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Sweat-induced skin disorders in athletes: The overlooked role of hyperhidrosis

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Abstract

Background. Hyperhidrosis is a chronic dermatological disorder characterized by sweat production exceeding physiological thermoregulatory requirements. In athletes, excessive sweating is frequently underestimated as a normal consequence of physical exertion despite its significant impact on epidermal barrier integrity and susceptibility to skin disease. Persistent moisture, occlusion, friction, and elevated ambient temperature create favorable conditions for the development of infectious, inflammatory, and mechanical dermatoses.

Aim. This review aimed to systematically summarize current evidence regarding hyperhidrosis-associated dermatoses in athletes, with particular emphasis on pathophysiology, clinical manifestations, diagnostic approaches, treatment strategies, and preventive measures relevant to sports medicine and dermatological practice.

Material and Methods. A narrative review of the available literature was conducted, focusing on the pathophysiology of hyperhidrosis, impairment of the epidermal barrier, and sweat-related dermatoses in physically active individuals. The analysis included fungal, bacterial,

yeast-related, inflammatory, and mechanical skin disorders associated with excessive sweating in athletes. Diagnostic methods, therapeutic modalities, and preventive interventions applicable in sports environments were also evaluated.

Results. Hyperhidrosis was identified as a major contributing factor to epidermal barrier dysfunction through maceration of the stratum corneum, increased transepidermal water loss, disruption of intercellular lipids, and alteration of cutaneous pH. These changes promote microbial colonization and increase susceptibility to dermatophytosis, erythrasma, bacterial folliculitis, candidiasis, miliaria, dyshidrotic eczema, intertrigo, and friction-related dermatoses. Athletes are particularly vulnerable due to repetitive mechanical trauma, prolonged occlusion, humid microenvironments, and shared sports facilities. Diagnostic evaluation requires detailed clinical assessment supported by validated tools, including the Hyperhidrosis Disease Severity Scale and Minor's iodine–starch test. Therapeutic management includes topical aluminum chloride, iontophoresis, botulinum toxin type A injections, and systemic anticholinergic agents in selected cases. Preventive strategies such as moisture control, breathable sportswear, hygiene optimization, and environmental sanitation were shown to play a crucial role in reducing recurrence and transmission of sweat-associated dermatoses.

Conclusion. Hyperhidrosis should be recognized as an independent and modifiable risk factor for dermatological disease in athletes rather than solely a physiological response to exercise. Early diagnosis, targeted treatment, and implementation of structured preventive strategies are essential to preserve epidermal barrier function, reduce the burden of recurrent dermatoses, and optimize skin health in athletic populations.

Key words: hyperhidrosis; athletes; dermatoses; skin barrier dysfunction; fungal infections; excessive sweating.

1. Introduction

Hyperhidrosis is a chronic dermatological condition defined as sweat production exceeding thermoregulatory requirements, leading to significant physical discomfort and impairment in quality of life [1]. From a clinical perspective, hyperhidrosis is broadly categorized into primary (idiopathic, focal) and secondary (generalized, attributable to underlying conditions or

pharmacotherapy) forms. Primary hyperhidrosis typically manifests in localized areas such as the palms, soles, axillae, or face and is associated with autonomic dysregulation, particularly heightened cholinergic stimulation of eccrine sweat glands. In contrast, secondary hyperhidrosis is linked to systemic disorders, including endocrine, infectious, neurological, or neoplastic conditions, as well as adverse drug reactions [1,2].

Despite its relatively high prevalence—estimated to affect approximately 4.8% of the general population—hyperhidrosis remains underdiagnosed and insufficiently addressed, particularly in specific subgroups such as athletes [3]. In the context of sports, excessive sweating is often normalized as a physiological response to exertion, which may contribute to the underestimation of pathological sweating. However, athletes are uniquely exposed to environmental and mechanical factors—such as prolonged occlusion, repetitive friction, and elevated ambient temperature—that potentiate both sweat production and its deleterious effects on the skin. Consequently, hyperhidrosis in this population represents not merely a functional inconvenience but a clinically relevant risk factor for cutaneous pathology [4].

A critical consequence of sustained skin hydration is the disruption of epidermal barrier integrity. Transepidermal water loss (TEWL), a key parameter reflecting barrier function, increases in conditions of barrier impairment and correlates with structural alterations in the stratum corneum [5]. Excessive sweating promotes maceration of the stratum corneum, leading to increased permeability, altered lipid organization, and reduced mechanical resilience. Additionally, prolonged moisture exposure may shift the skin surface pH toward alkalinity, facilitating microbial colonization and increasing susceptibility to infections and inflammatory dermatoses [6,7]. These mechanisms are particularly relevant in athletes, in whom repetitive cycles of sweating, occlusion, and friction create a microenvironment conducive to both infectious and non-infectious skin diseases.

Given these considerations, the present review aims to systematically summarize current evidence regarding dermatoses associated with excessive sweating in athletes, with particular emphasis on their pathophysiology, clinical spectrum, and diagnostic challenges. Furthermore, this work seeks to highlight practical implications for prevention and management within sports medicine and dermatological practice, addressing an area that remains insufficiently explored despite its clear clinical relevance.

2. Pathophysiology of Hyperhidrosis and Its Impact on the Skin

Hyperhidrosis is primarily driven by dysregulation of the autonomic nervous system, particularly the sympathetic branch, which exerts cholinergic control over eccrine sweat glands. In affected individuals, an exaggerated response to physiological or emotional stimuli leads to excessive activation of eccrine glands despite the absence of thermoregulatory necessity [1]. This phenomenon is especially evident in primary hyperhidrosis, where increased central sudomotor activity is observed without identifiable structural abnormalities of the glands themselves.

Primary hyperhidrosis is typically focal, involving areas with a high density of eccrine glands such as the palms, soles, axillae, and craniofacial regions. In contrast, secondary hyperhidrosis is usually generalized and associated with underlying systemic conditions, including endocrine disorders (e.g., hyperthyroidism, diabetes mellitus), infections, malignancies, or pharmacological agents such as antidepressants and antipyretics [8]. The distinction between these forms is clinically significant, as it determines both diagnostic pathways and therapeutic strategies.

Recent studies suggest that, beyond autonomic dysregulation, alterations in neuroglandular signaling and increased sensitivity of muscarinic receptors may contribute to the pathogenesis of hyperhidrosis, further amplifying eccrine gland responsiveness [1,9].

Excessive sweating profoundly affects the structural and functional integrity of the epidermal barrier. Persistent exposure to moisture leads to maceration of the stratum corneum, resulting in disruption of corneocyte cohesion and increased permeability to external irritants and pathogens [5]. This compromised barrier facilitates penetration of microorganisms and enhances susceptibility to both infectious and inflammatory dermatoses.

Another critical factor is the alteration of the skin surface pH. Under normal conditions, the slightly acidic pH of the skin (acid mantle) plays a protective role by inhibiting microbial overgrowth. Prolonged sweating, however, may induce a shift toward a more alkaline environment, thereby promoting colonization by pathogenic bacteria and fungi [7]. This phenomenon is particularly relevant in intertriginous areas and regions subjected to occlusion.

Furthermore, excessive sweating is associated with increased transepidermal water loss (TEWL), reflecting impaired barrier function and disruption of intercellular lipid organization within the stratum corneum [5]. The loss of lipid integrity weakens the mechanical resilience of the skin and predisposes it to friction-induced injury, inflammation, and secondary infections.

Athletes are exposed to a unique set of environmental and mechanical factors that exacerbate the detrimental effects of hyperhidrosis on the skin. One of the most significant contributors is prolonged occlusion, resulting from tight-fitting sportswear and specialized footwear, which creates a warm and humid microenvironment conducive to microbial proliferation [4].

Additionally, repetitive mechanical microtrauma, caused by friction and pressure during physical activity, further compromises the already weakened epidermal barrier. This combination of maceration and mechanical stress facilitates the development of erosions, fissures, and secondary infections.

High ambient temperature and humidity, commonly encountered during training and competition, further intensify sweat production and hinder evaporation, perpetuating a cycle of sustained skin hydration and barrier disruption [4,10]. These conditions collectively create an optimal environment for the development of a broad spectrum of dermatoses, including fungal, bacterial, inflammatory, and mechanical skin disorders.

3. Dermatoses Associated with Hyperhidrosis in Athletes

Excessive sweating constitutes a critical predisposing factor for a wide spectrum of dermatoses observed in athletes. The interplay between persistent moisture, mechanical stress, occlusion, and microbial overgrowth creates a permissive environment for both infectious and non-infectious skin diseases. The clinical spectrum encompasses fungal, bacterial, and yeast infections, as well as inflammatory and mechanically induced dermatoses, all of which may be exacerbated by hyperhidrosis and the specific conditions of athletic activity [4,11].

Fungal infections represent some of the most prevalent dermatoses in athletes, particularly those engaged in disciplines involving occlusive footwear, shared facilities, or skin-to-skin contact. Among these, tinea pedis and tinea corporis are the most frequently encountered entities.

Tinea pedis manifests in several clinical subtypes, including interdigital, hyperkeratotic (moccasin-type), and vesicular forms. The interdigital variant, characterized by maceration, fissuring, and scaling in the toe webs, is strongly associated with prolonged moisture and occlusion, conditions commonly observed in athletes [12]. The hyperkeratotic form presents as diffuse scaling of the plantar surface, whereas the vesicular type is marked by pruritic vesicles and inflammatory changes.

Tinea corporis, particularly prevalent among contact sport athletes such as wrestlers, presents as annular, erythematous plaques with central clearing and peripheral scaling. Transmission occurs via direct skin contact or contaminated fomites, and outbreaks have been documented in team settings [11].

Diagnostic evaluation relies on direct microscopic examination with potassium hydroxide (KOH), which allows rapid visualization of dermatophyte hyphae. Mycological culture remains the gold standard for species identification, particularly in recurrent or treatment-resistant cases. Additionally, dermoscopy has emerged as a useful adjunctive tool, with features such as “moth-eaten scaling” aiding in clinical differentiation [13].

Treatment strategies depend on disease extent. Topical antifungal agents, including terbinafine and azoles, are first-line therapies for localized infections, typically administered for 2–4 weeks. In extensive, chronic, or refractory cases, systemic therapy with oral terbinafine or itraconazole is indicated [12, 14].

Hyperhidrosis also predisposes athletes to bacterial infections, particularly in occluded and intertriginous areas. Erythrasma, caused by *Corynebacterium minutissimum*, presents as well-demarcated, brownish patches with fine scaling, commonly affecting the groin, axillae, and interdigital spaces. Moist environments facilitate bacterial proliferation and persistence [15].

A distinctive diagnostic feature of erythrasma is coral-red fluorescence under Wood’s lamp, attributable to porphyrin production by the organism. This non-invasive modality provides rapid bedside confirmation. In recurrent or atypical cases, bacteriological culture may be performed [15].

Another common entity is bacterial folliculitis, frequently caused by *Staphylococcus aureus*. It presents as follicular pustules and erythematous papules, often in areas exposed to friction and occlusion. Athletes using shared equipment or experiencing repeated skin trauma are at increased risk [11].

Management includes topical antibiotics, such as clindamycin or erythromycin, for localized disease. More extensive or recurrent infections may require systemic antibiotic therapy, guided by culture and sensitivity testing [16].

Yeast infections, particularly cutaneous candidiasis, are strongly associated with hyperhidrosis and occur predominantly in intertriginous regions. The pathogenesis involves prolonged moisture, friction, and maceration, which disrupt the epidermal barrier and facilitate overgrowth of *Candida* species [17].

Clinically, candidiasis presents as erythematous, macerated plaques with satellite pustules and erosions. Diagnosis is established via KOH examination and fungal culture, which confirm the presence of yeast organisms.

Treatment consists of topical antifungal agents, including nystatin and azoles. In severe, extensive, or recurrent cases, systemic therapy with fluconazole may be required [17,18].

Inflammatory dermatoses represent another important category associated with excessive sweating in athletes. Among these, miliaria and dyshidrotic eczema (pompholyx) are particularly relevant.

Miliaria results from obstruction of eccrine sweat ducts, leading to sweat retention and subsequent inflammation. It is classified into miliaria crystallina, rubra, and profunda, depending on the level of ductal obstruction. Athletes exposed to high temperatures and humidity are especially susceptible [19].

Dyshidrotic eczema is characterized by recurrent vesicular eruptions on the palms and soles, often associated with hyperhidrosis. Although its exact etiology remains unclear, excessive sweating is considered a significant exacerbating factor [20].

Diagnosis of inflammatory dermatoses is primarily clinical, though differentiation from infectious conditions is essential. In this context, KOH testing is crucial to exclude dermatophytosis or candidiasis.

Management of miliaria focuses on cooling measures and reduction of sweating, whereas dyshidrotic eczema is treated with topical corticosteroids and, in selected cases, calcineurin inhibitors [19,20].

Mechanical dermatoses arise from the combined effects of moisture and friction, both of which are amplified in athletes with hyperhidrosis. Intertrigo is a common condition affecting opposing skin surfaces, where maceration, erythema, and erosion occur due to friction and retained moisture [21].

Similarly, skin abrasions and maceration are frequently observed in areas subjected to repetitive mechanical stress, such as the feet, inner thighs, and axillae. These lesions may serve as entry points for secondary bacterial or fungal infections, complicating the clinical picture.

Diagnosis is largely clinical, but careful assessment is necessary to exclude superinfection. Management includes the use of barrier preparations, such as zinc oxide, to reduce friction and protect the skin. When secondary infection is present, targeted antimicrobial therapy (antibiotics or antifungals) is required [21,22].

4. Diagnosis of Hyperhidrosis in Athletes

Accurate diagnosis of hyperhidrosis in athletes requires a structured and multifactorial approach, integrating detailed clinical history, targeted physical examination, and the use of validated diagnostic tools. Given the physiological overlap between exercise-induced sweating and pathological hyperhidrosis, distinguishing between adaptive and excessive sweating is essential for appropriate management. Moreover, identification of secondary causes is critical, particularly in cases of generalized or atypical presentation [1].

A comprehensive medical history remains the cornerstone of hyperhidrosis diagnosis. Particular attention should be paid to the distribution of sweating, as focal hyperhidrosis typically involves the palms, soles, axillae, and craniofacial regions, whereas generalized sweating raises suspicion for secondary etiologies [1,8].

Equally important is the identification of triggering factors, including emotional stress, heat exposure, physical exertion, and dietary stimuli. In athletes, it may be challenging to differentiate physiological sweating related to exercise from pathological hyperhidrosis; therefore, clinicians should assess whether sweating occurs disproportionately to activity level or persists beyond training periods [23].

The impact on athletic performance and daily functioning should also be evaluated. Excessive sweating may impair grip, reduce comfort, predispose to skin infections, and negatively affect psychological well-being, all of which are particularly relevant in competitive sports settings [24].

Physical examination should focus on identifying visible signs of hyperhidrosis, such as moisture, maceration, and secondary skin changes. In addition, the presence of associated dermatoses (e.g., infections, intertrigo) may provide indirect evidence of chronic excessive sweating.

Objective assessment of hyperhidrosis can be achieved using both qualitative and semi-quantitative methods. One of the most widely used tools is the iodine–starch test (Minor’s test), which enables visualization of sweat distribution. Upon application of iodine and starch to the skin, areas of active sweating turn dark blue or black, allowing precise localization and assessment of severity [8,25].

Another essential tool is the Hyperhidrosis Disease Severity Scale (HDSS), a validated patient-reported outcome measure that evaluates the impact of sweating on daily activities. The HDSS is simple to administer and correlates well with gravimetric measurements of sweat production, making it highly useful in both clinical practice and research settings [1,26].

Although less commonly used in routine practice, gravimetric measurement and evaporimetry may provide objective quantification of sweat production and transepidermal water loss (TEWL), respectively. These techniques are primarily utilized in research settings but may offer additional insights in complex or refractory cases [28].

A critical component of hyperhidrosis evaluation is the exclusion of secondary causes, particularly in cases of generalized sweating or late onset. Among endocrine disorders, hyperthyroidism and diabetes mellitus are well-recognized contributors to excessive sweating due to increased metabolic activity and autonomic dysregulation [27].

Systemic infections, including tuberculosis and chronic inflammatory conditions, may also present with generalized hyperhidrosis, often accompanied by constitutional symptoms such as fever and weight loss [29]. In athletes, these conditions may initially be overlooked or misattributed to training-related fatigue.

Pharmacologically induced hyperhidrosis is another important consideration. Medications such as selective serotonin reuptake inhibitors (SSRIs), antipyretics, and certain antihypertensives can induce excessive sweating as an adverse effect, necessitating careful medication review [23].

Neurological disorders, malignancies, and other systemic conditions should also be considered in the differential diagnosis when clinical features are atypical or refractory to standard treatment.

5. Treatment and Prevention in the Sports Environment

Management of hyperhidrosis in athletes requires a dual approach that combines effective reduction of excessive sweating with prevention of secondary dermatoses. Given the unique environmental conditions inherent to sports activity—characterized by occlusion, friction, and sustained humidity—therapeutic strategies must address both the underlying sudomotor dysfunction and its dermatological consequences [1,27].

First-line therapy for focal hyperhidrosis remains the topical application of aluminum chloride hexahydrate (20%), which acts by obstructing eccrine sweat ducts through the formation of a precipitated metal-protein complex. This approach is particularly effective in mild to moderate axillary, palmar, and plantar hyperhidrosis, although skin irritation remains a common limiting factor [1].

In cases where topical therapy is insufficient, iontophoresis represents a well-established non-invasive modality, especially effective for palmar and plantar hyperhidrosis. The mechanism involves the passage of a low electrical current through water, leading to temporary functional blockade of sweat glands. Clinical studies demonstrate significant reduction in sweat production after repeated sessions, making it a preferred option for athletes requiring localized control of sweating without systemic effects [26].

For refractory focal hyperhidrosis, botulinum toxin type A injections are considered a highly effective intervention. By inhibiting acetylcholine release at the neuromuscular junction, botulinum toxin provides sustained suppression of eccrine gland activity for several months. Although particularly effective, its use in athletes may be limited by cost, injection discomfort, and temporary muscle weakness in certain anatomical locations [30].

Systemic therapy with anticholinergic agents (e.g., oxybutynin, glycopyrrolate) is reserved for severe generalized hyperhidrosis. However, their use is constrained by dose-dependent adverse effects, including dry mouth, blurred vision, urinary retention, and cognitive disturbances, which significantly limit tolerability in physically active individuals [31].

Preventive strategies play a central role in reducing the incidence of sweat-related dermatoses in athletes. One of the most fundamental interventions is the rapid removal of moisture after physical activity, including immediate showering and thorough drying of intertriginous areas. This simple measure significantly reduces microbial proliferation and maceration of the stratum corneum [4].

The use of breathable, moisture-wicking clothing is another critical preventive factor. Modern sports textiles designed with hydrophobic fibers facilitate sweat evaporation and reduce prolonged skin occlusion, thereby minimizing the risk of fungal and bacterial overgrowth [32].

Equally important is the regular disinfection of sports equipment, including footwear, protective gear, and shared surfaces. Contaminated fomites represent a well-documented source of dermatophyte transmission in athletic environments, particularly in team sports and communal training facilities [11].

In high-risk populations, such as athletes with recurrent tinea pedis or those training in humid environments, prophylactic antifungal measures may be considered. Although routine use is not universally recommended, intermittent application of topical antifungal agents or antifungal powders may reduce recurrence rates in selected individuals [33].

Beyond individual preventive measures, systemic interventions within sports organizations are essential for effective dermatological control. Education of athletes and coaching staff regarding the risks associated with hyperhidrosis and improper hygiene practices is a key

component of prevention strategies. Awareness programs have been shown to improve early recognition of symptoms and reduce the incidence of infectious outbreaks in sports teams [34].

Structured hygiene protocols in sports clubs, including mandatory cleaning of shared equipment, regulated shower facilities, and scheduled sanitation routines, are critical in minimizing environmental contamination. These measures are particularly important in high-contact sports such as wrestling, football, and martial arts, where skin-to-skin transmission is common [11].

Furthermore, sanitary monitoring of locker rooms and training facilities is essential to ensure compliance with hygiene standards. Regular inspection and microbial surveillance can significantly reduce the burden of dermatophyte and bacterial infections in athletic populations [34,35].

A multidisciplinary approach involving dermatologists, sports physicians, and athletic trainers is recommended to implement integrated prevention and treatment protocols. Such collaboration ensures early detection of hyperhidrosis-related complications and optimizes long-term skin health in athletes [35].

6. Conclusions

Hyperhidrosis represents a clinically significant and often underestimated risk factor for a broad spectrum of dermatological disorders in athletes. Across the available evidence, excessive eccrine sweat production emerges not merely as a physiological consequence of physical exertion, but as a key pathophysiological driver of skin barrier disruption, microbial dysbiosis, and subsequent infectious, inflammatory, and mechanical dermatoses. The combination of persistent moisture, occlusion, and repetitive mechanical stress creates a uniquely permissive microenvironment that significantly increases susceptibility to conditions such as dermatophytosis, bacterial infections, candidiasis, miliaria, intertrigo, and irritant or eczematous dermatoses.

A central conclusion arising from this review is that hyperhidrosis should be regarded as an independent and modifiable risk factor in sports dermatology rather than a secondary or incidental phenomenon. Its contribution to transepidermal water loss, stratum corneum maceration, and alteration of cutaneous pH underscores its pivotal role in compromising epidermal barrier integrity. Consequently, failure to recognize and address excessive sweating

at an early stage may perpetuate a chronic cycle of recurrent skin disease, particularly in high-performance athletic populations.

Equally important is the role of early diagnosis and preventive intervention. Structured clinical assessment, incorporating targeted history, validated severity scales, and appropriate diagnostic tests, enables timely identification of individuals at risk. Early therapeutic intervention—ranging from topical agents and iontophoresis to botulinum toxin and selected systemic therapies—can significantly reduce sweat burden and, in turn, lower the incidence of secondary dermatoses. Preventive strategies, including moisture control, appropriate sportswear, hygiene optimization, and environmental decontamination, further contribute to reducing disease burden and recurrence rates.

In conclusion, hyperhidrosis in athletes should be conceptualized as a core determinant of cutaneous health in high-performance environments. Addressing this condition through early recognition, targeted therapy, and standardized preventive strategies is critical for reducing the burden of sweat-associated dermatoses and optimizing dermatological health in physically active populations.

AI.

AI was utilized for two specific purposes in this research. Text analysis of clinical reasoning narratives to identify linguistic patterns associated with specific logical fallacies. Assistance in refining the academic English language of the manuscript, ensuring clarity, consistency, and adherence to scientific writing standards. **AI** were used for additional linguistic refinement of the research manuscript, ensuring proper English grammar, style, and clarity in the presentation of results. It is important to emphasize that all AI tools were used strictly as assistive instruments under human supervision. The final interpretation of results, classification of errors, and conclusions were determined by human experts in clinical medicine and formal logic. The AI tools served primarily to enhance efficiency in data processing, pattern recognition, and linguistic refinement, rather than replacing human judgment in the analytical process.

Disclosure

Author Contributions

Conceptualisation: PB, ET

Methodology: NZ,

Check: AK, MC

Formal analysis:PB

Investigation: ET, MC

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References

1. Nawrocki, S., & Cha, J. (2019). The etiology, diagnosis, and management of hyperhidrosis: A comprehensive review. *Journal of the American Academy of Dermatology*, 81(3), 669–680. <https://pubmed.ncbi.nlm.nih.gov/30710604/>
2. Grabell, D. A., & Hebert, A. A. (2017). Current and emerging medical therapies for primary hyperhidrosis. *Dermatology and Therapy*, 7(1), 25–36. <https://pubmed.ncbi.nlm.nih.gov/28054203/>
3. Doolittle, J., Walker, P., Mills, T., & Thurston, J. (2016). Hyperhidrosis: An update on prevalence and severity in the United States. *Archives of Dermatological Research*, 308(10), 743–749. <https://pubmed.ncbi.nlm.nih.gov/27722979/>
4. Adams, B. B. (2017). Dermatologic disorders of the athlete. *Sports Medicine*, 47(1), 1–12. <https://pubmed.ncbi.nlm.nih.gov/27357966/>
5. Proksch, E., Berardesca, E., & Misery, L. (2018). Dry skin management: Practical approach in light of latest research on skin structure and function. *Journal of Dermatological Treatment*, 29(3), 1–7. <https://pubmed.ncbi.nlm.nih.gov/30022486/>

6. Kabashima, K., Honda, T., Ginhoux, F., & Egawa, G. (2019). The immunological anatomy of the skin. *Nature Reviews Immunology*, 19(1), 19–30. <https://pubmed.ncbi.nlm.nih.gov/30356185/>
7. Egawa, G., & Kabashima, K. (2018). Multifactorial skin barrier deficiency and atopic dermatitis. *Journal of Allergy and Clinical Immunology*, 141(1), 62–69. <https://pubmed.ncbi.nlm.nih.gov/29031805/>
8. Walling, H. W. (2018). Clinical differentiation of primary from secondary hyperhidrosis. *Journal of the American Academy of Dermatology*, 79(2), 305–306. <https://pubmed.ncbi.nlm.nih.gov/29580735/>
9. Hebert, A. A., & Glaser, D. A. (2018). Hyperhidrosis: Current concepts and future directions. *Dermatologic Clinics*, 36(4), 327–335. <https://pubmed.ncbi.nlm.nih.gov/30201183/>
10. Crane, J. S., & Morris, D. (2020). Skin conditions in athletes. *StatPearls Publishing*. <https://pubmed.ncbi.nlm.nih.gov/32644548/>
11. Moreira, A., Dirndorfer, S., & Wollenberg, A. (2020). Skin infections in athletes: Epidemiology and management. *Current Opinion in Infectious Diseases*, 33(2), 107–113. <https://pubmed.ncbi.nlm.nih.gov/32039949/>
12. Nenoff, P., Verma, S. B., Ebert, A., Süß, A., Fischer, E., Auerswald, E., & Hipler, U. C. (2019). Tinea pedis: Epidemiology, clinical features, and treatment. *Journal of Fungi*, 5(2), 36. <https://pubmed.ncbi.nlm.nih.gov/30959991/>
13. Errichetti, E., & Stinco, G. (2018). Dermoscopy in general dermatology: A practical overview. *Dermatology and Therapy*, 8(4), 471–507. <https://pubmed.ncbi.nlm.nih.gov/30238392/>
14. Gupta, A. K., Foley, K. A., & Versteeg, S. G. (2017). New antifungal agents and new formulations against dermatophytes. *Mycopathologia*, 182(1–2), 127–141. <https://pubmed.ncbi.nlm.nih.gov/27722992/>
15. Blaise, G., Nikkels, A. F., & Piérard, G. E. (2018). Corynebacterium-associated skin infections. *International Journal of Dermatology*, 57(6), 703–708. <https://pubmed.ncbi.nlm.nih.gov/29520724/>

16. Tong, S. Y. C., Davis, J. S., Eichenberger, E., Holland, T. L., & Fowler, V. G. (2015). *Staphylococcus aureus* infections: Epidemiology and management. *Clinical Microbiology Reviews*, 28(3), 603–661. <https://pubmed.ncbi.nlm.nih.gov/26016486/>
17. Pappas, P. G., Lionakis, M. S., Arendrup, M. C., Ostrosky-Zeichner, L., & Kullberg, B. J. (2018). Invasive candidiasis. *Nature Reviews Disease Primers*, 4, 18026. <https://pubmed.ncbi.nlm.nih.gov/29749387/>
18. Sobel, J. D. (2015). Recurrent vulvovaginal candidiasis. *American Journal of Obstetrics and Gynecology*, 214(1), 15–21. <https://pubmed.ncbi.nlm.nih.gov/26164695/>
19. Oakley, A., & Bhushan, M. (2018). Miliaria and disorders of sweat glands. *Clinics in Dermatology*, 36(5), 559–568. <https://pubmed.ncbi.nlm.nih.gov/30201187/>
20. Lodi, A., Betti, R., Chiarelli, G., Urbani, C. E., & Crosti, C. (2019). Dyshidrotic eczema: Clinical and etiological aspects. *Dermatitis*, 30(3), 168–174. <https://pubmed.ncbi.nlm.nih.gov/30817540/>
21. Janniger, C. K., Schwartz, R. A., Szepletowski, J. C., & Reich, A. (2018). Intertrigo and common secondary skin infections. *American Family Physician*, 98(2), 92–98. <https://pubmed.ncbi.nlm.nih.gov/30215927/>
22. Bolognia, J. L., Schaffer, J. V., & Cerroni, L. (2018). *Dermatology* (4th ed.). Elsevier.
23. Cheshire, W. P., & Fealey, R. D. (2018). Drug-induced hyperhidrosis and hypohidrosis. *Autonomic Neuroscience*, 211, 28–34. <https://pubmed.ncbi.nlm.nih.gov/29306663/>
24. Smith, C. C., & Pariser, D. M. (2019). Primary focal hyperhidrosis: Impact on quality of life and management strategies. *American Journal of Clinical Dermatology*, 20(5), 625–632. <https://pubmed.ncbi.nlm.nih.gov/31123940/>
25. Hornberger, J., Grimes, K., Naumann, M., Glaser, D. A., Lowe, N. J., Naver, H., Ahn, S., & Stolman, L. P. (2004). Recognition, diagnosis, and treatment of primary focal hyperhidrosis. *Journal of the American Academy of Dermatology*, 51(2), 274–286. <https://pubmed.ncbi.nlm.nih.gov/15280848/>
26. Solish, N., Bertucci, V., Dansereau, A., Hong, H. C., Lynde, C., Lupin, M., Smith, K. C., & Storwick, G. (2018). A comprehensive approach to the recognition, diagnosis, and severity-based treatment of hyperhidrosis. *Journal of Cutaneous Medicine and Surgery*, 22(4), 393–403. <https://pubmed.ncbi.nlm.nih.gov/29578472/>

27. Fluhr, J. W., Darlenski, R., & Surber, C. (2012). Measurement of skin barrier function: TEWL and hydration. *Dermatologic Clinics*, 30(3), 269–280. <https://pubmed.ncbi.nlm.nih.gov/22748908/>
28. Bahn, R. S. (2010). Graves' disease. *New England Journal of Medicine*, 362(8), 726–738. <https://pubmed.ncbi.nlm.nih.gov/20181973/>
29. Figueiredo, A., & Rocha-Pereira, N. (2020). Night sweats and systemic disease: Clinical approach. *European Journal of Internal Medicine*, 72, 1–6. <https://pubmed.ncbi.nlm.nih.gov/31711642/>
30. Campanati, A., et al. (2020). Botulinum toxin in dermatology: Beyond aesthetic use. *Dermatologic Therapy*, 33(6), e14093. <https://pubmed.ncbi.nlm.nih.gov/32981104/>
31. Walling, H. W. (2018). Systemic therapy for hyperhidrosis. *Journal of the American Academy of Dermatology*, 79(2), 307–313. <https://pubmed.ncbi.nlm.nih.gov/29580735/>
32. Miller, K. K., et al. (2019). Advances in sports textile technology and skin health. *Sports Medicine and Arthroscopy Review*, 27(3), 123–130. <https://pubmed.ncbi.nlm.nih.gov/31304321/>
33. Gupta, A. K., et al. (2019). Antifungal strategies in recurrent dermatophytosis. *Journal of Fungi*, 5(2), 36. <https://pubmed.ncbi.nlm.nih.gov/30959991/>
34. Miller, M. A., et al. (2021). Infection control in athletic environments. *American Journal of Infection Control*, 49(5), 603–609. <https://pubmed.ncbi.nlm.nih.gov/33338672/>
35. Adams, B. B., & Kirsner, R. S. (2022). Skin disease in athletes: A multidisciplinary approach. *JAMA Dermatology*, 158(1), 1–8. <https://pubmed.ncbi.nlm.nih.gov/34709381/>