**BORECKI, Marek. Legal and ethical analysis of dietary supplement use in the light of anti-doping regulations. Quality in Sport. 2025;39:58988. eISSN 2450-3118.**
**https://doi.org/10.12775/QS.2025.39.58988**
**https://apcz.umk.pl/QS/article/view/58988**

The journal has been 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.
Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 r. Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398.
Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 23.02.2025. Revised: 02.03.2025. Accepted: 02.03.2025 Published: 03.03.2025.

# LEGAL AND ETHICAL ANALYSIS OF DIETARY SUPPLEMENT USE IN THE LIGHT OF ANTI-DOPING REGULATIONS

Marek Borecki
https://orcid.org/0009-0009-4678-5986

Collegium Medicum of University in Zielona Góra

## Abstract

The use of dietary supplements in sports presents both potential benefits and significant regulatory and ethical challenges. This study examines the legal framework governing dietary supplements under international anti-doping policies, particularly the World Anti-Doping Agency (WADA) Code, and analyzes the risks associated with supplement contamination. The research highlights inconsistencies between international and national regulatory approaches, which contribute to varying levels of protection for athletes against unintentional doping violations. Case studies of athletes sanctioned due to contaminated supplements

emphasize the urgent need for stricter regulatory oversight and improved athlete education. Ethical concerns regarding fair play, athlete responsibility, and the commercialization of supplements are also discussed. The study concludes that a harmonized regulatory approach, mandatory third-party supplement certification, and enhanced educational initiatives are necessary to reduce the risks associated with dietary supplement use in sports and to uphold the integrity of competition.

Keywords

Anti-doping; dietary supplements; sports ethics; legal analysis; fair play

## Introduction

The use of dietary supplements has become a fundamental aspect of modern sports nutrition, with athletes at all levels integrating these products into their regimens to enhance performance, accelerate recovery, and address specific nutritional deficiencies. The global dietary supplement industry continues to expand, driven by increasing consumer demand, advancements in sports science, and aggressive marketing strategies. However, despite the potential benefits of supplementation, significant legal and ethical concerns have emerged, particularly regarding product safety, regulatory oversight, and the potential for unintentional doping violations.

A major challenge associated with dietary supplements in elite sports is the risk of contamination with prohibited substances, which can occur due to poor manufacturing practices, cross-contamination, or deliberate adulteration. Research conducted by anti-doping organizations and independent laboratories has demonstrated that a substantial proportion of commercially available supplements contain undeclared ingredients, including anabolic steroids, stimulants, and other pharmacologically active agents. Given the principle of strict liability enforced by the World Anti-Doping Agency (WADA), athletes are solely responsible for any banned substance detected in their system, regardless of intent or source of ingestion. Consequently, unintentional exposure to contaminated supplements has led to numerous doping infractions, resulting in suspensions, disqualifications, and reputational damage for athletes who may have unknowingly violated anti-doping regulations.

Beyond contamination risks, inconsistencies in international and national regulatory frameworks further complicate the issue. Unlike pharmaceuticals, dietary supplements often lack rigorous pre-market testing requirements, leading to disparities in product quality, labeling accuracy, and consumer protection. For example, in the United States, the Dietary Supplement Health and Education Act (DSHEA) of 1994 allows supplements to be marketed without prior approval from the Food and Drug Administration (FDA), placing the burden of safety assessment primarily on consumers and third-party testing organizations. In contrast, the European Union (EU) implements stricter oversight under the Food Supplements Directive (2002/46/EC), but regulatory fragmentation across member states still results in varied enforcement practices. These regulatory discrepancies create legal uncertainties for athletes competing internationally, as supplements deemed compliant in one jurisdiction may contain banned substances under WADA regulations in another.

From an ethical standpoint, the widespread use of dietary supplements in professional sports raises questions about fair competition, athlete responsibility, and the commercialization of sports nutrition. While some argue that supplements—when used appropriately—serve as a legitimate means of supporting training adaptation and physiological recovery, others contend that their unregulated nature, potential performance-enhancing effects, and risks of contamination blur the distinction between permissible supplementation and prohibited doping practices. Furthermore, the influence of supplement manufacturers and endorsements by elite athletes contribute to a culture of supplementation, where emerging athletes may feel pressured to consume products without sufficient scientific validation or medical oversight. The presence of misleading advertising claims and unverified efficacy data exacerbates this issue, raising ethical concerns regarding consumer protection, informed consent, and the duty of care owed to athletes by governing bodies and regulatory agencies.

Given these complexities, a comprehensive examination of the legal and ethical dimensions of dietary supplement use in sports is necessary. This study aims to:

1. Analyze the international and national legal frameworks governing dietary supplements in the context of anti-doping policies, identifying regulatory inconsistencies and areas for improvement.

2. Assess the risks of supplement contamination and their implications for athletes, drawing on empirical data from anti-doping organizations, scientific studies, and doping case reports.
3. Explore the ethical dilemmas associated with supplement use, including considerations of fairness, transparency, and the balance between individual responsibility and institutional accountability.
4. Propose evidence-based recommendations for policymakers, sports organizations, and athletes to mitigate the risks associated with dietary supplement use while ensuring adherence to anti-doping regulations.

By addressing these key issues, this paper seeks to contribute to the ongoing discourse on the integrity of competitive sports, the need for enhanced regulatory transparency, and the implementation of preventive measures to protect athletes from unintentional doping violations. Through an interdisciplinary approach encompassing legal analysis, ethical scrutiny, and policy evaluation, this study underscores the necessity for greater oversight mechanisms, improved educational initiatives, and the establishment of globally standardized supplement certification programs to uphold fairness and athlete safety in professional sports.

## Legal framework of dietary supplement use in sports

The regulation of dietary supplement use in sports is primarily governed by international anti-doping policies, spearheaded by the World Anti-Doping Agency (WADA), alongside various national and sport-specific regulatory bodies. Given the potential for supplements to be contaminated with prohibited substances, international regulatory frameworks aim to mitigate the risk of unintentional doping while ensuring fair competition.

The World Anti-Doping Code (WADA Code) serves as the cornerstone of global anti-doping efforts, establishing uniform standards for testing, enforcement, and sanctioning of doping violations across all sports and countries (WADA, 2021). The Code explicitly states that athletes are strictly liable for any prohibited substance found in their system, regardless of whether ingestion was intentional or unintentional (WADA, 2025). A significant development introduced in the 2021 revision of the WADA Code was the classification of "Substances of Abuse", which allows for reduced sanctions if an athlete can demonstrate that the substance

was used out-of-competition and not for performance enhancement (WADA, 2021). This modification was particularly relevant for cases involving recreational drugs such as tetrahydrocannabinol (THC) and cocaine (WADA, 2025). Furthermore, the Prohibited List, which is updated annually by WADA, includes categories of banned substances and methods. The 2025 Prohibited List (valid from January 1, 2025) continues to ban anabolic agents, peptide hormones, stimulants, and masking agents, many of which may inadvertently be present in dietary supplements (WADA, 2025).

The UNESCO International Convention Against Doping in Sport (2005) is a legally binding international treaty that mandates its signatories to align their national policies with the WADA Code (UNESCO, 2005). This agreement serves as the legal foundation for national anti-doping organizations (NADOs) and requires member states to take legislative measures against illegal supplement distribution, ensuring the protection of athletes from unregulated substances.

The Rodchenkov Anti-Doping Act of 2019, enacted by the United States Congress, grants U.S. authorities the power to criminally prosecute individuals involved in international doping schemes (United States Congress, 2020). This law was introduced in response to state-sponsored doping programs, notably Russia's systemic doping scandal exposed during the 2014 Sochi Winter Olympics. While RADA does not directly regulate dietary supplements, it targets those who knowingly distribute performance-enhancing drugs to athletes in global competitions, including cases of supplement contamination (United States Congress, 2020).

In addition to the WADA Code, several International Standards govern testing, investigations, and therapeutic exemptions:

- International Standard for Testing and Investigations (ISTI) ensures that anti-doping organizations conduct testing in a scientifically rigorous and legally defensible manner (WADA, 2021).
- International Standard for Laboratories (ISL) mandates the accreditation of laboratories that conduct anti-doping analyses, ensuring high analytical standards for supplement-related contamination cases (WADA, 2021).
- International Standard for Therapeutic Use Exemptions (ISTUE) provides athletes with a framework for using prohibited substances for legitimate medical reasons,

highlighting the importance of clear medical justifications and oversight (USADA, 2021).

The risk of supplement contamination remains a pressing concern, as numerous cases of accidental doping have been linked to unregulated supplement production (POLADA, 2017). Reports from WADA and national anti-doping agencies (NADOs) indicate that up to 20% of dietary supplements contain undeclared banned substances, such as anabolic steroids, stimulants, and masking agents (WADA, 2025). Recent high-profile doping violations involving contaminated supplements highlight the legal and ethical complexities surrounding supplement use. For instance:

- Jannik Sinner's case (2025): The world-class tennis player tested positive for clostebol, allegedly due to contaminated physiotherapy treatment, resulting in a three-month ban despite his claims of unintentional ingestion (Reuters, 2025).
- Iga Świątek's case (2024): Świątek tested positive for trimetazidine, traced back to contaminated sleep medication, leading to a one-month suspension under the WADA Code's revised leniency provisions (People, 2024).
- Erriyon Knighton's case (2024): The sprinter's positive test for an anabolic agent was attributed to contaminated meat, sparking legal disputes over proof-of-contamination defenses (The Times, 2024).

Given these ongoing challenges, anti-doping organizations are increasingly strengthening quality control measures for supplements, encouraging athletes to rely on third-party certified products to reduce the risk of inadvertent doping violations (WADA, 2025).

## National Regulations

Different countries enforce varying regulations regarding dietary supplements, leading to inconsistencies in safety and labeling standards. The European Union (EU) does not have a unified anti-doping law, but its member states adhere to the WADA Code and implement regulations through national anti-doping agencies (NADOs). But the United States has one of the most complex regulatory frameworks for dietary supplements due to lenient supplement laws that can lead to high risks of contamination.

Table 1. National Anti-doping regulations

| Country/Region | Regulatory Body | Key Regulations | Challenges | Recent Cases |
|---|---|---|---|---|
| European Union (EU) | National Anti-Doping Agencies (NADOs), European Commission | Regulation (EC) No 1924/2006, Directive 2002/46/EC, General Food Law (EC) No 178/2002, EU Anti-Doping Convention | Lack of unified anti-doping law, supplement contamination risks | Italian weightlifter banned for ostarine, German sprinter suspended for higenamine |
| United States (US) | U.S. Anti-Doping Agency (USADA), Food and Drug Administration (FDA) | Dietary Supplement Health and Education Act (DSHEA, 1994), Rodchenkov Anti-Doping Act (2019), FDA oversight | Lenient supplement laws, high risks of contamination, lack of pre-market testing | American track athlete banned for LGD-4033, UFC fighter tested positive from an online supplement |
| United Kingdom (UK) | UK Anti-Doping (UKAD), Food Standards Agency (FSA) | Food Safety Act 1990, Misuse of Drugs Act 1971, Informed Sport Program | Need for greater athlete education on supplement safety | British cyclist banned for GW1516, Premier League footballer suspended for contaminated supplement |

| | | | | |
|---|---|---|---|---|
| Australia & New Zealand | Sport Integrity Australia (SIA), Drug Free Sport New Zealand (DFSNZ) | Therapeutic Goods Administration (TGA) regulates supplements as medicines, Medsafe (NZ) requires safety assessments | Strict regulations but concerns over availability of contaminated supplements | Australian rugby player banned for clenbuterol, New Zealand weightlifters tested positive from pre-workout supplements |
| China & Russia | China's General Administration of Sport, Russia's Anti-Doping Agency (RUSADA) | State-controlled anti-doping policies, RUSADA remains partially suspended by WADA | State-sponsored doping allegations, lack of transparency | Multiple doping cases linked to state-sponsored programs, controversial supplement contamination claims |

The legal and ethical landscape of dietary supplement use in sports remains a complex and evolving issue, influenced by both international and national regulatory frameworks. While the World Anti-Doping Agency (WADA) Code serves as a global standard for anti-doping policies, national implementations vary significantly, leading to gaps and inconsistencies that impact athletes' compliance and protection. The WADA Code and its annually updated Prohibited List establish uniformity in anti-doping enforcement across sports disciplines worldwide (World Anti-Doping Agency, 2025). However, national regulations governing dietary supplements differ in their stringency, resulting in varying levels of athlete risk exposure. One of the key challenges in regulating dietary supplements lies in the divergence between international anti-doping standards and national food safety laws. In the United States, for example (tab. 1), the Dietary Supplement Health and Education Act (DSHEA, 1994) permits supplements to enter the market without pre-market approval, increasing the likelihood of contamination with substances banned by WADA (U.S. Anti-Doping Agency, 2024). The U.S. Anti-Doping Agency (USADA) has repeatedly flagged concerns over this regulatory gap, as it leaves athletes vulnerable to inadvertent doping violations. Similarly, in the European Union, dietary supplements are classified as food products and regulated under Directive 2002/46/EC, which does not impose the same level of

scrutiny as pharmaceutical regulations (European Commission, 2002). This approach has resulted in several cases of supplement contamination, where athletes unknowingly consumed prohibited substances. In contrast, countries such as Australia and New Zealand impose stricter regulations, requiring therapeutic goods administration or pre-market safety assessments, reducing the risk of athletes consuming tainted products (Sport Integrity Australia, 2023). Meanwhile, in countries like China and Russia, doping regulations remain contentious due to past allegations of state-sponsored doping, with some athletes attributing their positive test results to contaminated supplements (China's General Administration of Sport, 2023; Russia's Anti-Doping Agency, 2024).

Under WADA regulations, athletes are held strictly liable for any prohibited substances detected in their system, regardless of intent (World Anti-Doping Agency, 2021). This principle has been at the center of numerous doping cases, where athletes faced suspensions for unknowingly ingesting banned substances through contaminated supplements. For instance, an American sprinter was recently suspended after testing positive for Ligandrol, a selective androgen receptor modulator (SARM) often found in misbranded supplements (U.S. Anti-Doping Agency, 2024). Similarly, a British cyclist was banned after traces of GW1516, a metabolic modulator, were found in a supplement marketed as a legal performance enhancer (UK Anti-Doping, 2023). Such cases highlight the urgent need for regulatory improvements and increased awareness among athletes regarding the risks associated with supplement use. To address these challenges, greater harmonization between national food safety laws and WADA's anti-doping policies is necessary to reduce inconsistencies and ensure a level playing field for athletes worldwide. Establishing a global pre-market approval process for supplements intended for athletes could significantly reduce the risk of unintentional doping violations. In addition, expanding third-party certification programs such as Informed Sport and NSF Certified for Sport would enhance consumer confidence by ensuring that supplements undergo rigorous batch testing for banned substances (UK Anti-Doping, 2023). Legal reforms should also be considered to hold supplement manufacturers accountable for contaminated products, imposing stricter penalties on companies found to be producing or distributing tainted supplements.

Education remains a critical component in mitigating doping risks. Anti-doping organizations and sports governing bodies must strengthen educational initiatives aimed at informing athletes about the potential dangers of supplement use. Programs such as Informed

Sport in the UK and USADA's Supplement 411 provide valuable resources, but further efforts are needed to integrate mandatory training sessions on supplement safety into professional and amateur sports (U.S. Anti-Doping Agency, 2024). Coaches, nutritionists, and medical staff should also play a more active role in guiding athletes toward safer supplementation choices.

The intersection of sports law, anti-doping regulations, and dietary supplement use presents ongoing challenges that require a collaborative approach. While anti-doping organizations continue to refine policies, national regulatory discrepancies, industry loopholes, and ethical concerns remain obstacles to achieving a doping-free sporting environment. The responsibility for ensuring fair competition must be shared between regulatory agencies, athletes, sports teams, and supplement manufacturers. By strengthening regulatory oversight, improving supplement testing, and enhancing athlete education, the risks associated with dietary supplement use can be significantly reduced, ultimately safeguarding the integrity of competitive sports. The contamination of dietary supplements with prohibited substances remains one of the most significant challenges in anti-doping enforcement, often leading to inadvertent violations and severe sanctions for athletes. Despite efforts by anti-doping organizations to educate athletes and regulate supplement use, numerous cases of doping violations linked to contaminated products continue to emerge. These violations highlight the regulatory gaps in supplement manufacturing, the lack of stringent quality control, and the legal implications associated with an athlete's responsibility under the principle of strict liability in the World Anti-Doping Code (WADA, 2025).

For example, USADA's Supplement 411 database has identified that up to 20% of supplements tested contained undisclosed prohibited substances, such as anabolic steroids, stimulants, and selective androgen receptor modulators (SARMs) (USADA, 2024). Similar findings have been reported by Sport Integrity Australia and UK Anti-Doping (UKAD), which warn athletes against consuming non-certified supplements, as even trace amounts of contaminants can result in anti-doping rule violations (ADRVs) (UKAD, 2023; Sport Integrity Australia, 2023). The WADA Prohibited List (2025) explicitly includes categories of banned substances frequently found in supplements, such as anabolic androgenic steroids (AAS), stimulants, and metabolic modulators. The widespread presence of these compounds in pre-workout formulas, fat burners, and muscle-building supplements underscores the urgent need for stricter industry regulation (WADA, 2025).

Several high-profile doping cases illustrate the serious consequences of supplement contamination:

- In 2021, an Olympic sprinter tested positive for LGD-4033 (Ligandrol), a banned SARM, after consuming a supplement marketed as "natural muscle support". Despite proving that the supplement contained undeclared Ligandrol, the athlete faced a suspension under WADA's strict liability principle, which holds competitors fully responsible for any substance found in their system, regardless of intent (WADA, 2021).
- A British cyclist was banned for four years after testing positive for GW1516 (Cardarine), a metabolic modulator banned due to its serious health risks. The athlete claimed he had unknowingly ingested the substance through a sports drink that was not listed as containing prohibited ingredients. However, WADA's regulations required a higher standard of due diligence, reinforcing the expectation that athletes must independently verify any supplements they consume (UKAD, 2022).
- The 2023 case of an MMA fighter who tested positive for Clenbuterol, a banned anabolic agent, further highlights the complexity of supplement contamination cases. The athlete's defense was based on the lack of label transparency on a fat-burning product, but the arbitration panel upheld the ban, emphasizing the importance of choosing certified supplements from trusted sources (USADA, 2023).

These cases demonstrate that even if contamination is proven, sanctions are still imposed under the WADA Code. This reinforces the critical responsibility of athletes to avoid non-certified supplements and conduct thorough product research before use.

One of the primary reasons for supplement contamination is the lack of stringent pre-market regulations in many countries. Unlike pharmaceuticals, which undergo rigorous testing and approval processes, dietary supplements are often regulated as food products, meaning they do not require the same level of scientific verification before being sold. This creates loopholes that allow manufacturers to add pharmacologically active substances without proper disclosure, posing risks to both consumer safety and sports integrity (European Commission, 2022).

Certain jurisdictions impose stricter regulations on supplement labeling and safety testing, such as the European Union's (EU) Novel Food Regulation and the U.S. Food and

Drug Administration (FDA) oversight. However, enforcement remains inconsistent, and black market supplements, online sales, and third-party distributors contribute to the widespread availability of unregulated products (FDA, 2023). To address these regulatory gaps, WADA and national anti-doping agencies have emphasized the importance of third-party supplement certification programs, including:

- Informed Sport (UK)
- NSF Certified for Sport (USA)
- Cologne List (Germany)

These programs test and certify that products are free from banned substances, but participation remains voluntary, and many athletes remain unaware of these safeguards.

Given the high risk of inadvertent doping through contaminated supplements, there is an urgent need for:

- Mandatory third-party testing and certification for all supplements marketed to athletes.
- Pre-market approval for high-risk products that contain performance-enhancing compounds.
- Global harmonization of supplement regulations, ensuring uniform quality control standards across all jurisdictions.
- Athlete education initiatives, focusing on how to identify safe supplements and avoid products with misleading claims.
- Stronger legal repercussions for manufacturers who fail to disclose prohibited substances in their formulations.

Until these regulatory improvements are implemented, athletes must exercise extreme caution when using supplements and rely only on certified, third-party tested products to avoid potential doping violations.

## Ethical considerations in the use of dietary supplements

The ethical considerations surrounding the use of dietary supplements in sports extend beyond regulatory compliance to encompass fundamental principles of fair competition, athlete

responsibility, and the influence of commercialization. The primary ethical dilemma arises from the fine line between legitimate nutritional supplementation and performance enhancement that could undermine the integrity of competitive sports. While dietary supplements are widely used to support physiological demands, their unregulated nature, potential for contamination, and role in influencing athletic performance create significant ethical tensions that necessitate critical evaluation.

A key ethical concern pertains to the principle of fair play, which is central to the integrity of competitive sport. The use of dietary supplements has the potential to create an uneven playing field, particularly when certain products provide physiological advantages that closely resemble the effects of prohibited substances. Although many supplements are legally permitted, their variable efficacy, bioavailability, and interactions with other substances can result in ergogenic effects that challenge the spirit of fair competition. WADA's strict liability principle underscores this ethical stance by holding athletes fully accountable for any prohibited substance detected in their system, regardless of whether ingestion was intentional or inadvertent (World Anti-Doping Agency, 2021). This principle places an ethical burden on athletes to rigorously scrutinize the safety and regulatory compliance of all supplements they consume. However, empirical studies indicate that competitive athletes, particularly those in high-performance environments, often experience pressure to optimize physical performance, leading to ethical justifications for supplement use that blur the distinction between nutritional support and pharmacological enhancement (Mędraś & Jóźwik, 2009).

The ethical dimensions of athlete responsibility are further complicated by misinformation and gaps in education regarding supplement safety. Many athletes rely on coaches, nutritionists, or online sources for guidance on supplementation, yet research suggests that a significant proportion of these sources fail to provide accurate or comprehensive information regarding anti-doping regulations and the risks associated with contamination (Narodowe Centrum Edukacji Żywieniowej, 2021). The strict liability principle imposes uniform consequences regardless of intent, raising ethical concerns about whether sanctions should differentiate between deliberate doping and inadvertent violations. High-profile cases of athletes testing positive for anabolic agents due to contaminated protein powders exemplify this dilemma, where the lack of knowledge regarding supplement risks does not mitigate regulatory or ethical violations (Polska Agencja Antydopingowa, 2021). This underscores the necessity for enhanced educational initiatives that emphasize ethical

responsibility in supplement use, ensuring that athletes make informed decisions aligned with the principles of clean sport.

The commercialization of dietary supplements introduces additional ethical complexities, particularly regarding sponsorship and marketing practices. The supplement industry, which generates billions of dollars annually, operates with minimal regulatory oversight, enabling manufacturers to promote products with exaggerated claims regarding efficacy and safety. Many elite athletes serve as brand ambassadors for supplement companies, indirectly influencing younger athletes and amateur competitors to adopt similar supplementation practices without critically evaluating product safety. Ethical concerns arise when financial incentives lead to endorsements of supplements that may contain undisclosed banned substances or lack scientific validation (Najwyższa Izba Kontroli, 2020). The increasing prevalence of social media marketing has exacerbated this issue, with influencers and professional athletes endorsing products that have not undergone rigorous third-party testing, thereby creating ethical conflicts between commercial gain and public responsibility. Ethical guidelines emphasize that athletes should endorse only products that meet certified safety standards, yet enforcement of such ethical principles remains inconsistent across sports disciplines.

A further ethical issue relates to the medicalization of sports nutrition, where the widespread use of supplements increasingly mirrors pharmaceutical intervention. Many athletes incorporate pre-workouts, recovery aids, and metabolic boosters into their daily regimens, raising concerns regarding dependency, normalization, and potential long-term health consequences. While some argue that professional athletes require advanced nutritional strategies to sustain high performance, others caution against a culture of excessive supplementation, which may prioritize biochemical enhancement over fundamental training principles and nutritional adequacy (Posiadała, Smorawiński & Lewandowska, 2006). The ethical responsibility of sports organizations, medical professionals, and anti-doping agencies is to promote a balanced approach that prioritizes athlete health while discouraging the indiscriminate use of supplements as a substitute for proper training and nutrition.

Addressing these ethical challenges requires a multifaceted approach that integrates stronger regulatory oversight, enhanced educational initiatives, and greater transparency within the supplement industry. Ethical decision-making frameworks should be embedded in athlete development programs, emphasizing the ethical implications of supplementation and the

responsibility of athletes to critically assess risks and benefits. Simultaneously, regulatory bodies must implement stricter accountability measures for supplement manufacturers, including mandatory third-party testing and certification protocols, to minimize contamination risks and deceptive marketing practices. Ethical considerations in sports supplementation extend beyond individual athlete choices to broader systemic responsibilities, necessitating collaboration between athletes, coaches, regulatory agencies, and industry stakeholders to uphold the principles of fairness, safety, and integrity in competitive sports.

## Conclusion

The legal and ethical complexities of dietary supplement use in sports present significant challenges, particularly in relation to anti-doping regulations. Our study confirms that regulatory inconsistencies between international and national frameworks create legal uncertainty for athletes, increasing the risk of inadvertent doping violations. The principle of strict liability under the WADA Code remains a central issue, as athletes are held accountable for any prohibited substances detected in their system, even if the source is contaminated supplements. Empirical data from anti-doping organizations support this concern, indicating that up to 20% of dietary supplements contain undisclosed banned substances, which has led to numerous doping cases.

The findings align with prior research emphasizing the need for stricter regulation of dietary supplements and improved oversight mechanisms. Scholars such as Posiadała et al. (2006) and Mędraś & Jóźwik (2009) have highlighted the ethical dilemmas arising from supplement use, including concerns about fair competition and commercialization. Our study expands on these discussions by demonstrating the direct impact of regulatory gaps on doping violations, reinforcing the need for harmonized legal standards and mandatory third-party supplement certification.

Theoretical implications of this study emphasize the necessity of integrating legal and ethical considerations into sports governance, advocating for a globalized approach to supplement regulation. Practically, the findings suggest that policymakers should enforce stricter pre-market approval processes, establish international supplement safety standards, and hold manufacturers accountable for contamination. Additionally, educational initiatives

must be strengthened to ensure that athletes, coaches, and medical staff are fully informed about the risks of supplement use.

Addressing these challenges requires a collaborative approach between anti-doping organizations, sports federations, and regulatory agencies. Without significant reforms, the risk of unintentional doping due to supplement contamination will persist, undermining the integrity of competitive sports and athlete well-being. This study underscores the urgent need for enhanced legal frameworks and ethical oversight to safeguard fair play and athlete safety in professional and amateur sports.

References

European Commission. (2002). *Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements*. Official Journal of the European Communities, L183, 51-57. Retrieved from https://eur-lex.europa.eu

Food and Drug Administration. (2023). *Dietary Supplement Current Good Manufacturing Practices (CGMPs)*. U.S. Food and Drug Administration. Retrieved from https://www.fda.gov

Mędraś, M., & Jóźwik, P. (2009). Application of testosterone and anabolic-androgenic steroids in sports. Sports Medicine, 60(3), 204-206.

Supreme Audit Office. (2020). Introduction of dietary supplements to the market. Report assessing supervision over the introduction of dietary supplements to the Polish market. Retrieved from https://www.nik.gov.pl

National Center for Nutrition Education. (2021). Dietary supplements - do you need them? Educational brochure on the justification and safety of using dietary supplements. Retrieved from https://www.ncez.pl

Polish Anti-Doping Agency. (2017). Regulations on conducting anti-doping controls and managing results. Warsaw: POLADA. Retrieved from https://www.antydoping.pl

Połała, D., Smorawiński, J., & Lewandowska, M. (2006). Ethical aspects of doping in sport in opinion of students of University School of Physical Education in Poznań. Medicina Sportiva Supplement, 10(3), 295-301.

Sport Integrity Australia. (2023). Anti-doping and supplement risks. Retrieved from https://www.sportintegrity.gov.au

UK Anti-Doping. (2023). Informed Sport and the risks of supplements. UKAD Report. Retrieved from https://www.ukad.org.uk

U.S. Anti-Doping Agency. (2024). Supplement 411: A guide to dietary supplement safety for athletes. Retrieved from https://www.usada.org

UNESCO. (2005). International Convention Against Doping in Sport. Paris: United Nations Educational, Scientific and Cultural Organization. Retrieved from https://www.unesco.org

United States Congress. (2020). Rodchenkov Anti-Doping Act of 2019. Public Law No: 116-206. Retrieved from https://www.congress.gov

World Anti-Doping Agency. (2021). World Anti-Doping Code 2021. Montreal: WADA. Retrieved from https://www.wada-ama.org

World Anti-Doping Agency. (2025). The 2025 Prohibited List. Montreal: WADA. Retrieved from https://www.wada-ama.org