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The Impact of Infectious Diseases on Athletes: Diagnosis, Management, and Return-To-Play Guidelines

May SALEM[1], Mohammad MOHAMMED[2]
[1,2]Dept. of Medical Laboratory Technologies - Gilgamesh University- Baghdad, IRAQ

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Annotation: Orthopedic injuries are commonly associated with sports; however, infectious diseases also contribute significantly to morbidity among athletes. While moderate-intensity exercise enhances immune function, extreme exercise durations and intensities may suppress immunity. Respiratory infections are the most prevalent, although athletes are also susceptible to skin, bloodborne, sexually transmitted, and cardiac infections. Infectious disease outbreaks remain a persistent concern in athletic populations. The management of infections in athletes aligns with general medical treatment protocols, yet considerations regarding return-to-play decisions and infection prevention strategies are particularly important in this demographic.

INTRODUCTION

Sports medicine is often associated with orthopedic injuries such as sprained ankles and muscle strains. However, infectious diseases account for up to 50% of medical visits in high school and collegiate athletic training facilities. While exercise has beneficial effects on the immune system, infections can induce fever, fatigue, and muscle weakness, thereby increasing the risk of secondary injuries and limiting athletic performance. Ensuring a safe return to play is crucial for both the well-being and safety of athletes. Furthermore, the close-contact nature of sports increases the likelihood of disease transmission, making infectious disease outbreaks a significant concern, particularly in organized sports at high school, collegiate, and Olympic levels.

The objective of this article is to examine the diagnosis, management, and return-to-play guidelines for common infectious diseases in high school and collegiate athletes, with an emphasis on optimizing patient care, enhancing public health, and reducing morbidity and

mortality.

Effects of Infection on Exercises:

Infectious diseases contribute to illness-related morbidity and can negatively impact athletic performance. Fever, for instance, affects coordination, concentration, muscle strength, and aerobic capacity. Additionally, fever impairs endurance, fluid balance, and thermoregulation. Viral infections exacerbate tissue wasting, muscle catabolism, and negative nitrogen balance. Symptoms such as pain, discomfort, and fatigue further hinder athletic performance (1).

The pharmacological management of infections poses additional challenges for athletes. While acetaminophen (paracetamol) is generally safe, certain medications such as quinolones have been linked to tendon rupture (2). Many antibiotics are associated with gastrointestinal disturbances, while antihistamines may induce sedation. Furthermore, ephedrine-containing compounds, which are prohibited by numerous sports organizations, can result in positive drug tests and disqualification from competition (1,3).

Upper Respiratory Tract Infections (URTI):

URTIs affect nearly all healthy adults between one to six times per year and represent the most frequently observed infections in athletic training facilities. These infections are predominantly viral and are transmitted through direct contact (e.g., hand-to-nose, eye, or mouth), airborne particles, and respiratory droplets. In confined environments such as locker rooms, a single infected individual may transmit the infection to 25%–70% of teammates (5).

Given the high transmissibility of URTIs, preventive measures are essential. Regular hand hygiene using soap and water or alcohol-based sanitizers significantly reduces the risk of transmission. Proper nutrition, hydration, and adequate sleep contribute to overall immune resilience. Symptomatic individuals should practice proper respiratory etiquette by coughing or sneezing into towels rather than their hands and should avoid public gatherings when possible. Annual influenza vaccination, which demonstrates 70%–90% efficacy in individuals under 65 years of age, is recommended for athletes without contraindications (6).

A gradual return to play is advised following an infectious illness. Asymptomatic or mildly symptomatic athletes should undergo a comprehensive medical history review and physical examination before resuming physical activity. Athletes experiencing symptoms localized above the neck (e.g., runny nose, sore throat) may engage in light jogging for 10 minutes. If symptoms worsen, exercise should be discontinued until resolution. If no symptom exacerbation occurs, gradual increases in training intensity can be implemented. In contrast, athletes presenting with systemic symptoms such as fever, gastrointestinal distress, or fatigue should refrain from exercise until complete symptom resolution (7).

Pharyngitis:

Sore throat mostly caused by the same viruses that produce URTI. Other infectious etiologies include Epstein-Barr virus (EBV), group A beta hemolytic streptococci (GABS), and rarely, mycoplasma pneumoniae (8). Symptoms comprise sore throat, pain with swallowing, fever, and URTI symptoms. Abdominal pain and headache may be seen too. Infectious mononucleosis (EBV) pharyngitis may occur

with URTI symptoms and swollen, erythematous tonsils with exudate, palatal petechial, and splenomegaly.

Patients with pharyngitis caused by GABS usually respond to antibiotics. As with other acute febrile illnesses, restart playing can be guided by the "neck check" as noted previously.

Infectious Mononucleosis:

Infectious mononucleosis (IM) is an acute, self-limiting disease caused by the Epstein-Barr virus (EBV), which is secreted in saliva and transmitted through direct contact. The peak incidence of

IM occurs between the ages of 15 and 25, with a dramatic decline by age 35. Eventually, approximately 95% of adults develop immunity (9). IM begins with a prodrome lasting at least three to five days, characterized by fatigue, headache, loss of appetite, and myalgia. Within a few days, symptoms such as sore throat, posterior cervical lymphadenopathy (more pronounced than anterior), and fever manifest. Classic symptoms typically persist for up to four weeks (10). Approximately 50% to 75% of infected individuals develop palpable splenomegaly, though physical examination may be unreliable, and 10% to 15% experience jaundice (1,9).

According to the consensus statement from the American Medical Society for Sports Medicine, athletes should refrain from all exercise for the first 21 days following the onset of illness. After this period, a gradual resumption of physical activity is recommended, beginning with walking and progressing at a rate not exceeding 10% of the usual weekly duration or intensity. Full recovery typically occurs within two to three months but may take longer in certain cases.

Sinusitis:

Sinusitis is commonly associated with water sports, including swimming, diving, water polo, and surfing (11). toms indicative of bacterial sinusitis include fever, purulent nasal discharge, maxillary toothache, sinus pain, and sinus tenderness upon palpation (2, 12). Individuals who initially experience upper respiratory tract infection (URTI) symptoms, followed by a brief improvement and then an abrupt worsening, are more likely to have bacterial sinusitis. The Berg prediction rule, which incorporates findings such as purulent rhinorrhea and focal sinus tenderness, can aid in diagnosing bacterial sinusitis and guiding appropriate management (13)

Otitis Media (OM) and Otitis Externa (OE):

Middle ear infections account for over 20 million cases of morbidity annually in the United States, with approximately 20% of affected individuals being adults. Approximately 30% of OM cases are viral, while the remainder are caused by bacterial pathogens such as Streptococcus pneumoniae and Moraxella catarrhalis. Patients typically present with ear pain and symptoms of an upper respiratory tract infection. Most OM cases are self-limiting, and antibiotics generally do not significantly alter the disease course in individuals older than two years. Athletes involved in water sports should refrain from participation until the tympanic membrane is intact and exhibits normal mobility.

OE is an infection of the external ear canal and occur frequently in water sports athletes. Repetitive water contact, preexisting allergies, and inadequate cerumen have been given as risk factors (4). *Pseudomonas aeruginosa* is the number one common identifiable cause, but fungi such as Aspergillus have been shown too(4). Clinicians and coaches can indicate to swimmers to tilt the head, shake the water out of the ear canal, and dry it with a hair dryer after swimming (1). Athletes can reduce their risk of developing OE by avoiding attaching things into the ear canal and using isopropanol drops to dry and/or dilute acetic acid to acidify the external ear canal (4). Ear plugs are controversial. Resuming water sport is based on symptoms resolution and patient tolerance.

Acute Bronchitis:

Acute bronchitis accounts for more than 10 million office visits per year. Respiratory viral infections cause 90% of acute bronchitis cases, and the last 10% generally involve bacteria such as Bordatella pertussis, mycoplasmia pneumonia, and Chlamydia pneumoniae (11).

Exercising too much can raise the risk for respiratory tract infections, it suppresses the immune system, leaving individual more vulnerable to illnesses, especially viral sickness. Immune system may become weakened due to the cumulative effect of overtraining, or it may happen after a single bout of excessive exercise such as a marathon. The definition of “too much exercise” may be difficult to pinpoint because what is moderate training for some exercisers is overtraining for others.(14)

Also, each person's immune system is unique and factors such as other stresses and personal nutrition also play a role. On the other hand, regular exercise as opposed to over-exercising can help improve the immune function and help reduce effects of age-related declines in immune function

Exercise-Induced Asthma:

During normal breathing, the air inspired is first warmed and moistened by the nasal passages. However, because people tend to breathe through their mouths when they exercise, they are inhaling colder and drier air.

In exercise-induced asthma, the muscle around the airways are sensitive to the changes in temperature and humidity and react by contracting, thus narrows the airway. This produce the symptoms of exercise-induced asthma, which consist of coughing with asthma, tightening of the chest wheezing , unusual fatigue while exercising and shortness of breath when exercising. (15).

The symptoms of exercise-induced asthma generally initiated within 5 to 20 minutes after the start of exercise, or 5 to 10 minutes after brief exercise has stopped.

Trainer should not abandon physical activity because of exercise-induced asthma. There are procedures for prevention of asthma symptoms and that will allow you to maintain normal physical activity. In deed, many athletes, even Olympic athletes compete with asthma. (16) .Asthma inhalers or bronchodilators used prior to exercise can control and prevent exercise-induced asthma symptoms. Administering these medications 10 minutes before exercise, can prevent the airways from contracting and help control exercise-induced asthma (17)

To help prevent exercise-induced symptoms, one should practice good control of asthma.

In addition, warming up prior to exercise and cooling down after prove helpful in asthma prevention. For patients with allergies and asthma, exercise should be avoided during high pollen days or when temperatures are extremely low and air pollution levels are high. Infections can induce asthma (colds, flu, sinusitis) and increase asthma symptoms, so it's best to restrict exercise during sickness.(18)

COVID-19 infections and effects on College Athletics and Prospective Student-Athletes

In 2020, the novel coronavirus disease, COVID-19, spread rapidly around the globe [**19**]. To restrict the spread of COVID-19, health authorities formulated policies to increase physical distancing and limit person-to-person contact [**20**,**21**,**22**]. This comprised closing schools, community centers, parks, athletic and fitness facilities, and halting organized sports [**23**,**24**]. Many health authorities provided guidelines to continue physical activity safely. This consist of engaging with people from the same household or small groups, while maintaining physical distancing [**25**,**26**]. Options for physical activity concentrated on in-home exercise programs (e.g., yoga, online fitness classes), outside activity during non-peak hours, and appropriate hand hygiene practices before and after activity [**27**,2**8**,2**9**,**30**,**31**].

COVID-19 has led to the rapid expansion of research examining the impact of the pandemic on physical activity, social connections, and mental health. Drastic effects were reported e.g.in Italy and Spain one report showed that >85% of children decreased physical activity levels, increased screen time, and increased maladaptive emotional and behavioral signs [**32**]. In Germany, isolation was increased and decreased social connections was decreased and an increased psychological distress. In China, where COVID-19 was announced as a public health emergency **[33],** 40% of youth experienced psychological distress (e.g., post-traumatic stress disorder and negative coping, stress. In the United States, a study of high school student-athletes reported elevated self-reported anxious and depressive symptoms in females when compared to males **[33**]. In one study published in [**34**] , documented increased self-reported anxious and depressive symptomatology in grade 12 students, when compared to lower grades. Schools usually provide opportunities for mental health supports (e.g., guidance counsellor) and without these supports in

place, coupled with increased isolation, change in routine, and decreased opportunities for socialization, the mental health in high school students is of concern.

Physical activity and social connection are both essential determinants of mental health [**35,36 ,37 ,38].** Reports indicate that youth who participate in team sports had better mental health scores than youth who engaged in individual sports [**39**]. This is in contrast to the results reported by McGuine et al. [**34**] who found that during the first few months of COVID-19, team sport athletes self-reported more anxious and depressive symptoms compared to individual sport athletes. As such, the effect of COVID-19 may be more difficult for team sport athletes than individual sports.

Furthermore, physical activity of any kind has been positively related with mental health among youth **[40**,**41**,42]. Schools traditionally facilitate opportunities for group-based physical activity and social connection through physical education and extra-curricular sport activities. However, physical distancing measures increased during COVID-19 and the suspension of in-person schooling might reduce important social connections and physical activity opportunities for student-athletes.

The impact of the COVID-19 pandemic on Iraqi youth is not yet well understood. Few researchers describe the experiences and perceptions of Iraqi youth during the pandemic **(43).** Existing studies rely on survey methods to examine youth experiences during COVID-19; however, they are limited in understanding the depth and variations of youth perceptions during COVID-19 and have not focused on the Iraqi student-athlete population.

Stopping or modifying school, sports, and/or recreational opportunities may greatly impact health behaviors including engagement in physical activity, social connections, and mental health among high school student-athletes. The aim of any study was to describe and interpret Iraqi high school student-athletes' experiences with physical activity, mental health, and social connections during the COVID-19 pandemic.

Myocarditis:

Myocarditis, the inflammation of the heart muscle, is an infrequent complication of otherwise benign viral infections. The most frequent cause is the Coxsackie virus of the Enterovirus family **(44**). Other viruses, bacteria, noninfectious cocaine agents can cause myocarditis. Males are more commonly suffered than females, and individuals between 20 and 40 yrs are at the highest risk **(44)** Athletes with probable or confirmed myocarditis should be prevented immediately from all competitive sports and stop all strenuous activity for 6 months after becoming symptomatic. Patients may return to exercise once their tests and ECG are completely normal When they have no arrhythmias, and they have no serum indication of heart failure or inflammation **(45).**

Research indicated that strenuous exercise while viremia led to the development of myocarditis both in animals and may increase risk of myocarditis in humans too**(46).**

Gastro-enteritis:

Gastroenteritis is the number two most common infection, after URTI, in adolescents and young adults **(47)**. The most common causative agents are viruses (Rotavirus, Norwalk virus), but bacteria such as *E. coli* and Salmonella, and protozoa such as *Cryptosporidium* and *Giardia lamblia* also can produce disease. Transmission is principally fecal-oral, and athletes and sharing food and water, travel and live in close accommodations, and share personal care items, are at risk of large-scale outbreaks **(48,49).** Athletes should preserve good hydration, whereas patients who are more than 3% to 5% dehydrated should consume oral rehydration fluid if they can tolerate oral intake and intravenous fluids if they cannot. Isotonic sports drinks can be used, and cold water is good in most cases. Those who are less than 3% to 5% dehydrated usually can consume oral rehydration. Return-to-competition in athletes cured from acute gastroenteritis is

based on symptoms, especially hydration status. A well-hydrated, asymptomatic athlete normally return to play without any problem **(50).**

Blood Borne Infections:

Some infectious organisms, such as the human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV), are transmitted through blood and other body fluids. There is an indication of HIV seroconversion with a possible association with a bleeding injury during a football game in Italy **(51, 52).**

An indication of an outbreak of HBV in an American football team with 11 infected players out of 65 players in 19 months **(53,54)**

Elite athletes participating in contact sports are at risk of bleeding injuries, leading to transmission of blood-borne hepatitis type B, C and D (HBV, HCV and HDV) which are capable of inducing chronic liver disease, liver failure and liver cancer **(55)**.

One report documented that three soccer players from an amateur club were contracted HCV infection from sharing needles to inject vitamin complexes **(56).**

Although, HIV is most commonly contracted by sexual contact, especially in homosexuals, and needle sharing, such as when athletes share needles to inject vitamins or steroids. Contact with saliva and sweat during sports seem to seldom transmit infection.

Moderate exercise clearly benefit athletes who are infected with HIV. Moderate aerobic exercise (AE) and progressive resistance exercise (PRE) improve CD4 and CD8 counts and viral load and quality of life **(57).**

It is indicated that PRE improves body weight and limb strength, whereas AE enhances lipid profiles and decreases adiposity **(58).** It also seems to improve overall quality of life **(59).** However, there are neither accepted screening criteria for HIV infections in athletes nor any restriction or guidelines to participation in sport activities **(60).**

Sexually-Transmitted Infections:

In Brazilian athletes, the prevalence of the sexually transmitted diseases was 48% (24 cases). Human papilloma virus was the most reported agent (44%). Concerning the human papillomavirus genotypes, subtype 16 was the most prevalent (53%), followed by 11-6 (22%) and 18 (13%) **(61**). Two athletes tested positive for C. trachomatis. Cases of infections by *Neisseria gonorrhoeae*, syphilis, hepatitis B, hepatitis C and human immunodeficiency virus were not encountered. In a study in female athletes in São Paulo, Brazil, the prevalence of sexually transmitted diseases in was high. Primary prevention measures (hepatitis B and human papillomavirus vaccination) and secondary (serology, pap smears) must be offered to this specific group of women. However, only 26 athletes had been vaccinated for hepatitis B virus **(61).**

Common dermatological infections in athletes and return to play:

Epidemiologic Characteristics:

The incidence rates of skin-related infectious diseases has been reported at 8.5% of high school sports-related conditions and injuries and 20.9% of college sports-related conditions and injuries. **(62)**

About half of these skin infections occurred in the head, face, or neck, likely secondary to direct skin-to-skin contact with infected competitors. It was .reported that among the high school athletes, the prevalence of skin infections in major categories were shown to be bacterial in 30%; Herpes viruses in 20%; and Tinea fungi in 20%. of studied adolescents. In another investigation, among collegiate athletes, the prevalence of skin infections have been reported to be 47% due to Herpes viruses ; impetigo was reported in 37%; Tinea fungi in 7%; cellulitis in 6%; and

methicillin-resistant *Staphylococcus aureus* (MRSA) in 3%. Concerning, *Herpes gladiatorum*, numerous authors have estimated an overall prevalence at about 20% of sports-related skin infections **(63).** It is estimated that the incidence of contracting a skin infection from direct contact while competing against an infected athlete is 33%. Reported statistics from Minnesota State Wrestling Tournaments between 1997 and 2006 revealed high incidence of dermatological infections **(64).**

Fungal Dermatologic Conditions:

incidence of skin infections is around 2.5 to 3.7 of 100 individual competitors, with the highest incidence reported in urban areas **(65).**

According to data of the National Collegiate Athletic Association (NCAA) wrestling injury database statistics from 1988 through 2004 show the incidence of skin infections is estimated 0.98 of 1000 athlete exposures (with exposure defined as equivalent to 1 practice or game) **(66).**

In their data, Lincolin and Likness **(67)** documented that 70% of athletes with skin infections miss fewer than 7 days of sports before return to play.

It seems that *Tinea* infections represent most fungal infections in the athletic population, and etiological agents of these conditions are commonly the following: *Trichophyton rubrum* and *Tinea tonsurans*.

Return-to-play guidelines indicate the athlete to undergo a minimum of 14 days of treatment **(68,69).**

In one study of professional and collegiate soccer players association in 2007 revealed that *Tinea pedis* incidence rates was 69% in male athletes compared to 43% in female athletes .Concerning , age matched control group incidences of 20% in men and 0% in women was reported **(70).** Athletes are at more increased risk of infection secondary to a warm, moist environment inside occlusive footwear, shared pools and treatment tubs, and communal showers **(71).**

In their guidelines the National Federation of State High School Associations (NFHS) does not restrict play with occurrence of *Tiinnea pedis***(72**) . Prevention of spread of *Tinea pedis* consists of appropriate barriers (e.g., clothing), laundering of towels and athletic gear after each use, use of shower footwear and other shower sanitation, and prompt identification and treatment of cases. Education of all sports participants, coaches, and athletic training staff is primordial **(72).**

Because of the very low transmission rates of *Malassezia furfur*, athletes are not restricted from sports participation **(72).**

Viral Dermatologic Conditions:

Herpes gladiatorum caused by *Herpes simplex* virus type 1 (HSV-1) is diagnosed based on clustered vesicles with erythematous borders **(73**). Tzanck preparation is confirmatory, revealing large, multinucleated cells. Time lapse from virus exposure to vesicle appearance is 4 to 11 days, with viral shedding occurring before vesicle formation **(74 ,75**). Transmission occurs via direct skin-to-skin contact or fomites. The body locations affected are the head and face in 71% to 73% of cases) ,in extremities in 18% to 42% of cases), and in the trunk (11% to 28% of cases) **(76).**

Evidence proved that use of oral antiviral medications during the sports season may be beneficial for suppression of infection in athletes and coaches who have positive results from HSV serology tests in individuals who have recurrent lesions. Evidences also show that annual HSV serology testing should be performed to identify individuals who may need suppression-dosed antiviral medication before the start of the season **(76).**

Cases of herpetic whitlow and *Herpes labialis* (cold sores) should be rapidly identified, and patients treated and restricted from sports participation. Initiating factors for herpes labialis outbreaks include stress and ultraviolet radiation, both of which are common in student athletes and other individuals participating in outdoor sports. In one study accomplished in 2008 on

skiers provided evidence of increased risk of *Herpes labialis* secondary to participating in high-altitude, outdoor sport in which athletes are surrounded by a white, reflective environment. The authors concluded that skiers should apply sunscreen with a sun protection factor of 30 to protest themselves bad weather **(77).**

Herpes zoster (shingles) is reactivation of the varicella zoster virus, appearing as a vesicular eruption in a dermatomal pattern. It is recommended to avoid physical activity that irritates the rash or results in a lot of sweating that could make it worse. Swimming, contact sports, and group exercise situations that could spread the virus should also be abandoned until after the rash heals. As with all exercise, patients with shingles should listen to their body requirement **(78).**

Molluscum contagiosum due to poxvirus that produces dome-shaped, flesh-colored papules 1 mm to 5 mm in diameter that frequently develop central umbilication upon maturation. Acquisition of this infection occurs via direct transmission by skin-to-skin or water-to-skin contact. Return to play may be possible immediately as recommended through NCAA guidelines or at 24 hours after lesion removal as stated by NFHS guidelines **(79).**

Return-to-play guidelines for patients with herpetic viral skin infections have become more stringent in recent years. The NFHS guidelines require that all vesicles be crusted or matured for 48 hours without new lesions before the patient returns to play.The NFHS guidelines also require oral antiviral treatment for 10 days in primary outbreaks and 120 hours in recurrent outbreaks. If systemic symptoms are present, the minimum period of oral antiviral treatment is 14 days prior to medical clearance **(80).**

According to the NCAA recommendations,return-to-play guidelines generally are less restrictive than the NFHS guidelines. The NCAA requires the absence of new, non-crusted lesions or the absence of bacterial superinfection for 72 hours, as well as the absence of systemic symptoms, with a minimum of 120 hours of oral antiviral medication. The NCAA acts does not allow the covering of sites of active infections in participants **(80).** Furthermore, Verrucae (warts) must be covered to participate in sports, though neither the NFHS nor the NCAA require individuals with this condition to undergo treatment prior to returning to play **(80).**

Bacterial Dermatologic Conditions:

Essential risk factors for bacterial infections comprise antibiotic use within the previous year, crowded conditions and close contact, interrupted skin integrity, uncovered abrasions. They also include shared fomites, suboptimal cleanliness, not showering prior to pool use, poor hygiene and inadequate hand washing by athletes and members of the sports medicine team, and insufficient laundry and environment sterilization **(81).**

Bacterial infections of the skin in athletes can develop as abscesses, furuncles (boils), folliculitis, and cellulitis. Infectious agents should be looked for culture to confirm species identification before initiating treatment. Empiric antibiotic coverage for community-acquired MRSA should be considered if the community's incidence is greater than 15%. The national leader and advocate for high school athletics (NFHS) recommends that all bacterial infections be managed similarly to community-acquired MRSA infections **(82).**

Community-acquired MRSA caused substantial morbidity and mortality in athletes since emerging in the 1960s.It is proved that the incidence of community-acquired MRSA in the United States is 21%, whereas, colonization prevalence there is approximately 30% for non-resistant *Staphylococcus* strains and 1% for MRSA **(83,84).** The athlete may mistakenly consider the lesion to be a spider bite or insect bite, delaying proper identification and treatment. In one study on US the football players revealed that the majority of MRSA infections occur early in the sport's season and among those players with the most direct contact (e.g., lineman and linebackers). Furthermore, high-risk sports incriminated for MRSA infection include basketball, fencing, rugby, volleyball, weight lifting, and wrestling **(85).**

Concerning, the gold standard treatment for patients with MRSA is lesion incision and drainage as well as empiric oral antibiotic treatment after abscess culture identification, depending on resistance patterns. In respect to prevention strategies, they may include limiting risk factors, applying topical antibiotic ointment to abrasions, and considering eradication of colonization **(86).** The recurrence rate of MRSA is estimated to be 10% to 30% in the community **(86).**

Decolonization treatment varies, it principally involves a 7-day course of topical ointment to the nares (bacitracin, mupirocin); skin washes (chlorhexidine gluconate 4%, silver sulfide 2%, tea tree 10%); as well as systemic antibiotics **(87 ,88,89).** Decolonization is controversial, because it is associated with only 39% compliance and includes the possibility of development of further resistance among patients **(90).** A proven alternate to decolonization is through the use diluted bleach-water bath twice weekly **(91).**

Furuncles, carbuncles, and abscesses typically appear as erythematous, fluctuant, circumscribed soft-tissue nodules or masses. They necessitate appropriate restriction from sports. Use of antibiotics is optional in treatment unless cellulitis is also present, but antibiotics are required for return to sports participation **(92)** .

Impetigo and cellulitis are common superficial skin infections among athletes. They are frequently caused by *Staphylococcus* and *Streptococcus* bacteria acquired via direct skin contact or fomites.

Folliculitis is the inflammation and possible superinfection of hair follicles, predominantly by methicillin-sensitive *S aureus* or *Pseudomonas* **(92).** Return-to-play guidelines from NCAA for bacterial infections include no new lesions for 48 hours, oral antibiotic treatment for 48 hours **(93),** or 72 hours (per NFHS guidelines) without any actively exudative lesions. However, guidelines currently do not permit sports participants to merely cover the site of an active infection, the site does need to be covered upon medical clearance and until the tissue is normalized. If lesions continue to drain beyond 72 hours, MRSA should be considered as the etiologic agent, followed by treatment with the appropriate agent for a minimum of 10 days **(93).**

Infestations:

Scabies is a pruritic infestation of the *Sarcoptes scabiei* mite, which causes tortuous erythematous burrows in the superficial skin layers. Treatment consist of the use of permethrin 5%, lindane, malathion, or ivermectin, in addition to fomite decontamination **(94).**

Return-to-play allowance require restriction of activity for 24 hours after completion of treatment, in addition to negative results from a scabies mineral oil preparation under microscopy **(94).**

Pediculosis (lice) is a clinical diagnosis with identification of the organism confirmed with microscopy. Treatment includes permethrin 1%, lindane, or malathion, along with fomite decontamination. Return-to-play guidelines require restriction of activity for 24 hours after completion of treatment and negative results from a reexamination testing **(95).**

EXERCISE IN UNUSUAL PLACES:

Extreme sports have gained popularity over the past two decades. Participants often run, swim, climb, and do other strenuous activities in multiday events. These events are held in jungles, mountains, deserts, and other harsh areas that often have poor sanitation. Extreme sports athletes are exposed to infection with parasites, ticks, waterborne diseases, and zoonoses. Typical traveler's diarrhea noted too. Because of the nature of the events, these athletes often carry little equipment and may not take time for important preventive measures **(96).**

Adequate information and well preparation can minimize the dangers.

CONCLUSION

There is a relationship between exercise and changes in immunity. Hence, athletes are prone to different medical problems such as injuries and infections. Infection is an important medical problem which could be a reason for athletes' absence from training. The relationship between physical activity and immune system, characteristics of different types of infections in athletes with emphasis on special clinical presentations or complications, time to return to physical activity and training and strategies to prevent development and transmission of infections in athletes or physically active people are the main topics of this review. Infectious diseases are the most common illnesses that afflict athletes. Diagnosis and treatment is similar to that for non-athletes. High-level athletes often are at higher risk because of physiology, the realities of life on the road such as overcrowding, and personal hygiene and public health practices noted previously. Infection prevention and return-to-play issues are uniquely important among athletes.

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