# Most common skin infections among athletes- literature review

**Authors**:

**Julia Marcinkowska**
https://orcid.org/0009-0005-7006-4303
Śląski Uniwersytet Medyczny w Katowicach
ul. Poniatowskiego 15, 40-05 Katowice, Poland

**Krzysztof Marcinkowski**
https://orcid.org/0009-0002-5759-7285
Szpital Specjalistyczny im. Ludwika Rydygiera w Krakowie
os. Złotej Jesieni 1, 31-820 Karków, Poland

**Maciej Michalik**
https://orcid.org/0009-0009-7799-7252
Warszawski Szpital Południowy
ul. Pileckiego 99, 02-781 Warszawa, Poland

**Jakub Mikszta**
https://orcid.org/0009-0000-4194-9915
SPZOZ WSS nr 3 w Rybniku
ul. Energetyków 46, 44-200 Rybnik, Poland

**Natalia Mikszta**
https://orcid.org/0009-0003-8444-7650
SPZOZ WSS nr 3 w Rybniku
ul. Energetyków 46, 44-200 Rybnik, Poland

**Tomasz Lorenc**
https://orcid.org/0009-0008-9902-469X
Warszawski Szpital Południowy
ul. Pileckiego 99, 02-781 Warszawa, Poland

**Mateusz Muras**
https://orcid.org/0009-0005-1392-3773
WSS nr 2 w Jastrzębiu-Zdroju
al. Jana Pawła II 7, 44-330 Jastrzębie-Zdrój, Poland

Corresponding author: **Krzysztof Marcinkowski,**

## Abstract:

**Purpose of Research**:

The aim of this review article is to provide an overview of the most common skin infections affecting athletes, with a focus on their prevalence, etiology, clinical characteristics, prevention strategies, and treatment options.

**Research Materials and Methods**:

This review is based on a systematic analysis of scientific literature published on PubMed. The review synthesizes data from both Polish and international contexts, with particular attention to high-risk groups such as wrestlers and youth athletes.

**Discussion**:

Skin infections in athletes are common, particularly in contact sports such as wrestling, where skin-to-skin contact, sweating, and minor injuries are frequent. Bacterial infections, especially those caused by methicillin-resistant Staphylococcus aureus (MRSA), account for the majority of cases, followed by fungal infections (Tinea corporis and capitis) and viral infections such as herpes gladiatorum (HSV-1). These infections can spread quickly within teams and facilities, leading to time lost from training and competition, stigmatization, and even serious systemic complications in severe cases. Risk factors include inadequate hygiene practices, shared equipment, compromised skin integrity, and lack of awareness.

**Conclusion**:

Skin infections represent a significant and often underestimated burden in the sports environment. Effective prevention requires a multifactorial approach combining hygiene protocols, athlete education, and medical surveillance. Coaches, medical personnel, and athletes themselves must remain vigilant to recognize early signs of infection and respond appropriately. Enhancing awareness and standardizing prevention practices are critical to reducing transmission, minimizing health risks, and ensuring the well-being and performance of athletes.

**Keywords**: Skin infection, athletes, MRSA, Herpes gladiatorum, Tinea gladiatorum

## Introduction:

The skin, being the largest organ of the human body, has many very important functions in the human body. The main functions of the skin include thermoregulatory function [1], water homeostasis [2], vitamin D3 synthesis [3], sensory function [4] or immune function [5]. However, one of the most important functions appears to be the protective function, which simultaneously prevents dehydration of internal organs and the ingress of harmful substances from the external environment, such as UV-radiation or microorganisms. Although the protective function is very complex, it is made possible by the lipid matrix located in the stratum corneum [6], [7], [8], [9]. However, when this barrier is broken, it is affecting the overall wellbeing of the individual [9].

Although practising sport undeniably has health benefits [10], skin infections are a significant health problem in the sporting environment, particularly among athletes participating in sports characterised by intense physical contact and frequent exposure to wet and contaminated surfaces [11].

The aim of this review article is to analyse the problematic nature of the most common skin infections in sport - with a focus on the most common disease entities, risk factors for their development, current preventive recommendations and hygiene practices.

## Epidemiology of skin infections in sport

Athletes, due to the use of occlusive clothing, high perspiration, sharing the same equipment, skin-to-skin contact, as well as mechanical trauma, are at higher risk of skin infections [12]. Mats and other equipment are a minority in the causes of infections [13]. All athletes are at risk of skin problems [14], but the sport most at risk of skin infections is wrestling. As the study showed, 28.56 per 100,000 athlete exposures were for wrestlers, ten times higher than the second most common cause, football (2.32/100,000) [11]. Wrestlers are particularly at risk due to the constant skin-to-skin contact required in this type of sport. The high school wrestlers are most at risk to fungal infections, the viral infection herpes gladiatorum caused by herpes simplex virus-1 (HSV-1), and bacterial infections, specifically methicillin-resistant Staphylococcus aureus (MRSA) [15]. To a lesser extent, but still at risk athletes exposed to skin infection also include people playing sports with moderate skin-to-skin contact (e.g. volleyball, basketball, lacrosse), as well as non-contact sports: swimming, tennis, or baseball) [11]. As a systematic review of the literature has shown, young athletes and those training under physically demanding conditions are also particularly vulnerable groups due to the immaturity of the immune system, reduced hygiene awareness and the sharing of sports equipment, while professional athletes are at additional risk of infection due to frequent travel, contact with a variety of microbial environments and pressure to continue training despite visible symptoms of infection [16]. Furthermore, sport itself can exacerbate existing skin lesions [17]. Although skin lesions are not usually associated with severe discomfort, they can account for 10-15% of time-loss injuries [18].

It is important to bear in mind that such infections are not always recorded [19] and the number of infections may be underestimated, which poses another public health challenge. The lack of mandatory reporting of cases in many countries, the downplaying of symptoms by the athletes themselves, ambiguous clinical signs in the early stages of infection, and the athletes' own fear of potential exclusion from competition may be responsible for this. In contrast, other dermatological problems such as psoriasis, eczema and abrasions, although not part of skin infections and should not be confused with them, can increase the risk of skin infections [13].

Skin infections are one of the most common dermatological complaints in the sporting environment. According to a national survey of US high school students, up to 60.6% of all infections in athletes were bacterial, while 28.4% were fungal [11]. In contrast, a cross-

sectional analysis showed variation in the type and frequency of dermatoses according to sport [17]. According to a systematic review of the literature, fungal infections and Staphylococcus aureus infections (including resistant strains - MRSA) pose the greatest risk to athletes training in gyms, gyms and locker rooms [16].

According to a 20-year general review, MRSA is most often responsible for infections (27.4 percent of the articles), followed by Tinea corporis and capitis (13.7 per cent) [16]. In contrast, according to a national survey of US high school students, up to 60.6% of all infections in athletes were bacterial, while 28.4% were fungal [11].

## Methicillin resistant staphylococcus aureus (MRSA)

Infections caused by Staphylococcus and Streptococcus, including methicillin-resistant Staphylococcus aureus MRSA, are among the most common skin and soft tissue infections in humans. Clinical forms of these infections include impetigo, which is the most common, as well as rubella, cellulitis, folliculitis, boils, carbuncles and abscesses [13]. Among those most at risk of MRSA infection, are wrestlers [20]. Frequent skin-to-skin contact, microtrauma and the sharing of sports equipment favour the transmission of bacterial pathogens [13]. Athletes are more likely to be colonised by MRSA than patients in intensive care units and similar to people with chronic illnesses. Importantly, such colonisation is associated with a 7-fold increased risk of future MRSA infection [21]. Due to unresponsiveness to standard treatment and the increasing prevalence of MRSA strains, treatment of cutaneous bacterial infections in athletes poses increasing difficulties [22]. One method to prevent MRSA may be the use of soap-and-water wipes [23]. Decolonisation of MRSA can be performed by chlorhexidine rinses with 2% mupirocin ointment [24]. Empirical treatment is usually limited to trimethoprim-sulfamethoxazole or clindamycin together with topical mupirocin [13]. In addition, it should be borne in mind that MRSA strains can lead to severe systemic complications such as septic shock or osteomyelitis [25]. In case of concomitant inflammatory parameters indicating a systemic course of MRSA infection, hospitalisation is recommended [26]. During hospitalisation, vancomycin is the treatment of choice, and drugs such as linezolid, daptomycin and tigecycline should be reserved for those patients who do not respond to vancomycin therapy [27].

## Herpes gladiatorum

Herpes gladiatorum, as Herpes simplex (HSV) infections in athletes are commonly called, is a common and widespread skin infection [28], [29]. The lesions are predominantly maculopapular, vesicular and pustular in nature and occur particularly on the face, scalp, arms, back, chest and upper extremities [30]. Rarely, ocular involvement may occur, but this is associated with serious complications such as corneal scarring or retinal necrosis [31], [32]. Herpes gladiatorum infection is primarily through skin-to-skin contact rather than mat contact [33]. When the diagnosis is uncertain, microbiological diagnosis for HSV-1 and HSV-2 is recommended [34]. Nevertheless, due to its subclinical nature, HSV diagnosis is

underestimated and can be as low as 87.4 percent, making it difficult to prevent players from becoming infected [35]. When infection is suspected, infected athletes should be isolated from other athletes and sports equipment and oral antiviral treatment should be initiated [13]. The prophylactic use of valacyclovir at a dose of 1 gram per day has also been shown to be beneficial in reducing the incidence of HSV outbreaks [36]. The treatment of HSV includes acyclovir, famciclovir and valacyclovir, where the dosage and duration of therapy depends on whether the infection is primary or secondary [18].

## Tinea gladiatorium

Tinea gladiatorium (TG) is the term for fungal infections of the skin and scalp in athletes, most commonly involving species within the Trychophyton genus [29]. Tinea corporis infect the stratum corneum, and tinea capitis are responsible for infection in the hair and follicle region of the scalp [37]. Although TG is not characterised by clear morbidity and mortality, it can have a significant impact on the sporting goals of specific athletes [38]. These lesions in adults usually lead to asymptomatic carriage [39], whereas in children and adolescents the mycosis fungoides manifests as an endotrix on the scalp, with visible spores of the parasite in the hair shaft and
damaged [37]. T. tonsurans causes mycosis fungoides, which starts with sharply demarcated, erythematous, scaly patches that spread outwards [40]. When exfoliative lesions are present in the perifollicular area, they may resemble lichen planopilaris [41]. However, it is important to note that mycosis fungoides-like rashes in sports may be microbiologically negative, requiring careful diagnosis [42].
Topical treatment is preferred as the treatment of choice [43].Fluconazole, itraconazole and terbinafine seem to be the best choices, due to their high efficacy and low toxicity [38].

## Prevention and hygiene

In the prevention of skin infections in athletes, thorough cleaning of the facilities is key, where this applies to sports areas as well as changing rooms, equipment and even indoor multi-purpose facilities [44]. Education of athletes is a very important element [44]. It should address the benefits of general hygiene, including frequent hand washing and showering on site after each sporting activity. Athletes should not share personal items among themselves. Treatment of infections in contact sport athletes must often be individualised to address specific issues of treatment duration, time in the competitive season, local resistance patterns and athlete factors such as desire for prophylaxis, allergies and potential medication side effects [13].
From a public health perspective, skin infections in the athlete population represent a significant epidemiological challenge, related to the potential risk of pathogen transmission within teams, clubs and training centres. This phenomenon underscores the need to implement effective preventive strategies, including both personal hygiene education and standardisation of sanitation procedures, as well as systematic monitoring of the cleanliness of sports equipment and infrastructure.

## Conclusion

The skin, as the body's largest organ, plays a vital protective role, but in the athletic environment it is particularly vulnerable to damage and infection. High perspiration, frequent skin-to-skin contact, shared equipment use, and microtraumas increase the risk of infections—especially in contact sports such as wrestling. The most common pathogens include bacteria (especially MRSA), viruses (HSV-1), and fungi (e.g., *Trychophyton* species). While skin infections are rarely life-threatening, they can lead to complications, lost training days, and withdrawal from competition. Early diagnosis, appropriate treatment, and effective prevention—through hygiene, isolation of infected athletes, and education—are key to limiting their spread. Given that the true incidence is likely underestimated, better surveillance systems and increased awareness among athletes and coaches are necessary.

## Disclosure

### Author's Contribution

Conceptualization: Julia Marcinkowska, Krzysztof Marcinkowski
Methodology : Natalia Mikszta, Mateusz Muras, Maciej Michalik
Formal analysis: Tomasz Lorenc
Investigation: Maciej Michalik, Tomasz Lorenc
Data curation: Natalia Mikszta, Krzysztof Marcinkowski, Julia Marcinkowska
Writing - rough preparation: Jakub Mikszta, Mateusz Muras, Julia Marcinkowska, Natalia Mikszta, Maciej Michalik
Writing - review and editing: Maciej Michalik, Krzysztof Marcinkowski, Tomasz Lorenc
Supervision: Krzysztof Marcinkowski, Jakub Mikszta

*All authors have read and agreed with the published version of the manuscript.*

**Funding Statement –** Not applicable.
**Institutional Review Board Statement –** Not applicable.
**Informed Consent Statement –** Not applicable.
**Data Availability Statement –** The authors confirm that the data supporting this study are available in the article’s references.
**Conflict of Interest –** Authors declare no conflict of interest.

## References

1. Baker LB. Physiology of sweat gland function: The roles of sweating and sweat composition in human health. Temperature (Austin). 2019;6(3):211-259. Published 2019 Jul 17. doi:10.1080/23328940.2019.1632145
2. El-Chami C, Haslam IS, Steward MC, O'Neill CA. Role of organic osmolytes in water homoeostasis in skin. Exp Dermatol. 2014;23(8):534-537. doi:10.1111/exd.12473
3. Holick MF, Chen TC, Lu Z, Sauter E. Vitamin D and skin physiology: a D-lightful story. J Bone Miner Res. 2007;22 Suppl 2:V28-V33. doi:10.1359/jbmr.07s211
4. Lumpkin EA, Caterina MJ. Mechanisms of sensory transduction in the skin. Nature. 2007;445(7130):858-865. doi:10.1038/nature05662
5. Nestle FO, Di Meglio P, Qin JZ, Nickoloff BJ. Skin immune sentinels in health and disease. Nat Rev Immunol. 2009;9(10):679-691. doi:10.1038/nri2622
6. van Smeden J, Janssens M, Gooris GS, Bouwstra JA. The important role of stratum corneum lipids for the cutaneous barrier function. Biochim Biophys Acta. 2014;1841(3):295-313. doi:10.1016/j.bbalip.2013.11.006
7. Proksch E, Brandner JM, Jensen JM. The skin: an indispensable barrier. Exp Dermatol. 2008;17(12):1063-1072. doi:10.1111/j.1600-0625.2008.00786.x
8. Lee SH, Jeong SK, Ahn SK. An update of the defensive barrier function of skin. Yonsei Med J. 2006;47(3):293-306. doi:10.3349/ymj.2006.47.3.293
9. Stamatas GN, Zvulunov A, Horowitz P, Grove GL. Skin barrier protection. Dermatol Res Pract. 2012;2012:691954. doi:10.1155/2012/691954
10. Warburton DE, Nicol CW, Bredin SS. Health benefits of physical activity: the evidence. CMAJ. 2006;174(6):801-809. doi:10.1503/cmaj.051351
11. Ashack KA, Burton KA, Johnson TR, Currie DW, Comstock RD, Dellavalle RP. Skin infections among US high school athletes: A national survey. J Am Acad Dermatol. 2016;74(4):679-84.e1. doi:10.1016/j.jaad.2015.10.042
12. Blake Steele, R., Taylor, J.S., Aneja, S. (2020). Skin Disorders in Athletes: Professional and Recreational Sports. In: John, S., Johansen, J., Rustemeyer, T., Elsner, P., Maibach, H. (eds) Kanerva's Occupational Dermatology. Springer, Cham. https://doi.org/10.1007/978-3-319-68617-2_186
13. Peterson AR, Nash E, Anderson BJ. Infectious Disease in Contact Sports. Sports Health. 2019;11(1):47-58. doi:10.1177/1941738118789954
14. Reinberg J, Ailor SK, Dyer JA. Common sports-related dermatologic infections. Mo Med. 2007;104(2):119-123.
15. Williams C, Wells J, Klein R, Sylvester T, Sunenshine R; Centers for Disease Control and Prevention (CDC). Notes from the field: outbreak of skin lesions among high school wrestlers--Arizona, 2014. MMWR Morb Mortal Wkly Rep. 2015;64(20):559-560.
16. Grosset-Janin A, Nicolas X, Saraux A. Sport and infectious risk: a systematic review of the literature over 20 years. Med Mal Infect. 2012;42(11):533-544. doi:10.1016/j.medmal.2012.10.002
17. Derya A, Ilgen E, Metin E. Characteristics of sports-related dermatoses for different types of sports: a cross-sectional study. J Dermatol. 2005;32(8):620-625. doi:10.1111/j.1346-8138.2005.tb00810.x
18. Johnson R. Herpes gladiatorum and other skin diseases. Clin Sports Med. 2004;23(3):473-x. doi:10.1016/j.csm.2004.02.003
19. Turbeville SD, Cowan LD, Greenfield RA. Infectious disease outbreaks in competitive sports: a review of the literature. Am J Sports Med. 2006;34(11):1860-1865. doi:10.1177/0363546505285385
20. Braun T, Kahanov L, Dannelly K, Lauber C. CA-MRSA Infection Incidence and Care in High School and Intercollegiate Athletics. Med Sci Sports Exerc. 2016;48(8):1530-1538. doi:10.1249/MSS.0000000000000940
21. Karanika S, Kinamon T, Grigoras C, Mylonakis E. Colonization With Methicillin-resistant Staphylococcus aureus and Risk for Infection Among Asymptomatic Athletes: A Systematic Review and Metaanalysis. Clin Infect Dis. 2016;63(2):195-204. doi:10.1093/cid/ciw240
22. Lindenmayer JM, Schoenfeld S, O'Grady R, Carney JK. Methicillin-resistant Staphylococcus aureus in a high school wrestling team and the surrounding community. Arch Intern Med. 1998;158(8):895-899. doi:10.1001/archinte.158.8.895
23. Anderson BJ. Effectiveness of body wipes as an adjunct to reducing skin infections in high school wrestlers. Clin J Sport Med. 2012;22(5):424-429. doi:10.1097/JSM.0b013e3182592439

24. Mody L, Kauffman CA, McNeil SA, Galecki AT, Bradley SF. Mupirocin-based decolonization of Staphylococcus aureus carriers in residents of 2 long-term care facilities: a randomized, double-blind, placebo-controlled trial. Clin Infect Dis. 2003;37(11):1467-1474. doi:10.1086/379325
25. O'Laughlin DM, Cook J. Financial analysis of methicillin-resistant Staphylococcus aureus in a high school wrestler. Dermatol Nurs. 2009;21(6):337-344.
26. Stevens DL, Bisno AL, Chambers HF, et al. Practice guidelines for the diagnosis and management of skin and soft-tissue infections [published correction appears in Clin Infect Dis. 2005 Dec 15;41(12):1830] [published correction appears in Clin Infect Dis. 2006 Apr 15;42(8):1219. Dosage error in article text]. Clin Infect Dis. 2005;41(10):1373-1406. doi:10.1086/497143
27. Breen JO. Skin and soft tissue infections in immunocompetent patients. Am Fam Physician. 2010;81(7):893-899.
28. Becker TM, Kodsi R, Bailey P, Lee F, Levandowski R, Nahmias AJ. Grappling with herpes: herpes gladiatorum. Am J Sports Med. 1988;16(6):665-669. doi:10.1177/036354658801600620
29. Pleacher MD, Dexter WW. Cutaneous fungal and viral infections in athletes. Clin Sports Med. 2007;26(3):397-411. doi:10.1016/j.csm.2007.04.004
30. Dyke LM, Merikangas UR, Bruton OC, Trask SG, Hetrick FM. Skin infection in wrestlers due to herpes simplex virus. JAMA. 1965;194(9):1001-1002.
31. Anderson BJ. The effectiveness of valacyclovir in preventing reactivation of herpes gladiatorum in wrestlers. Clin J Sport Med. 1999;9(2):86-90. doi:10.1097/00042752-199904000-00008
32. Holland EJ, Mahanti RL, Belongia EA, et al. Ocular involvement in an outbreak of herpes gladiatorum. Am J Ophthalmol. 1992;114(6):680-684. doi:10.1016/s0002-9394(14)74044-9
33. Anderson BJ. The epidemiology and clinical analysis of several outbreaks of herpes gladiatorum. Med Sci Sports Exerc. 2003;35(11):1809-1814. doi:10.1249/01.MSS.0000093759.79673.3C
34. Usatine RP, Tinitigan R. Nongenital herpes simplex virus. Am Fam Physician. 2010;82(9):1075-1082.
35. Centers for Disease Control and Prevention. Genital herpes—CDC fact sheet. 2017. http://www.cdc.gov/std/herpes/stdfact-herpes-detailed.htm. Accessed September 12, 2017.
36.Anderson BJ, McGuire DP, Reed M, Foster M, Ortiz D. Prophylactic Valacyclovir to Prevent Outbreaks of Primary Herpes Gladiatorum at a 28-Day Wrestling Camp: A 10-Year Review. Clin J Sport Med. 2016;26(4):272-278. doi:10.1097/JSM.0000000000000255
37. Nowicka D, Bagłaj-Oleszczuk M, Maj J. Infectious diseases of the skin in contact sports. Adv Clin Exp Med. 2020;29(12):1491-1495. doi:10.17219/acem/129022
38. Kohl TD, Lisney M. Tinea gladiatorum: wrestling's emerging foe. Sports Med. 2000;29(6):439-447. doi:10.2165/00007256-200029060-00006
39. Peixoto RRGB, Meneses OMS, da Silva FO, Donati A, Veasey JV. Tinea capitis: Correlation of clinical aspects, findings on direct mycological examination, and agents isolated from fungal culture. Int J Trichology. 2019;11(6):232–235.
40. Wilson EK, Deweber K, Berry JW, Wilckens JH. Cutaneous infections in wrestlers. Sports Health. 2013;5(5):423-437. doi:10.1177/1941738113481179
41. Auchus IC, Ward KM, Brodell RT, Brents MJ, Jackson JD. Tinea capitis in adults. Dermatol Online J. 2016;22(3):13030/qt4dm9s3fh. Published 2016 Mar 16.
42. Mark A. BergMichael MinerWilliam O RobertsTinea Gladiatorum Prevalence Among Wrestlers in the Era of Required Skin Inspection.Asian J Sports Med.12(2):e103813.https://doi.org/10.5812/asjsm.103813.
43. Drake LA, Dinehart SM, Farmer ER, et al. Guidelines of care for superficial mycotic infections of the skin: tinea corporis, tinea cruris, tinea faciei, tinea manuum, and tinea pedis. Guidelines/Outcomes Committee. American Academy of Dermatology. J Am Acad Dermatol. 1996;34(2 Pt 1):282-286. doi:10.1016/s0190-9622(96)80135-6
44. Weesner T. Skin Infections: Which Student-Athletes Are at Greatest Risk?. NASN Sch Nurse. 2017;32(4):235-237. doi:10.1177/1942602X17700649