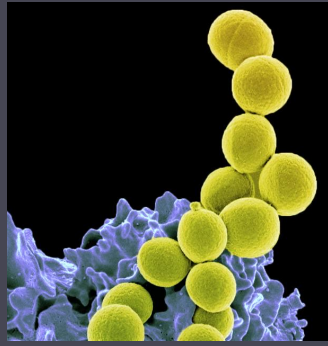


Bacterial Cutaneous Infections



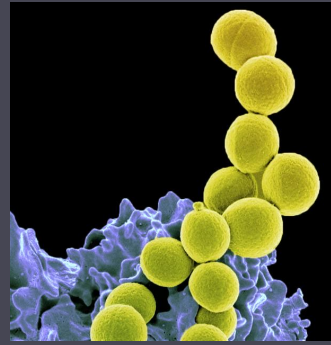
- Cellulitis/Abscesses
 - can occur just about anywhere there is skin
 - athletes are particularly susceptible due to abrasions and physical contact
 - *Staph aureus* and *Strep pyogenes* are the most common pathogens
 - be wary of *Pseudomonas*, *Aeromonas*, and *Vibrio* in water athletes
 - MRSA is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

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)

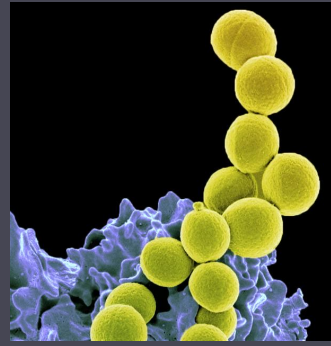
Abscesses



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



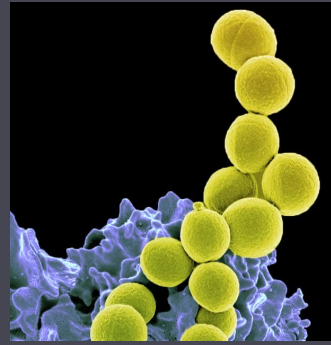
Bacterial Cutaneous Infections



- 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



MRSA Infections



- Treatment

- Oral antibiotics

- Trimethoprim-sulfamethoxazole (Bactrim/Septra)
 - Clindamycin
 - Rifampicin
 - Tetracycline/doxycycline/minocycline

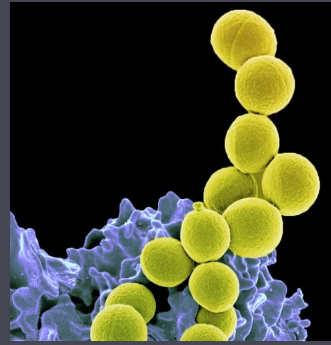
- IV antibiotics

- Vancomycin
 - Linezolid (Zyvox) -- PO or IV

- For recurrences in patients with known carrier status, treat with intranasal mupirocin (Bactroban)

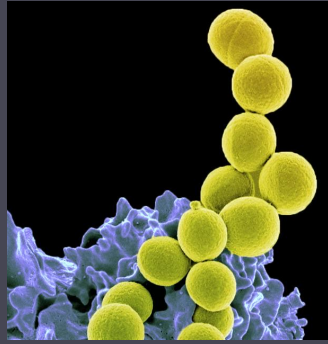


Bacterial Cutaneous Infections

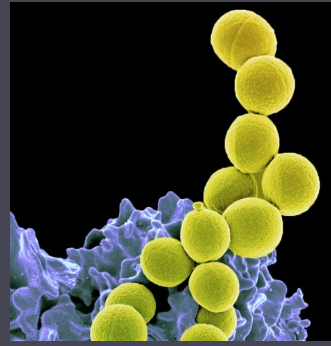


- Impetigo
 - superficial skin infection, usually produced by *Staph aureus* and β -hemolytic *Strep*
 - bullous and nonbullous (more common)
 - vesicles on erythematous base with honey-crusted lesions; vesicles often progress to pustules
 - most common in children and young adults
 - more often in warm,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

Impetigo



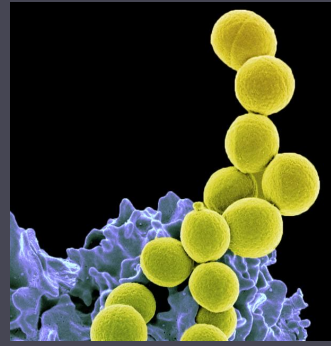
Impetigo



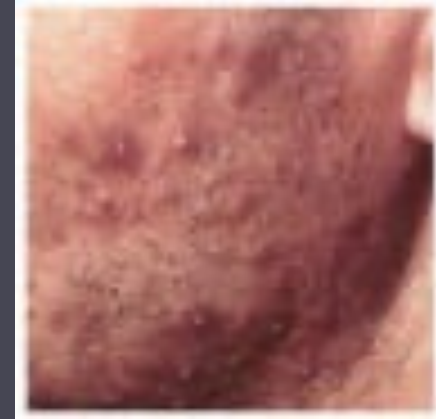
- Treatment
 - Mupirocin ointment tid for 7-10 days
 - oral cephalexin or dicloxacillin q6hrs for 7-10 days if more widespread
 - Prevent spread!



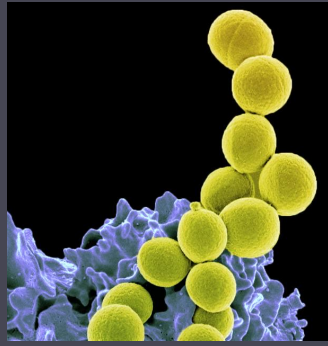
Bacterial Cutaneous Infections



- 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

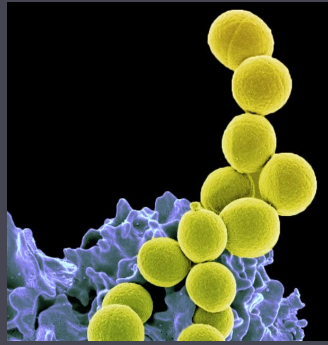


Folliculitis



- 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

Bacterial Cutaneous Infections



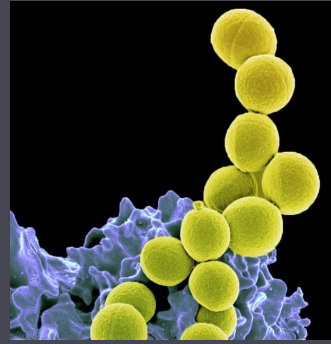
- Ear infections (Otitis externa)
 - increased risk for athletes training in hot, humid weather, and especially *water sports*
 - also occurs with use of foreign objects (Q-tips)
 - culprit often mixed flora with *Pseudomonas*
 - red, edematous ear canal with significant pain



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

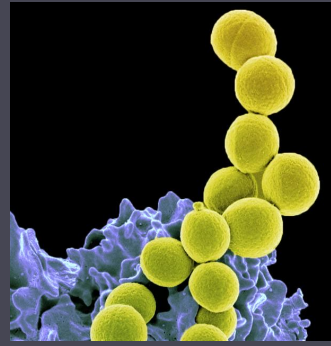


Conjunctivitis



- 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)

Bacterial Cutaneous Infections



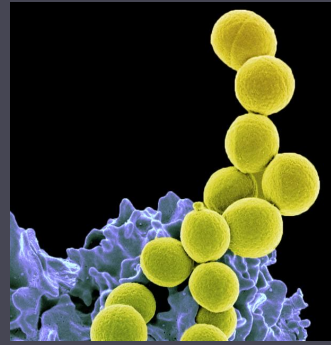
- Hand Infections

- 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



Bacterial Cutaneous Infections



- Hand Infections

- Felon

- closed
 - can
 - x-ray
 - oste
 - treatment is with *good* incision
 - hand surgery consult is usual

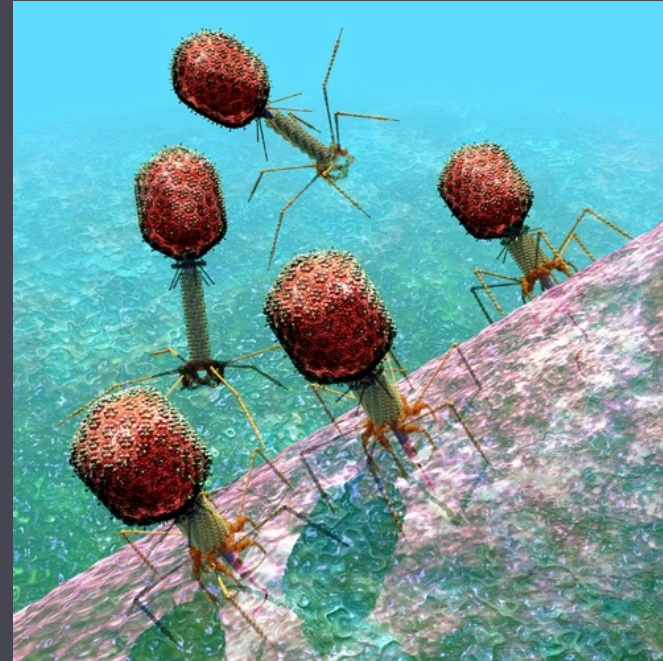


infections
or
antibiotics

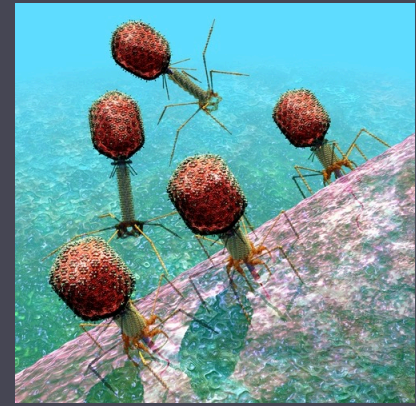


Viral Cutaneous Infections

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

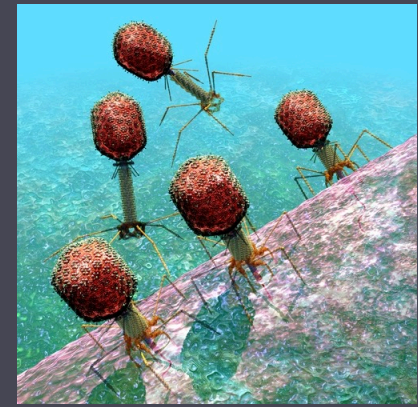


Viral Cutaneous Infections



- 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

Viral Cutaneous Infections



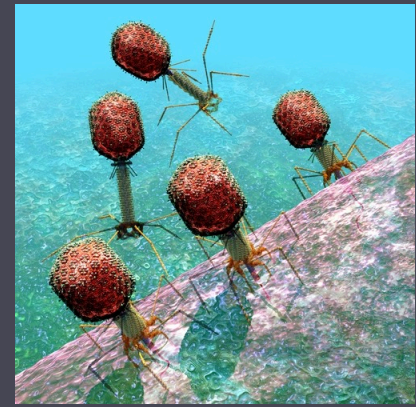
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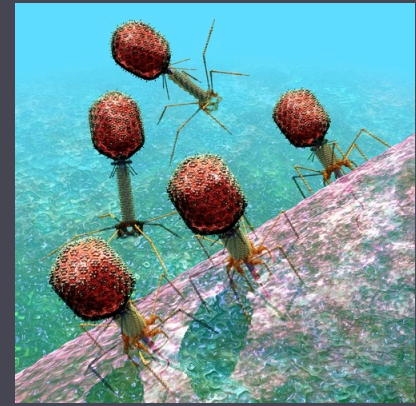
Herpes Gladiatorum



- 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

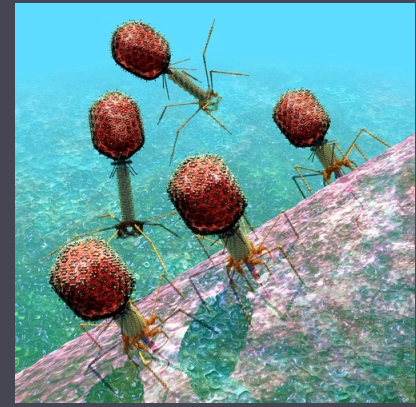


Herpes Zoster



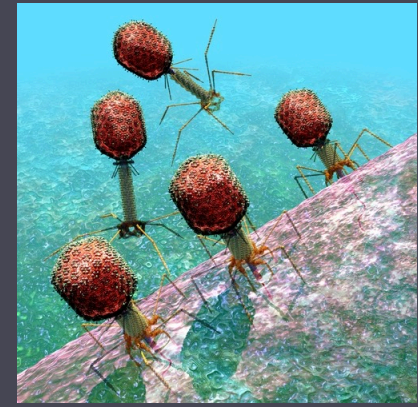
- Similar to herpes gladiatorum, but forms along a dermatomal pattern
- Antiviral therapy with 72 hours of symptoms
- Associated with more pain from neuritis
- Analgesics initially for neuritis pain
- Tricyclic antidepressants may be added for refractory neuropathic pain

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

Viral Cutaneous Infections

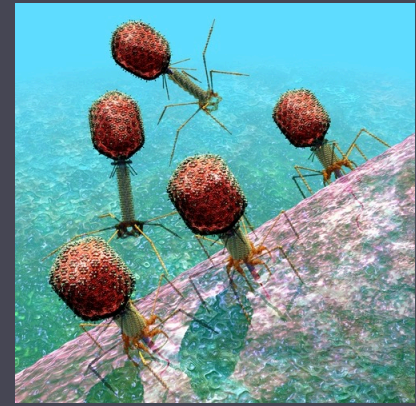


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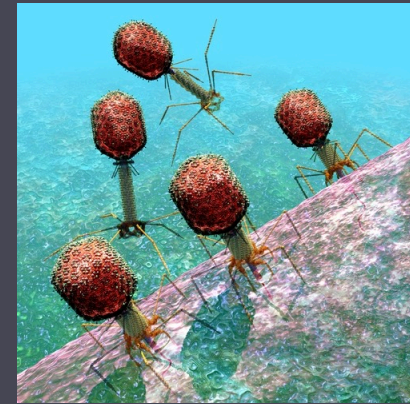
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Viral Cutaneous Infections



- 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

Viral Cutaneous Infections



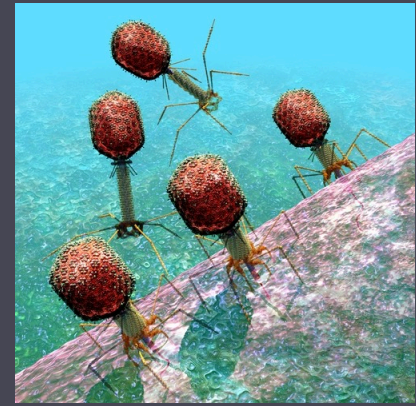
- Molluscum Contagiosum

- “umbrella-shaped”
- 2-4mm
- caused by molluscum contagiosum virus
- risk factors include skin-to-skin contact, in abrasion, swimming pools, hot tubs, and
- frequently found in children, especially in the face, neck, and torso
- often treated with cryotherapy, laser, or electrocauterization



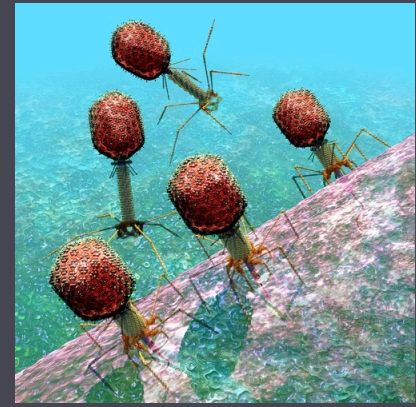
Viral Cutaneous Infections

- 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



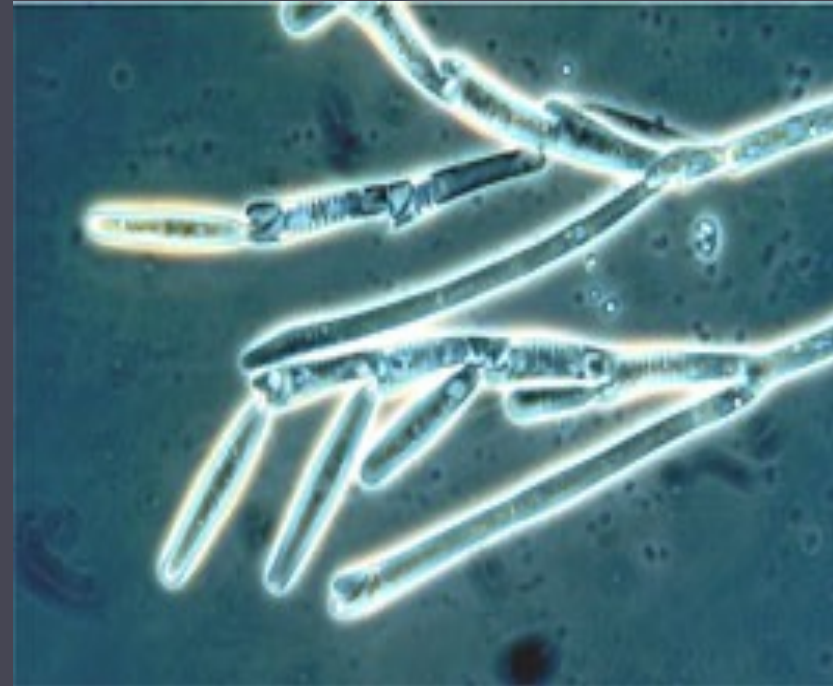
Viral Cutaneous Infections

- 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

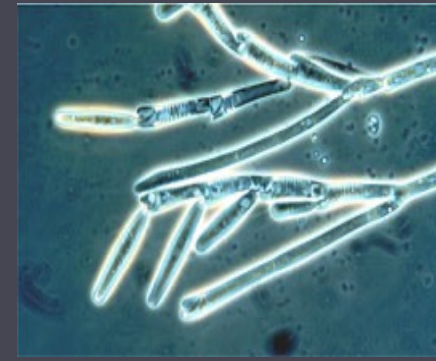


Cutaneous Infections

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



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



Fungal Cutaneous Infections



- Tinea Corporis
 - well-marginated scaling circular plaques with central clearing
 - *Trichophyton rubrum* most common
 - KOH scrapings showing branching hyphae with septa
 - treat with topical antifungal creams bid for 2 weeks
 - resistant or extensive cases may require 2-4 weeks of oral therapy

Fungal Cutaneous Infections



- Tinea Corporis

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- KOH
- septa
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Fungal Cutaneous Infections



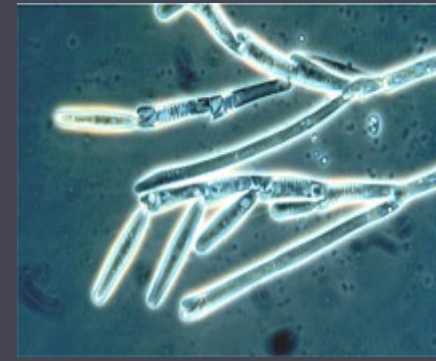
- Tinea Cruris
 - “jock itch” is characterized by crescent-shaped large, well-margined erythematous plaques in the crural folds that burn and itch
 - typically caused by *Microsporum*, *Trichophyton*, and *Epidermophyton*
 - treated with topical antifungals bid for 2-3 weeks
educate patients about preventive measures

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

Tinea Pedis



Tinea Pedis



Tinea Pedis



Topical Antifungals



Antifungal	Tinea Corporis Effectiveness	Tinea Cruris Effectiveness	Tinea Pedis Effectiveness	Cost
Terbinafine	High	High	High	Moderate-High
Naftifine	High	High	High	Moderate-High
Clotrimazole	High	High	Moderate-High	Low (OTC)
Miconazole	Moderate-High	Moderate-High	Moderate-High	Low (OTC)
Econazole	Moderate-High	Moderate-High	Moderate-High	Moderate
Ketoconazole	Moderate-High	Moderate-High	Moderate-High	Moderate
Ciclopirox	Moderate-High	Moderate-High	Moderate-High	High
Tolnaftate	Moderate	Moderate	High	Low (OTC)

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 for symptoms
 - oral agents are an option for tough cases, and for cases with extensive nail involvement
 - **nystatin** is *not* effective for dermatophyte infections

Corynebacterium Infections

- Can affect

Figure: Courtesy



Figure 1. Pitted keratolysis presents as multiple small pits in the weight-bearing areas of the foot.



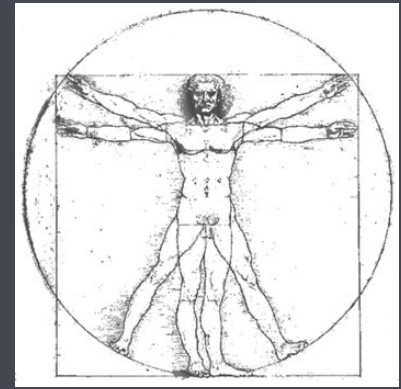
- or plantar

Figure: Courtesy of Dirk M. Elston, MD, and Gardner, MD



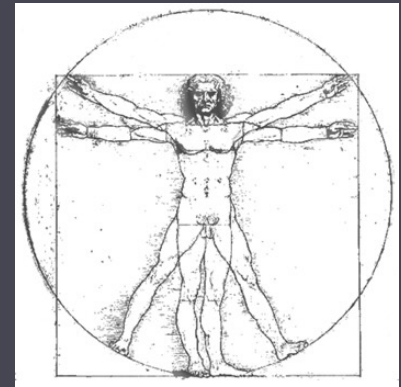
Figure 2. Pitted keratolysis of figure 1 shows multiple pits (arrow) on the sole. The lesions and odor pointed to the keratolysis.

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

Non-cutaneous Infections



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

Mononucleosis



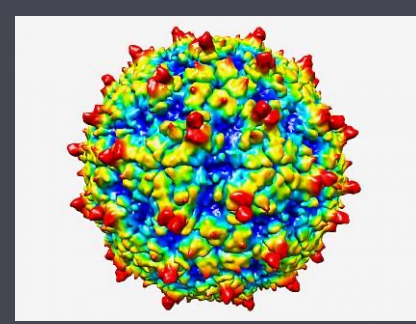
- Signs & Symptoms
 - syndrome of malaise, headache, fatigue, anorexia, and myalgias
 - exam findings include tonsillar enlargement, cervical lymphadenopathy, soft palate petechiae, and splenomegaly
 - may also have atypical lymphocytosis and elevated liver function tests

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

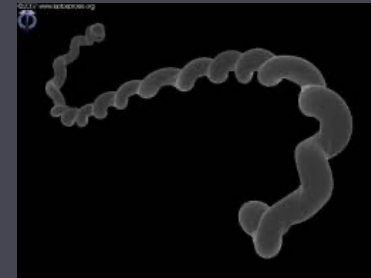
Non-cutaneous Infections



- 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”

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



Non-cutaneous Infections

- Bloodborne pathogens

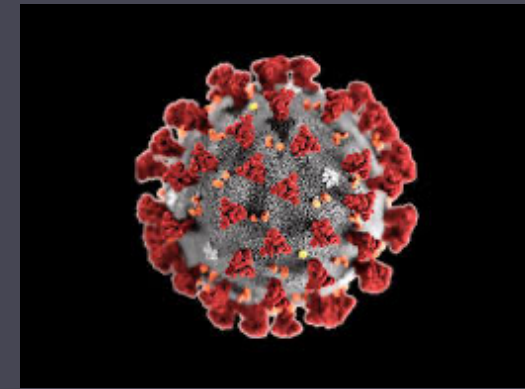
- HIV

- 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

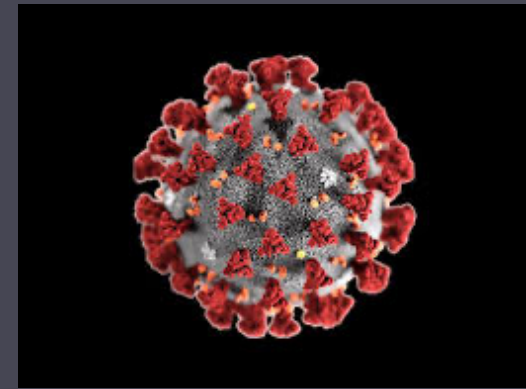
- some patients can tolerate sports quite well
 - clinical signs and symptoms should guide return to play

COVID-19



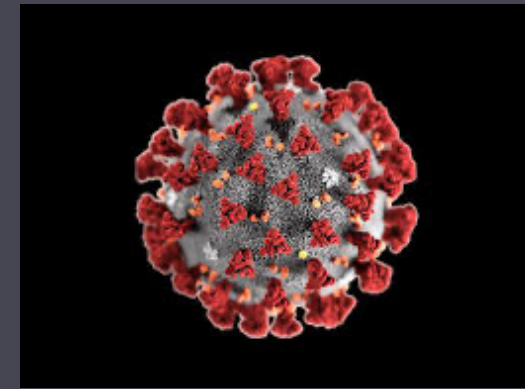
- There is a strong correlation with physical activity and better Covid-19 outcomes
- Myocarditis incidence estimated at 0.5-3%
- Symptoms to look for:
 - Chest pain
 - Shortness of breath out of proportion to URI
 - Palpitations
 - Syncope

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**

- ≥ 4 days of fever > 100.4
- ≥ 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



09

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



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.

Thank you!

