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The Role of *Lactobacillus reuteri DSM 17938* in Athletic Performance and Recovery

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Abstract

Introduction and purpose: The gut microbiota plays a vital role in modulating health, immunity, and recovery, all of which are crucial for athletes. *Limosilactobacillus reuteri* DSM 17938 is a well-documented probiotic strain with anti-inflammatory, immunomodulatory, and gastrointestinal benefits. This review explores its potential application in supporting athletic performance and post-exercise recovery.

Material and method: A narrative literature review was conducted using PubMed, Scopus, and Google Scholar databases. Articles published between 2000 and 2024 were included, with a focus on clinical and experimental studies evaluating the effects of *L. reuteri* DSM 17938 on gastrointestinal function, inflammation, immune response, and athletic outcomes.

Results: Evidence suggests that *L. reuteri* DSM 17938 contributes to gut barrier integrity, reduces exercise-related gastrointestinal discomfort, modulates inflammatory cytokines (e.g., IL-6, TNF-α), and supports immune function. While direct evidence linking this strain to improvements in performance metrics (e.g., endurance, VO_2max) is limited, its supportive role in recovery and resilience is promising.

Conclusions: *L. reuteri* DSM 17938 shows potential as a functional supplement for athletes, particularly in improving gut health, reducing inflammation, and enhancing immune defense. Further clinical research is needed to confirm its direct effects on athletic performance.

Keywords: Lactobacillus reuteri DSM 17938, probiotics, athletic performance, recovery, gut microbiota, inflammation, immunity.

Introduction

Gut microbiota significantly influences both overall health and athletic performance through its multifaceted roles in metabolism, immune function, and mental health. Studies have indicated that gut bacteria help regulate energy homeostasis and maintain gut barrier integrity, both vital for preventing metabolic disorders and fostering recovery in athletes [1–3]. A balanced gut microbiota can enhance nutrient absorption and support muscle recovery, thereby influencing athletic outcomes [3–5].

Moreover, the gut-brain axis suggests that microbiota can affect psychological well-being; specific strains, like Lactobacillus rhamnosus, help mitigate stress-related behaviors, enhancing mental resilience in athletes [6]. The production of metabolites such as short-chain fatty acids by gut microbiota also contributes to the anti-inflammatory responses necessary for exercise recovery [7,8]. Therefore, the maintenance of diverse and balanced gut microbiota should be a priority for athletes focusing on peak performance and overall health.

Lactobacillus reuteri DSM 17938 plays a notable role in sports science, particularly concerning gastrointestinal health and immune support. Research indicates that this specific strain may help reduce exercise-induced gastrointestinal distress, a common issue faced by athletes, thereby potentially contributing to improved performance and comfort during training and competitions [9,10]. Additionally, probiotics such as L. reuteri have been shown to positively affect gut barrier function, which is crucial for nutrient absorption and recovery in competitive sports settings [11,12].

Another vital aspect of L. reuteri's relevance in sports is its potential to modulate immune responses. Regular supplementation with this strain may enhance the body’s defenses against upper respiratory infections, which can hinder training continuity [13]. Furthermore, the gut-brain axis, influenced by gut microbiota, highlights the potential of probiotics in improving mental resilience, particularly for athletes during intense competitive phases [9,14]. Thus, integrating L. reuteri DSM 17938 into the diets of athletes may contribute to both physical performance and psychological well-being.

Aim

The aim of this study is to explore the potential benefits of *Limosilactobacillus reuteri* DSM 17938 in the context of athletic performance and recovery. Specifically, the review focuses on the strain’s effects on gut health, immune function, and inflammation-factors that play a crucial role in supporting athletes’ physical condition and resilience. The goal is to assess current scientific evidence and highlight whether this probiotic can serve as a supportive tool in sports nutrition and recovery strategies.

Materials and methods

This work is based on a narrative literature review aimed at summarizing current knowledge about the potential role of *Limosilactobacillus reuteri* DSM 17938 in athletic performance and recovery. Scientific publications were searched in databases such as PubMed, Scopus, and Google Scholar using keywords including *L. reuteri DSM 17938*, *probiotics in sports*, *gut microbiota*, and *immune response in athletes*. The selection included peer-reviewed articles and clinical studies published in English from 2000 to 2024, with a focus on the probiotic's effects on gastrointestinal health, immune modulation, inflammation, and exercise-related outcomes. Non-relevant articles or those not related to DSM 17938 were excluded. The gathered data were analyzed qualitatively and grouped thematically to provide a comprehensive overview of the topic.

Review and discussion

Lactobacillus reuteri DSM 17938: Biological Properties and Health Potential

Limosilactobacillus reuteri DSM 17938 is distinguished from other probiotic strains largely due to its specific safety profile, enhanced colonization ability, and diverse therapeutic activities. Regarding safety, DSM 17938 is derived from L. reuteri ATCC 55730 and is notable for lacking plasmids associated with antibiotic resistance, making it a safer option for pediatric use, especially in vulnerable populations such as infants [15–19].

In terms of colonization, studies suggest that DSM 17938 exhibits a robust ability to establish itself within the human gut microbiota, achieving significant persistence compared to other strains [17,18]. Its colonization potential is complemented by evidence demonstrating its effectiveness in addressing various gastrointestinal disorders, particularly infantile colic and acute gastroenteritis, where it consistently reduces symptoms and enhances gut health [20–23]. Additionally, DSM 17938 demonstrates notable anti-inflammatory properties, potentially aiding in conditions like inflammatory bowel diseases and offering protection against pathogens through mechanisms like competitive exclusion [24–26]. This multifaceted functional capacity underscores its prominence among probiotic strains [27,28].

Limosilactobacillus reuteri DSM 17938 exhibits notable immunological, anti-inflammatory, and gastrointestinal effects, distinguishing it as a relevant probiotic strain. Immunologically, it enhances the gut-liver axis, influencing immune responses that mitigate inflammation and enhance gut barrier integrity [16,29]. Studies have shown that DSM 17938 can downregulate pro-inflammatory cytokines such as interleukin-8, indicating its anti-inflammatory capabilities [16,26,30]. Furthermore, this strain has been associated with an increase in regulatory T cell populations, which play a significant role in immunomodulation [31].

In terms of gastrointestinal effects, DSM 17938 has demonstrated efficacy in improving gut motility and reducing symptoms of functional gastrointestinal disorders, particularly in infants with colic and constipation [32,33]. Clinical evidence indicates that it shortens the duration of acute infectious diarrhea in children and enhances gastric emptying, supporting its role in gastrointestinal health [34,35]. Moreover, L. reuteri DSM 17938 is recognized for its ability to produce antimicrobial metabolites like reuterin, further contributing to gastrointestinal wellness by inhibiting pathogen growth [26,36].

Limosilactobacillus reuteri DSM 17938 has been extensively studied across diverse populations, including infants and children, demonstrating various beneficial outcomes. In pediatric populations, particularly infants, DSM 17938 has been shown to reduce the duration of acute infectious diarrhea, alleviate symptoms of colic, and improve gastrointestinal function, evidenced by several randomized controlled trials [21,37–39]. For example, one study indicated that administration of DSM 17938 in infants led to a significant decrease in crying time and stool consistency improvement, suggesting its efficacy in managing infantile colic [21,40].
Recent investigations among athletes have highlighted the strain's potential to enhance gut health, which is crucial during intense training regimens. While research suggests that DSM 17938 could improve gut microbiota health and mitigate gastrointestinal distress typically experienced by athletes, more studies are required to fully understand these effects [23,41].
Additionally, in populations with specific conditions, such as preterm infants, the strain has been linked to reduced feeding intolerance and a lower risk of necrotizing enterocolitis [25,39].
In conclusion, L. reuteri DSM 17938 exhibits diverse benefits, emphasizing its role as a functional probiotic across different demographic groups, including healthy individuals and those experiencing gastrointestinal disorders.

Effects of *L. reuteri* DSM 17938 on Athletic Performance

The evidence regarding the impact of *Lactobacillus reuteri* DSM 17938 on physical performance indicators, such as endurance, VO_2max, or strength, remains limited. Most investigations into this probiotic strain focus on its role in gastrointestinal health and related conditions, predominantly in infants and children, rather than athletic performance metrics.
While studies have demonstrated that *L. reuteri* DSM 17938 may be effective in managing gastrointestinal issues, such as reducing constipation and diarrhea [42–44], its efficacy in enhancing physical performance parameters, like VO_2max or strength, has not been explicitly validated in the literature. The existing research primarily centers on gastrointestinal health and immune response, with some implications for overall well-being rather than targeted physical adaptations [24,45,46].
Supplementation with Lactobacillus reuteri DSM 17938 may positively influence biomarkers associated with oxidative stress and inflammation, which are critical factors in exercise-related adaptations. Research indicates that L. reuteri can suppress pro-inflammatory markers such as COX-2 in immune cells, thereby mitigating inflammation [47]. This anti-inflammatory potential can enhance recovery and adaptation to training stress, as supported by evidence of probiotics' role in maintaining immune homeostasis and regulating inflammation [48]. Additionally, L. reuteri has been associated with producing metabolites that regulate host immune responses, potentially countering excessive oxidative stress generated during prolonged physical activity [49].
Moreover, increased antioxidant enzyme activity has been observed with probiotic administration. A study demonstrated that probiotic strains can enhance the activities of superoxide dismutase and catalase, enzymes crucial for combating oxidative stress [50]. This enhancement could lead to improved endurance and recovery in athletes, suggesting that L. reuteri may aid in optimizing training adaptations through its beneficial modulation of oxidative stress and inflammatory responses [51].

Current data on the metabolic and neuromuscular benefits of *Lactobacillus reuteri* DSM 17938 in active individuals is relatively scarce, yet emerging evidence suggests potential advantages. This strain has been reported to have anti-inflammatory properties, which may indirectly support metabolic health by alleviating exercise-induced inflammation [24]. For instance, research indicates that *L. reuteri* can enhance the production of adenosine, a signaling molecule that may influence metabolic pathways beneficial for muscle recovery and energy regulation post-exercise [52].

Additionally, some studies show that probiotics like *L. reuteri* can improve gut health, which is linked to better nutrient absorption and metabolism, potentially enhancing overall athletic performance [27]. However, direct evidence of its impact on neuromuscular performance, such as strength or endurance, remains limited, and further research is required to substantiate these claims specifically in active individuals.

***L. reuteri* DSM 17938 and Recovery: Inflammation, Immunity, and Gut Health in Athletes**

Limosilactobacillus reuteri DSM 17938 is recognized for its immunomodulatory and anti-inflammatory effects, which can significantly impact post-exercise immune function and systemic inflammation. This probiotic strain facilitates immune regulation through various mechanisms, including the modulation of inflammatory cytokines like IL-6 and TNF-α, which are typically elevated after exercise [16,53]. In preclinical studies, DSM 17938 demonstrated a capacity to alleviate multi-organ inflammation in immune dysregulation models, highlighting its potential protective role in systemic inflammation following physical stress [54,55].

Moreover, the probiotic enhances gut health, which is crucial for maintaining optimal immune function post-exercise. It has been shown to support gut barrier integrity and microbiota balance, thus contributing to improved systemic inflammation levels [56,57]. By activating adenosine receptors implicated in inflammation modulation, DSM 17938 can directly influence the immune response following exercise-related stress, thereby potentially reducing unwanted inflammatory responses [55,58].

Supplementation has demonstrated potential benefits in reducing the frequency and severity of upper respiratory tract infections (URTIs) among athletes. For example, a study by Bergendiová et al. showed that pleuran (β-glucan from Pleurotus ostreatus) supplementation enhances cellular immune responses and can alter exercise-induced suppression of natural killer cell activity in athletes, potentially mitigating the risk of respiratory infections [59]. Similarly, probiotics, particularly Lactobacillus species, have been reported to improve immune responses, decreasing both the incidence and severity of infections among populations engaged in strenuous physical activity [60,61].

Moreover, regular intake of anti-inflammatory dietary supplements can modulate the immune system positively, thereby reducing systemic inflammation typically associated with intensive training [62]. Athletes experience altered immune function during heavy training, which can increase susceptibility to URTIs, highlighting the need for appropriate nutritional strategies to bolster their immune defenses [63]. Overall, evidence suggests that specific nutritional interventions can effectively support athlete immune health and minimize the impact of URTIs.

Limosilactobacillus reuteri DSM 17938 is associated with improved gastrointestinal comfort and integrity, especially during intense physical activity.

Research indicates that this probiotic strain promotes gut health by enhancing the integrity of the intestinal barrier, which is crucial for maintaining gastrointestinal comfort under stress conditions such as heavy exercise [27,57]. The mechanism behind this involves its ability to modulate the gut microbiome, reduce gastrointestinal inflammation, and improve gut motility, thereby alleviating symptoms like bloating and discomfort commonly experienced by athletes during strenuous activities [27,64].

Furthermore, supplementation with DSM 17938 has been shown to decrease markers of inflammation within the gut and improve overall gastrointestinal function during periods of intense exercise [65]. In controlled trials, participants reported fewer gastrointestinal disturbances while taking this probiotic, suggesting its effectiveness in enhancing gut comfort and resilience during physical stress [66]. Thus, DSM 17938 serves as a valuable nutritional intervention for athletes aiming to optimize gastrointestinal integrity and comfort during intense physical exertion.

Conclusions

Limosilactobacillus reuteri DSM 17938 emerges as a promising probiotic strain with potential benefits for athletic populations, primarily through its effects on gastrointestinal health, immune modulation, and inflammation control. Although direct evidence linking this strain to measurable improvements in athletic performance metrics such as VO_2max, endurance, or strength remains limited, the indirect contributions of L. reuteri DSM 17938 to recovery and well-being are well-supported.

The strain's ability to enhance gut barrier integrity, reduce gastrointestinal discomfort, and modulate pro-inflammatory cytokines such as IL-6 and TNF-α suggests its utility in mitigating common physiological stressors faced by athletes during intense training periods. Furthermore, by supporting immune function and reducing the incidence of upper respiratory tract infections, L. reuteri DSM 17938 may help maintain training consistency and reduce downtime due to illness.

While most existing research has focused on pediatric and clinical populations, emerging evidence points to the strain's applicability in physically active individuals. Its role in promoting antioxidant activity, regulating inflammation, and improving gastrointestinal resilience highlights its potential as a functional component of athlete-centered nutritional strategies.

Given the growing interest in microbiome-targeted interventions in sports science, further research is warranted to assess the specific impacts of L. reuteri DSM 17938 on performance-related outcomes in diverse athletic settings. Randomized controlled trials with well-defined endpoints are essential to establish evidence-based recommendations for probiotic use among athletes.

In summary, although L. reuteri DSM 17938 is not a direct ergogenic aid, it holds significant promise as a supportive agent in athletic recovery, immune health, and gastrointestinal function-critical components of sustained high-level performance.

Disclosure

Author's contribution: conceptualization, Julia Charkot and Wojciech Bieńkowski; methodology, Wojciech Bieńkowski; software, Wojciech Bieńkowski; check, Irmina Jaszczuk, i; formal analysis, Irmina Jaszczuk; investigation, Julia Charkot; Resources, Irmina Jaszczuk; data curation, Irmina Jaszczuk; writing - rough preparation, Wojciech Bieńkowski; writing - review and editing, Julia Charkot; visualization, Wojciech Bieńkowski; Supervision, Julia Charkot; Project administration, Julia Charkot; Receiving funding, Julia Charkot

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