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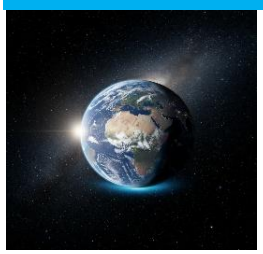

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Contagious molluscum in swimmers with atopic dermatitis: transmission risk, clinical challenges and impact on sports participation - a narrative review

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Abstract

Background. Molluscum contagiosum (MC) is a common cutaneous poxvirus infection transmitted primarily through direct skin-to-skin contact and autoinoculation, with indirect spread via fomites considered plausible in shared environments. Swimmers may face heightened exposure to communal facilities and equipment, while atopic dermatitis (AD) can amplify susceptibility and disease burden through skin-barrier dysfunction and itch-driven dissemination. These factors can create clinical uncertainty about transmission risk, complicate management, and contribute to unnecessary restriction from training and competition.

Aim. To synthesize current evidence on MC transmission risk and clinical course in swimmers with AD, and to summarize management and infection-control considerations relevant to safe sports participation.

Material and methods. A narrative review was conducted using targeted searches of PubMed/MEDLINE and Google Scholar, supplemented by screening of reference lists and verification through official journal/publisher records. Search terms combined MC with AD-related constructs (eczema, filaggrin/barrier dysfunction) and aquatic/sport contexts (swimming, pools, athletes, transmission, fomites, return-to-play), and were expanded to include contemporary therapeutics relevant to clearance timelines. Publications from the last 10 years (2016–2026), including randomized clinical trials, observational studies, and high-quality reviews.

Results. The evidence base supports contact and autoinoculation as the dominant transmission pathways for MC, while direct evidence for chlorinated pool water as a primary vehicle remains limited; the swimmer setting is more plausibly "facility-associated" through shared surfaces, changing areas, and personal items. AD consistently emerges as a risk amplifier and phenotype modifier, with barrier dysfunction and pruritus promoting wider lesion dissemination and eczematization that can obscure diagnosis and complicate treatment tolerability. Therapeutic advances supported by randomized trials, including provider-applied cantharidin 0.7% formulations and topical nitric oxide–releasing berdazimer gel, offer practical options to reduce lesion burden and support time-sensitive participation planning. Athlete-oriented infection-control principles emphasize individualized decisions, strict non-sharing of personal items, attention to hygiene in shared facilities, and lesion coverage when feasible, rather than blanket exclusion.

Conclusions. In swimmers with AD, MC risk mitigation should prioritize barrier optimization, reduction of scratching-driven spread, and targeted control of contact and fomites in shared

aquatic environments, while avoiding overattribution of risk to pool water alone. Integrating evidence-based lesion-directed therapy with AD control and pragmatic facility guidance is most likely to reduce transmission risk, limit stigma, and preserve sports participation through individualized, proportionate restrictions when necessary.

Key words: molluscum contagiosum, atopic dermatitis, swimmers, transmission risk, infection control, sports participation, return-to-play.

1. Introduction

Molluscum contagiosum (MC) is a common cutaneous poxvirus infection that typically presents as discrete, dome-shaped papules, often with central umbilication, and a clinical course that is frequently self-limited in immunocompetent hosts. Despite its generally benign prognosis, MC can impose a substantial burden through prolonged persistence, lesion visibility, pruritus, perilesional dermatitis, secondary bacterial infection, and progressive spread via autoinoculation, particularly in children and in individuals with underlying inflammatory skin disease (Meza-Romero et al., 2019; Forbat et al., 2017; Robinson & Townsend, 2020). Contemporary clinical syntheses consistently emphasize that transmission is driven primarily by direct skin-to-skin contact and self-inoculation, with indirect spread via contaminated fomites plausibly contributing in settings characterized by shared personal items and high-touch surfaces such as towels, clothing, and sports equipment (Meza-Romero et al., 2019; Robinson & Townsend, 2020; Montyn Lücher et al., 2025). These features make MC particularly consequential in organized sport, where close interpersonal proximity and shared facilities can facilitate dissemination, while institutional responses may amplify psychosocial impact through stigma or exclusion.

Atopic dermatitis (AD) is a clinically important susceptibility modifier for MC, because it couples epidermal barrier disruption with pruritus-driven scratching that promotes viral entry and lesion propagation across multiple body sites. Mechanistic plausibility is supported by evidence linking filaggrin-related barrier dysfunction to MC infection risk in atopic phenotypes, reinforcing that MC susceptibility in AD is not merely behavioral but may be biologically mediated by structural barrier compromise (Manti et al., 2017; Kojima et al., 2024).

Epidemiologic evidence also indicates an association between MC and AD beyond early childhood, suggesting that AD may remain relevant to MC risk profiles across adolescent and adult populations (Hill et al., 2024). Clinically, the relationship can be bidirectional: MC lesions may precipitate eczematous flares and perilesional inflammation, which in turn increases scratching, autoinoculation, and diagnostic ambiguity, especially when treatment-related irritation resembles eczema exacerbation (Silverberg, 2018; Paller et al., 2024). In sports participation contexts, this interaction can translate into higher lesion burden, longer durations of visible disease, and greater likelihood of participation disruption.

Swimming represents a distinctive context in which the potential for MC spread intersects with AD-related vulnerability. Swimmers frequently engage in repeated exposure to communal environments, including locker rooms, showers, pool decks, benches, and shared high-touch surfaces, and in many youth or team settings there is routine proximity during training and incidental sharing or cross-contact with towels and training aids. Evidence specifically addressing viral cutaneous infections in swimmers supports the relevance of aquatic sport environments to the circulation of contagious dermatoses, although it does not establish chlorinated pool water as a dominant vehicle for MC transmission (Sfyri et al., 2021). Athlete-focused dermatology and sports medicine literature similarly frames contagious skin infections as problems of contact patterns and shared environments, a perspective that is particularly useful for correcting the common assumption that “the pool water” itself is the primary source of infection (Nowicka et al., 2020; Anderson et al., 2023; Truong et al., 2024). Consequently, swimmer-centered counseling should explicitly distinguish evidence-supported mechanisms (contact, autoinoculation, and fomite-mediated spread) from pathways that remain plausible but weakly substantiated, while still offering practical mitigation steps that reduce risk without imposing disproportionate participation restrictions.

Clinical management has evolved in ways that matter for swimmers because treatment feasibility and time-to-clearance can directly influence decisions about training, competition, and institutional policies. Randomized phase 3 trial evidence supports the efficacy of provider-applied cantharidin 0.7% formulations and topical nitric oxide–releasing berdazimer gel, expanding the range of evidence-based options for patients with extensive lesions or those in settings where transmission concerns have operational significance (Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024). AD-specific analyses underscore the practical complexity of treating MC in atopic skin, where baseline inflammation can complicate assessment of local reactions and where barrier optimization remains integral to reducing scratching-driven spread and improving tolerability (Paller et al., 2024; Silverberg,

2018). Regulatory milestones confirming the availability of approved cantharidin-based therapy further reflect the maturation of this therapeutic landscape and strengthen the clinical case for proactive management when prolonged contagiousness threatens participation or increases psychosocial harm (FDA, 2023; Keam, 2024).

Within this context, a focused narrative review on contagious MC in swimmers with AD is warranted because it addresses a clinically common yet operationally challenging intersection of infection control, dermatologic comorbidity, and sports participation. The AD phenotype modifies risk and disease course, aquatic sport participation shapes exposure opportunities and social responses, and newer therapeutics create additional options for individualized plans that balance athlete well-being with prevention of onward spread (Manti et al., 2017; Montyn Lücher et al., 2025; Paller et al., 2024; Anderson et al., 2023).

Research Objective. To synthesize contemporary evidence on MC transmission risk, clinical challenges, and management strategies in swimmers with AD, and to translate this evidence into pragmatic recommendations that support safe sports participation while minimizing onward transmission.

Research Problems. The review addresses how MC is most plausibly transmitted in swimmer-associated settings, how AD modifies susceptibility and clinical course, and how evidence-based management and infection-control strategies can be implemented in aquatic sports to reduce stigma-driven exclusion while maintaining reasonable safeguards (Meza-Romero et al., 2019; Sfyri et al., 2021; Anderson et al., 2023; Truong et al., 2024).

Research Hypotheses. It is hypothesized that MC risk in swimmers is driven predominantly by contact- and fomite-associated pathways around aquatic activity rather than by pool-water exposure per se, that AD increases lesion burden and persistence through barrier dysfunction and autoinoculation, and that integrating optimized AD control with timely evidence-based MC therapy and targeted facility hygiene can reduce transmission risk while preserving participation (Montyn Lücher et al., 2025; Paller et al., 2024; Eichenfield et al., 2020; Browning et al., 2022).

2. Research materials and methods

This manuscript was designed as a narrative review addressing molluscum contagiosum in swimmers with atopic dermatitis, with an explicit focus on transmission plausibility in aquatic sport contexts, clinical challenges in atopic skin, and implications for sports participation and infection control. The methodological approach was structured to be compatible with the Journal of Education, Health and Sport (JEHS) framework while appropriately adapting participant-based elements to a literature-based synthesis.

2.1. Participants

No human participants were recruited because this is a narrative review. The “materials” comprised published scientific sources retrieved from bibliographic databases and verified

against official journal, publisher, or issuer pages. Evidence was eligible for inclusion if it was published within the last 10 years (2016–2026, up to the search date) and addressed at least one of the following domains: transmission mechanisms or epidemiology of molluscum contagiosum; associations between molluscum contagiosum and atopic dermatitis, including barrier-related or immunologic considerations; aquatic or athlete-related contexts relevant to exposure and transmission; or evidence-based clinical management that could influence contagious period, symptom burden, or participation decisions (Meza-Romero et al., 2019; Manti et al., 2017; Sfyri et al., 2021; Anderson et al., 2023; Paller et al., 2024). Sources were excluded if bibliographic verification was not possible (missing DOI/PMID and no official publisher/issuer record), if they were clearly out of scope for a clinical or sports-relevant interpretation, or if they represented duplicative reporting without additional information.

2.2. Review methodology

PubMed/MEDLINE served as the primary database, supplemented by Google Scholar and official publisher platforms to locate full records and confirm bibliographic identifiers. The final search was completed on 2 January 2026. Search concepts were built around three intersecting blocks: the disease entity (molluscum contagiosum), the susceptibility modifier (atopic dermatitis/eczema with barrier-related terms such as filaggrin), and the exposure/participation context (swimmers, swimming, pools, aquatic environments, athletes, and sports medicine). Treatment-focused terms (cantharidin/VP-102/YCANTH and berdazimer/nitric oxide) were incorporated to capture contemporary randomized evidence relevant to practical clearance timelines and participation planning (Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024; Keam, 2024). Titles and abstracts were screened for relevance to the review questions, and potentially eligible items were checked in full record form to confirm publication date, scope, and verifiable identifiers. Priority was given to randomized clinical trials and high-quality syntheses for management questions, and to mechanistic or epidemiologic studies for the AD–molluscum relationship, with swimmer- and athlete-context sources retained to inform environment-specific interpretation and participation considerations (Montyn Lücher et al., 2025; Sfyri et al., 2021; Truong et al., 2024).

2.3. Data Collection and Analysis

For each included source, information was extracted on study design and population/setting, the presence and role of atopic dermatitis (including explicit AD subgroup

analyses or barrier/genetic markers), transmission-relevant content (direct contact, autoinoculation, and fomite plausibility, including any aquatic facility discussion), and management-relevant outcomes (clearance, tolerability, and practical prevention or participation implications). Because the included evidence was heterogeneous in design and outcome reporting, no meta-analysis was attempted. Instead, a thematic narrative synthesis was applied, organizing findings into a coherent clinical argument that distinguishes evidence-supported conclusions from areas where swimmer-specific causality is plausible but not firmly established. This approach was guided by the contemporary literature emphasizing contact and autoinoculation as primary pathways, the role of barrier dysfunction in AD, and the practical relevance of newer therapies with randomized trial support (Meza-Romero et al., 2019; Silverberg, 2018; Eichenfield et al., 2020; Browning et al., 2022; Paller et al., 2024).

2.3.1. Statistical Software

Not applicable.

2.3.2. AI

AI-assisted support was used only to improve drafting efficiency, linguistic consistency, and organization of the thematic narrative. AI was not used to generate, fabricate, or infer bibliographic data. All cited sources were selected based on database retrieval and verified through PubMed records and/or official journal, publisher, or issuer pages prior to inclusion, and interpretive statements were written to remain within the boundaries of the cited evidence base (Eichenfield et al., 2020; Browning et al., 2022; FDA, 2023).

2.3.3. Statistical Methods

Formal statistical hypothesis testing was not performed. The synthesis was structured around clinically actionable themes: transmission biology and epidemiology relevant to aquatic sport; atopic dermatitis as a modifier of susceptibility, dissemination, and inflammatory phenotype; swimmer-associated exposure pathways with explicit separation of supported versus weakly evidenced mechanisms; and management strategies that intersect with infection control and sports participation, including newer evidence-based therapies that may reduce the practical duration of visible contagious disease (Montyn Lücher et al., 2025; Anderson et al., 2023; Truong et al., 2024; Sugarman et al., 2024).

3. Research results

3.1. Transmission biology and epidemiology of molluscum contagiosum in contexts relevant to aquatic sport

Across contemporary clinical syntheses, the dominant and most consistently supported transmission mechanisms for molluscum contagiosum are direct skin-to-skin contact and autoinoculation, with indirect transmission via contaminated fomites considered plausible and context-dependent (Meza-Romero et al., 2019; Robinson & Townsend, 2020; Forbat et al., 2017). In practical terms, this hierarchy implies that environments with frequent close interpersonal contact, recurrent skin friction, and sharing of personal items can support spread even when the ambient environment itself is not inherently "infectious." The swimmer context often amplifies perceived risk because aquatic training is embedded in shared physical spaces (locker rooms, showers, benches, pool decks) and may involve shared or cross-contaminated items such as towels and training aids. Evidence directly focused on swimmers indicates that viral cutaneous infections can be observed in swimmer populations and that aquatic sport environments represent a plausible setting for transmission dynamics, but the available data do not establish chlorinated pool water as the primary vehicle of molluscum contagiosum spread; rather, they are more compatible with "facility-associated" exposure through contact and shared surfaces (Sfyri et al., 2021). This distinction is clinically important, because it directs prevention efforts toward modifiable behaviors and environmental hygiene rather than toward assumptions of waterborne transmission.

Table 1. Evidence synthesis for molluscum contagiosum in swimmers with atopic dermatitis

Thematic domain	Evidence-supported observations	What remains plausible / less directly evidenced	Practical implications for swimmers with AD	Key sources
Transmission biology and epidemiology	MC transmission is most consistently supported via direct skin-to-skin contact and autoinoculation; fomite spread is plausible in shared environments (Meza-Romero et al., 2019; Robinson & Townsend, 2020; Forbat et al., 2017).	The relative contribution of specific fomites is difficult to quantify and likely varies by setting; evidence does not robustly establish pool water as a primary vehicle (Sfyri et al., 2021).	Prevention should prioritize reducing direct contact exposure and controlling fomites (towels, shared equipment), rather than focusing primarily on pool water (Meza-Romero et al., 2019; Sfyri et al., 2021).	(Meza-Romero et al., 2019; Robinson & Townsend, 2020; Forbat et al., 2017; Sfyri et al., 2021)
AD as a risk amplifier and phenotype modifier	AD is associated with increased susceptibility and/or burden of MC through barrier dysfunction and itch-driven autoinoculation; filaggrin-related signals support biological plausibility (Manti et al., 2017; Kojima et al., 2024).	The exact causal pathways and the magnitude of risk by AD severity or phenotype are not fully defined; inflammatory background can confound clinical interpretation (Hill et al., 2024; Silverberg, 2018).	Management should explicitly integrate AD control to reduce scratching and dissemination, and to improve diagnostic clarity and treatment tolerability (Silverberg, 2018; Paller et al., 2024).	(Manti et al., 2017; Kojima et al., 2024; Hill et al., 2024; Silverberg, 2018; Paller et al., 2024)
Swimming-related	Aquatic sport environments plausibly facilitate facility-	There is limited swimmer-specific causal	Risk reduction should emphasize behavior and	(Sfyri et al., 2021; Montyn Lücher et

exposure pathways	associated transmission via shared spaces and high-touch surfaces; swimmer-focused evidence supports relevance of the setting without proving waterborne spread (Sfyri et al., 2021).	evidence isolating which environmental elements drive transmission; conclusions should be cautious and framed as plausibility (Montyn Lücher et al., 2025).	facility practices: strict non-sharing of towels/personal items, attention to locker-room/shower hygiene, and early recognition (Montyn Lücher et al., 2025; Anderson et al., 2023; Truong et al., 2024).	al., 2025; Anderson et al., 2023; Truong et al., 2024)
Clinical management and sport participation impact	Phase 3 RCTs support efficacy of cantharidin 0.7% formulations and berdazimer gel for lesion reduction/clearance (Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024).	Trials are not designed to measure transmission reduction or sport-continuity outcomes directly; AD-related inflammation may complicate tolerability assessment (Paller et al., 2024).	Evidence-based therapy can enable more predictable clearance timelines to support participation planning; decisions should be individualized, considering lesion burden, location, and feasibility of reliable mitigation (Anderson et al., 2023; Truong et al., 2024).	(Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024; Paller et al., 2024; Anderson et al., 2023; Truong et al., 2024)

3.2. Atopic dermatitis as a risk amplifier and modifier of clinical phenotype

Multiple recent lines of evidence support atopic dermatitis as a clinically meaningful susceptibility modifier for molluscum contagiosum. Barrier dysfunction provides a coherent mechanistic framework: impaired stratum corneum integrity and microfissuring facilitate viral entry, while pruritus-driven scratching increases the probability of autoinoculation and multi-site dissemination. Genetic and clinical findings linking filaggrin-related barrier impairment to molluscum contagiosum reinforce this model and suggest that susceptibility in atopic phenotypes is not purely behavioral (Manti et al., 2017; Kojima et al., 2024). Epidemiologic analysis further supports an association between molluscum contagiosum and atopic dermatitis across broader populations, including adults, consistent with the concept that inflammatory barrier disease remains relevant to risk beyond early childhood (Hill et al., 2024). Clinically, the interaction is often bidirectional: molluscum lesions may provoke perilesional eczema and trigger or exacerbate atopic dermatitis, which then increases scratching and propagates further spread, producing a cycle of persistence and dissemination (Silverberg, 2018). For swimmers, this phenotype is consequential because frequent aquatic exposures and friction can aggravate barrier instability, intensify pruritus, and thereby increase both lesion burden and the time during which visible lesions are present.

3.3. Swimming-related exposure pathways and evidence boundaries: supported versus plausible mechanisms

When the swimmer context is analyzed through the lens of the broader transmission evidence, a consistent pattern emerges: the most defensible pathways in aquatic sport settings remain direct contact and fomite-associated transfer around the pool environment rather than waterborne spread itself (Meza-Romero et al., 2019; Robinson & Townsend, 2020; Sfyri et al., 2021). This does not mean that aquatic settings are irrelevant; rather, they function as enablers

of contact and surface-mediated exposure. High-frequency use of communal spaces, shared seating and changing areas, and the practical realities of youth/team training increase opportunities for transfer through towels, clothing, and shared equipment, especially when hygiene practices are inconsistent. Athlete-focused infection literature aligns with this framing by emphasizing shared environments and close contact as recurring risk amplifiers for contagious dermatoses, supporting the rationale for targeted facility hygiene, strict non-sharing practices for personal items, and pragmatic lesion coverage strategies when feasible (Nowicka et al., 2020; Anderson et al., 2023; Truong et al., 2024). Importantly, because swimmer-specific causal studies for molluscum transmission are limited, conclusions about the relative contribution of any single environmental element (for example, a particular surface or shared item) should remain cautious and framed as plausibility rather than certainty (Montyn Lücher et al., 2025). The evidence, however, is sufficiently consistent to justify prevention strategies focused on contact reduction, fomite control, and rapid identification and management of contagious lesions, particularly in swimmers with atopic dermatitis who are more likely to experience extensive disease.

3.4. Clinical management in swimmers with atopic dermatitis and implications for sports participation

The clinical management problem in this population is twofold: achieving lesion clearance and minimizing onward transmission risk while avoiding unnecessary exclusion from sport. In swimmers with atopic dermatitis, diagnosis can be complicated by perilesional eczema that obscures classical morphology, while treatment tolerability and interpretation of local reactions are more challenging because erythema, irritation, and pruritus may reflect either therapy effects or a concurrent atopic flare (Silverberg, 2018; Paller et al., 2024). Recent therapeutic advances have practical relevance for participation planning. Randomized phase 3 trials support the efficacy of provider-applied cantharidin 0.7% formulations and topical nitric oxide–releasing berdazimer gel in reducing lesion burden, expanding evidence-based options beyond observation alone and offering a more structured pathway for athletes who face participation pressure or institutional constraints (Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024). AD-specific analyses of newer therapies further underscore the need to integrate barrier optimization and inflammation control into treatment plans, both to reduce autoinoculation and to improve tolerability and clinical interpretability of skin reactions (Paller et al., 2024).

From a participation perspective, athlete-oriented guidance emphasizes individualized decisions that balance contagiousness management with athlete welfare. Although many formal return-to-play frameworks are derived from contact sports, their core principles translate to swimming: prompt identification, avoidance of sharing personal items, targeted hygiene of high-touch environments, and lesion coverage when feasible, with temporary restriction considered primarily when lesion burden is extensive, lesions cannot be reliably covered, or adherence to mitigation is not realistic in the specific training context (Anderson et al., 2023; Truong et al., 2024). Regulatory confirmation of approved therapies reflects the maturation of practical treatment pathways that can support time-sensitive clearance strategies when participation stakes are high, though regulatory documents primarily inform availability rather than comparative effectiveness (FDA, 2023; Keam, 2024).

3.5. Statistical Hypothesis Testing

Not applicable, as this narrative review synthesizes heterogeneous evidence without generating new quantitative datasets.

4. Discussion

This narrative review synthesizes contemporary evidence on molluscum contagiosum (MC) at the intersection of atopic dermatitis (AD) and aquatic sport participation, where infection-control concerns frequently translate into practical restrictions that may exceed what the evidence supports. Three interpretive points emerge as most consequential for clinical practice and for athlete-facing decision-making. First, the transmission model most consistently supported by contemporary reviews remains dominated by direct contact and autoinoculation, with fomite-mediated spread plausibly contributing in shared environments; by contrast, the literature does not robustly support the common assumption that chlorinated pool water is a primary vehicle for MC transmission (Meza-Romero et al., 2019; Robinson & Townsend, 2020; Forbat et al., 2017; Sfyri et al., 2021). Second, AD modifies both susceptibility and the lived clinical phenotype of MC through barrier dysfunction and pruritus-driven autoinoculation, producing more extensive or persistent disease and more diagnostic and therapeutic ambiguity than is typically appreciated in non-atopic hosts (Manti et al., 2017; Kojima et al., 2024; Silverberg, 2018; Hill et al., 2024). Third, newer evidence-based therapies and a growing athlete-focused dermatology literature provide practical tools to shorten the period of visible lesions and to operationalize risk mitigation without defaulting to broad exclusion from training (Eichenfield et al., 2020; Browning et al., 2022; Anderson et al., 2023; Truong et al., 2024).

A central challenge in aquatic sport settings is the gap between perceived and evidence-supported risk. Swimmers, parents, and coaches frequently attribute MC acquisition to "the pool," and this perception can drive stigmatization and categorical restrictions. However, the available swimmer-related evidence is more compatible with facility-associated exposure—via close contact, shared locker rooms and showers, and shared objects—than with true waterborne transmission under standard pool maintenance (Sfyri et al., 2021). This has practical implications for prevention policy: interventions aimed at the water itself are unlikely to be the most efficient levers, whereas ensuring consistent hygiene of high-touch surfaces, reinforcing strict non-sharing of towels and personal items, and supporting early recognition and management are more aligned with the established contact-fomite-autoinoculation framework (Meza-Romero et al., 2019; Anderson et al., 2023). It also implies that participation decisions should be individualized and based on lesion burden, location, and the feasibility of mitigation measures, rather than on the mere presence of MC in a swimmer.

The AD phenotype requires special emphasis because it amplifies not only risk but also the complexity of clinical management. Barrier dysfunction, supported by filaggrin-related association signals, provides a credible biologic explanation for increased susceptibility and potentially higher lesion burden in atopic populations (Manti et al., 2017; Kojima et al., 2024). The clinical consequence is that swimmers with AD may experience a self-reinforcing cycle: lesions provoke perilesional inflammation and itch, scratching promotes autoinoculation and dissemination, and irritation from water exposure or topical therapy can be difficult to differentiate from eczema flare, potentially delaying effective treatment adjustments (Silverberg, 2018; Paller et al., 2024). This cycle has participation implications because extensive disease increases the logistical difficulty of lesion coverage, increases visible stigma, and may increase the probability that a facility or team imposes restrictions. Therefore, in swimmer populations, MC management should not be conceptualized as lesion treatment alone; it should be framed as a combined strategy of lesion-directed therapy and AD control to reduce scratching-driven spread and to improve treatment tolerability and interpretability.

Therapeutic advances meaningfully shift the feasibility of time-sensitive management in athletic contexts. Phase 3 randomized evidence supports both provider-applied cantharidin 0.7% formulations and topical nitric oxide–releasing berdazimer gel as efficacious approaches for reducing lesion burden (Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024). While these trials were not designed specifically around athletic outcomes, their relevance lies in enabling more predictable clearance trajectories compared with passive observation, which may be acceptable medically but can be operationally

problematic in sports environments where contagious lesions prompt concern. AD-specific analyses of berdazimer provide additional nuance: local reactions and inflammatory background may complicate assessment, reinforcing the need for careful counseling and concurrent barrier-focused care (Paller et al., 2024). Regulatory confirmation of approved treatment options further supports the practicality of proactive management pathways when persistent, extensive, or cosmetically burdensome disease threatens participation or quality of life, although regulatory communications are not substitutes for comparative clinical effectiveness data (FDA, 2023; Keam, 2024).

The question of return-to-play or continued participation in swimming requires an explicit balancing of contagion control with athlete welfare. Athlete-focused guidance and the sports medicine literature increasingly emphasize structured assessment and pragmatic mitigation—lesion coverage when feasible, non-sharing policies for towels and equipment, and attention to facility hygiene—rather than automatic exclusion (Anderson et al., 2023; Truong et al., 2024). In aquatic sport, however, lesion coverage has unique constraints: dressings may loosen in water and repeated wet-dry cycles can irritate atopic skin. This suggests that participation decisions should be tailored to the specific training context, accounting for lesion location, dressing durability, the swimmer's ability to adhere to hygiene measures, and the likelihood of close contact during training. Temporary restriction may be justified when disease is widespread or located in areas prone to friction and exposure, when coverage is unreliable, or when adherence to mitigation is unlikely, but such restriction should be time-limited and paired with a clear management plan to reduce the risk of prolonged exclusion.

The limitations of the evidence base should be transparent. Swimmer-specific studies that isolate MC transmission pathways are scarce, and much of the swimmer-context inference is derived from general transmission principles and broader athlete infection-control literature (Sfyri et al., 2021; Anderson et al., 2023). Moreover, epidemiologic associations between AD and MC do not establish causality in individual cases, although the convergence of mechanistic plausibility and consistent association across studies strengthens confidence that AD functions as a meaningful risk modifier (Manti et al., 2017; Hill et al., 2024). Finally, while randomized treatment trials provide strong evidence for efficacy, their outcomes do not directly measure transmission reduction or sports participation continuity, leaving an implementation gap that must be bridged through clinical judgment and shared decision-making (Eichenfield et al., 2020; Browning et al., 2022). Despite these limitations, the evidence is sufficiently coherent to support an approach that prioritizes contact- and fomite-targeted mitigation, optimizes AD

control, and uses evidence-based therapies to shorten contagious periods when participation stakes are high.

5. Conclusions

Molluscum contagiosum in swimmers with atopic dermatitis should be approached as a predominantly contact- and autoinoculation-driven infection in which shared facilities and fomites can plausibly contribute, while direct evidence for chlorinated pool water as a primary transmission vehicle remains limited. The swimmer context is therefore best understood as an environment that amplifies opportunities for interpersonal contact and surface-mediated exposure, rather than as an inherently waterborne risk, and prevention efforts should be directed accordingly (Meza-Romero et al., 2019; Robinson & Townsend, 2020; Sfyri et al., 2021).

Atopic dermatitis meaningfully modifies susceptibility and clinical course through barrier dysfunction and itch-driven autoinoculation, increasing the likelihood of extensive disease, perilesional eczema, and diagnostic and therapeutic complexity. Evidence linking barrier-related factors such as filaggrin dysfunction to molluscum susceptibility supports the biological plausibility of this risk amplification, while epidemiologic data reinforce that the association between molluscum contagiosum and atopic dermatitis extends beyond early childhood contexts (Manti et al., 2017; Kojima et al., 2024; Hill et al., 2024; Silverberg, 2018). In swimmers, these mechanisms can prolong the period of visible disease and increase participation disruption, underscoring the importance of integrating lesion-directed therapy with barrier optimization and anti-inflammatory AD control.

Recent therapeutic advances provide practical options that can shorten the period of visible lesions and support individualized participation planning. Randomized phase 3 evidence supports both provider-applied cantharidin 0.7% formulations and topical nitric oxide–releasing berdazimer gel as effective therapies, and AD-specific analyses highlight the need for careful counseling regarding local reactions and concurrent eczema management (Eichenfield et al., 2020; Eichenfield et al., 2021; Browning et al., 2022; Sugarman et al., 2024; Paller et al., 2024). For sports participation, the most defensible approach is individualized decision-making grounded in lesion burden, location, feasibility of reliable coverage, and adherence to hygiene and non-sharing practices, rather than categorical exclusion based solely on diagnosis (Anderson et al., 2023; Truong et al., 2024). Clear communication with athletes, families, coaches, and facilities—explicitly distinguishing evidence-supported transmission mechanisms from assumptions—can reduce stigma and prevent unnecessary restrictions while still applying reasonable infection-control safeguards.

Disclosure

The authors declare that this manuscript was prepared independently. No external organization influenced the study design, data interpretation, or the content of the manuscript.

Supplementary Materials

Not applicable.

Author Contributions

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Conflicts of Interest

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