

AU InforMed

Volume 24 Number 4 (Issue 356)

Thursday, June 18, 2026

Guest Editors: Jansen Rogers, Kamryn Richardson, Alexis Keene, Pharm D. Candidates 2027
Bernie R. Olin, Pharm D.



Key Inforbits

- Dietary supplements in America
- The dangers of adulterations
- What can pharmacists do?
- Electronic verification safety systems
- Evidence based supplements

Supplements: Trendy and Dangerous

Over-the-counter (OTC) dietary supplements are a hot commodity in America. More than half of Americans over the age of 20 years old reported taking at least one dietary supplement in the past 30 days.¹ The *Journal of the American Medical Association*

conducted a study and pulled information from the U.S Food and Drug Administration (FDA) Center for Drug Evaluation and Research database from 2007 through 2016.² The investigators showed that 776 dietary supplements were found to be adulterated

and 146 different dietary supplement companies were implicated.² The OTC products that were found to be adulterated were mainly those marketed for sexual enhancement (353 [45.5%]), weight loss (317 [40.9%]), muscle building (92 [11.9%]) with 619 of those products containing one unapproved drug ingredient and 157 of those products containing more than one. The contaminants were sildenafil for sexual enhancement, sibutramine for weight loss, and anabolic steroids or steroid-like ingredients for muscle building supplements.² Safety to our patients is of the utmost importance and it is the pharmacist's job to ensure that we are recommending safe products for our patients. While the former statement is true, as pharmacists, we should also seek to know and understand the efficacy of these supplements. Many patients come to the pharmacy counter asking if a specific product will help them lose fat, build muscle, improve recovery, etc. In this discussion, we will also highlight the key supplements that have robust data supporting their safety and efficacy.



[Image courtesy of NBC News](#)

The prevalence of supplement use is exploding, and the knowledge surrounding them is simply not able to keep up. This newsletter serves to bridge the gap by expanding on the rising issue of OTC supplement use, the dangers of contamination, how to screen companies and their products for quality assurance, and to identify the safety and efficacy of key evidence-based OTC supplements for weight loss, muscle gain, and performance enhancement.

Adulteration of supplements is a rising issue in America. The issue stems from The Dietary Supplement Health and Education Act (DSHEA) of 1994. This act amended the Federal Food, Drug, and Cosmetic Act. DSHEA removed the FDA's ability to approve dietary supplements for safety and effectiveness before they reach the market.³ It is only after the product reaches the market that the FDA is able to study the supplement for safety, efficacy, and contamination. The FDA acknowledges this issue and strongly encourages patients to speak with their pharmacist or physician before deciding to purchase a dietary supplement. The adulterated supplements identified in the FDA database that were being used for sexual enhancement were found to have the active ingredients, sildenafil, tadalafil, and dapoxetine, an antidepressant not approved by the FDA.² Additionally, two supplements in this category contained sibutramine, an active pharmaceutical ingredient also commonly found in weight loss supplements.² Sibutramine (Meridia) is a schedule IV controlled substance used for the treatment of obesity. Sibutramine has been withdrawn from both the U.S. and Canadian markets after the Sibutramine Cardiovascular OUTcomes (SCOUT) trial indicated it caused an increased risk of heart attack and stroke in sibutramine-treated patients with cardiovascular disease.^{4,5} Adulterated supplements being used for weight loss contained sibutramine and its analogues, and phenolphthalein, a laxative that was also removed from the market, and fluoxetine.² Among the 317 adulterated weight-loss supplements identified, six contained additional active pharmaceutical ingredients, including bumetanide, cetilistat, orlistat, diclofenac, demethylamylamine, fenproporex, furosemide, lorcaserin, phenytoin, propranolol, rimonabant, and an unspecified diuretic.² Fenfluramine was also found among this list, a medication that was withdrawn from the market after it was found to increase the risk of atrial regurgitation.⁶ For the 92 adulterated substances being used for muscle gain, 73 were found to be contaminated with undeclared anabolic steroids or steroid-like substances.² The Commissioner of the FDA wrote a letter to supplement manufacturers stating they found supplements contaminated with undeclared pharmaceutical agents, warfarin and benzodiazepines.

Why Is Supplement Adulteration Dangerous?



The danger of supplement adulteration is that patients often believe dietary supplements are safe because they are marketed as "natural." However, many adulterated supplements contain undeclared pharmaceutical ingredients that can expose patients to significant health risks without their knowledge. Unlike prescription medications, patients may not report supplement use to healthcare providers, increasing the likelihood of adverse events, drug interactions, and delayed recognition of toxicity.

For example, sildenafil and tadalafil found in sexual enhancing supplements can cause severe hypotension when taken with nitrates or other vasodilating medications. Undeclared sibutramine, commonly identified in weight-loss products, has been associated with an increased risk of myocardial infarction and stroke, particularly in patients with underlying cardiovascular

disease. Similarly, anabolic steroids found in muscle building supplements may lead to hepatotoxicity, hypertension, dyslipidemia, infertility, mood disturbances, and suppression of endogenous testosterone production.

The risk becomes even greater when patients have chronic disease states or are taking prescription medications. Hidden active pharmaceutical ingredients may duplicate therapy, worsen existing medical conditions, or interact with prescribed treatments. Because these substances are not listed on the product label, patients and healthcare professionals are unable to accurately assess safety before use. This lack of transparency creates a significant patient safety concern and highlights the importance of pharmacist involvement in evaluating supplement quality and counseling patients on evidence-based product selection.

Ultimately, the concern extends beyond simple contamination. Adulterated supplements can expose patients to medications that have been withdrawn from the market due to safety concerns, substances banned in athletic competition, and ingredients with unknown doses or purity. These products may provide little warning before causing serious adverse outcomes, making vigilance from both patients and healthcare professionals essential.

How Can a Pharmacist Help?

The best way a pharmacist can help patients select safe products is to help them look for an independent, third party testing mark. Specific third parties a pharmacist needs to know about include Informed Choice/ Informed Sport and NSF Certified for Sport. These third party testing companies verify label claims against the product contents, protect against the adulteration of products with prohibited substances, and help identify substances that are banned from competition in the finished product.⁸ By recommending a supplement that is third party tested by a reputable organization, pharmacists can confidently know that the product they have chosen does not contain any potentially harmful ingredients.⁸



[Image courtesy of Nutraceuticals](#)



[Image courtesy of Informed Choice](#)

Pharmacists can also aid this growing issue by implementing a third-party verified only policy. By doing this, pharmacists can prevent harmful supplements from even reaching the hands of their patients. Most patients do not consider natural or herbal products to be OTC medications.

Pharmacists should always be asking open ended questions regarding a patient's dietary supplement use to a supplement related adverse events, drug interactions, and provide education on the safe use of their supplements.

Pharmacists also have a great opportunity to practice pharmacovigilance. If a pharmacist identifies to a side effect, they to the brand name, lot number, and specific adverse events. Below are some resources to aid in the screening of supplements and identification of known, or potentially adulterated products; hyperlinks have been inserted into each database name for convenience. Pharmacists can also aid this growing issue by implementing a third-party verified only policy. By doing this, pharmacists can prevent harmful supplements from even reaching the hands of their patients. Most patients do not consider natural or herbal products to be medications. Pharmacists should always be asking open ended questions regarding a patient's

dietary supplement use for related adverse events, drug interactions, and provide education on the safe use of their supplements. Pharmacists also have a great opportunity to practice pharmacovigilance. If a pharmacist identifies to a side effect, they to the brand name, lot number, and specific adverse events. Below are some resources to aid in the screening of supplements and identification of known, or potentially adulterated products; hyperlinks have been inserted into each database name for convenience.

Electronic Verification Safety Systems:

FDA MedWatch Electronic List:

- A safety and adverse events reporting program. Pharmacists can sign up for immediate email notifications for identified adulterated products. Notifications include alerts about drugs, over the counter supplements, medical devices, etc.

FDA Health Fraud Product Database:

- A searchable online registry reporting products that were found to be adulteration with hidden unlisted pharmaceutical agents. Contains many products labeled for body building, enhanced performance, and weight loss.

FDA Recalls, Market Withdrawals & Safety Alert Page:

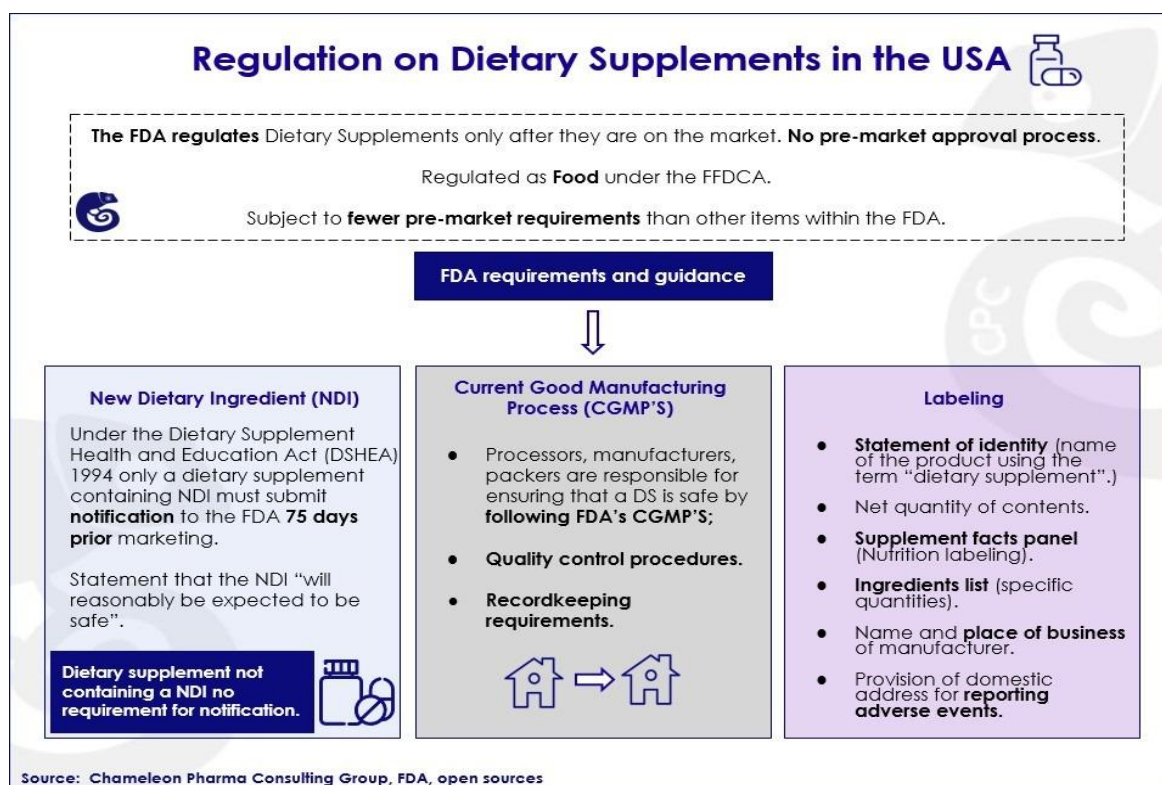
- Database tracking active product recalls and withdrawals due to manufacturer failures or contamination. This database includes medications, supplements, and medical devices.

U.S. Anti-Doping Agency (USADA) Supplement Connect & High Risk List:

- This database allows users to search for products and manufacturers that have received warnings from the FDA. It also has a list of products that have been directly tested and found to contain World Anti-Doping Agency (WADA) prohibited substances. Additionally, it has provider education on the suffixes that are commonly associated with prohibited substances, including but not limited to, -ol, -diol, -stene, or -amine.

Global Drug Reference Online (GDRO):

- This is a partnership between many international anti-doping agencies. Clinicians can type individual chemical ingredients listed on the product label and can see if they are always banned in competition. This resource would be geared towards athletes who may be concerned about a specific product in their supplement.



Evidence Based Supplements

Given the large number of dietary supplements available to consumers, pharmacists should be familiar with products that have demonstrated both safety and efficacy in clinical research. Table 1 summarizes several evidence-based supplements commonly used for performance enhancement, muscle growth, recovery, and overall health. Key benefits, dosing considerations, potential adverse effects, and their use during competition are highlighted to aid in patient counseling. The supplements discussed below represent some of the most extensively studied and clinically supported options currently available.

Table 1: Evidence-Based Dietary Supplements

Supplement	Primary Benefit	Evidence Strength	Typical Dose	Major Safety Concerns	Banned In Competition?
Creatine Monohydrate	Increases strength, lean mass, recovery, training adaptations	Strong	3-5 g daily	Weight gain from water retention	No
HMB	May reduce muscle breakdown and aid recovery	Weak-mixed	3 g/day commonly studied	Generally well tolerated	No

Vitamin D	May improve performance and immunity in deficient individuals	Moderate (only if deficient)	Based on deficiency status	Excessive supplementation may cause toxicity	No
Caffeine	Improves endurance, alertness, power output, repeated sprint performance	Strong	3-6 mg/kg 60 minutes before exercise	Anxiety, insomnia, jitteriness, tachycardia	No – disclaimer: it is on the NCAA banned list above certain urinary thresholds
Dietary Nitrate	Improves endurance and exercise efficiency	Moderate-strong	310-560mg nitrate 2-3 hours pre-exercise	GI upset	No
Beta-Alanine	Delays fatigue during high-intensity exercise	Moderate	~65 mg/kg/day divided doses	Paresthesia (tingling)	No
Sodium Bicarbonate	Improves short-duration high-intensity performance	Moderate	0.2-0.4 g/kg pre-exercise	Significant GI distress	No
Protein	Supports muscle growth and recovery	Strong	1.6-2.2 g/kg/day total protein intake	Generally well tolerated	No

*Evidence strength presented in the table is established by the IOC consensus statement¹⁰

Creatine Monohydrate

Creatine is a naturally occurring compound that is obtained through dietary sources and also produced by the body.⁹ Insufficient dietary intake of creatine can lead to lower creatine stores in both muscle tissue and the bloodstream. Creatine supplementation has been associated with several potential benefits, including increases in lean body mass and muscular strength, improved recovery following high-intensity exercise, and enhanced training adaptations through greater growth factor activity and gene expression.⁹ Additional reported benefits include increased intracellular water content, reduced symptoms and faster recovery after intense workouts, improved recovery during periods of immobilization or inactivity following injury, enhanced cognitive function, and a potential role in reducing the risk of or aiding recovery from mild traumatic brain injury (mTBI). Creatine is one of the most extensively researched dietary

supplements and is generally considered safe for healthy individuals.⁹ A modest increase in body weight is commonly observed with supplementation, primarily due to increased water retention within muscle cells. This effect may be important for athletes participating in weight-class sports or activities where additional body mass could negatively affect performance.⁹ Although some studies suggest improvements in cognitive processing, it remains unclear whether these cognitive effects directly translate into enhanced athletic performance.

Beta-hydroxy beta-methylbutyrate (HMB)

Beta-hydroxy beta-methylbutyrate (HMB) is a compound produced during the metabolism of the essential amino acid leucine.⁹ HMB supplementation has been investigated for its potential to increase lean muscle mass, improve strength, and enhance training adaptations by reducing muscle protein breakdown. It may also help lessen muscle damage and improve recovery following strenuous exercise. Despite these potential benefits, the current evidence does not support a strong recommendation for HMB supplementation in athletes. Research suggests that its effects may not provide additional advantages beyond those achieved by meeting established dietary protein intake recommendations.⁹ HMB may have a potential role in rehabilitation settings, particularly during periods of prolonged inactivity or immobilization; however, the available evidence in these populations remains limited.

Vitamin D

Vitamin D3 is an essential fat-soluble vitamin that plays a critical role in numerous physiological processes.⁹ Approximately 90% of the body's vitamin D is produced through skin exposure to sunlight, with the remainder obtained from dietary sources. Vitamin D insufficiency and deficiency have been reported in athletes at all levels of competition, from recreational participants to professional athletes, particularly in situations where sunlight exposure is limited.⁹ Inadequate vitamin D levels have been associated with impaired adaptations to exercise, an increased risk of upper respiratory tract infections (URTIs), a greater likelihood of injury, and elevated physiological stress. For individuals who are deficient, supplementation may help support exercise adaptations, reduce the frequency, duration, and severity of URTIs, and improve markers related to stress and recovery. However, routine supplementation without confirming a deficiency is not recommended, as current evidence does not support indiscriminate vitamin D use in athletes.⁹

Caffeine

Caffeine is a stimulant with well-established ergogenic effects and is one of the most widely used performance-enhancing supplements in sport.¹⁰ Research has consistently demonstrated benefits across a variety of athletic activities, including endurance events, high-intensity exercise, repeated sprint efforts, and short-duration anaerobic tasks.

For optimal performance benefits, caffeine is typically consumed in doses of 3–6 mg/kg of body weight approximately 60 minutes before exercise, usually in the form of anhydrous caffeine such as capsules or powders.¹⁰ Smaller doses (<3 mg/kg or roughly 100–200 mg) may also be effective, particularly when consumed before or during exercise and alongside a carbohydrate source.¹⁰ Studies have shown that caffeine can improve endurance performance by increasing time to fatigue and enhancing time-trial performance across a range of exercise modalities, including cycling, running, and rowing. Low doses taken during prolonged exercise may

improve cycling time-trial performance by approximately 3 to 7%.¹⁰ In high-intensity, short-duration activities, caffeine supplementation has been associated with improvements in completion time, power output, total work performed, and repeated sprint performance. Higher doses (≥ 9 mg/kg) generally do not provide additional performance benefits and are associated with a greater risk of adverse effects such as nausea, anxiety, insomnia, jitteriness, and restlessness.¹⁰ Because individual responses to caffeine vary, athletes should experiment with different doses and timing strategies during training before using caffeine in competition. Consuming caffeine alongside carbohydrates during exercise may further enhance its effectiveness. Although caffeine has mild diuretic properties, the fluid loss associated with performance-enhancing doses is generally too small to negatively impact hydration status.

Dietary Nitrate

Dietary nitrate (NO_3^-) is a popular nutritional supplement that has been extensively studied for its potential to improve exercise performance.¹⁰ Research has primarily focused on its effects during prolonged submaximal exercise as well as high-intensity, intermittent, and short-duration activities.¹⁰ Nitrate supplementation increases the availability of nitric oxide (NO) through the nitrate–nitrite–nitric oxide pathway.¹⁰ Nitric oxide plays an important role in regulating blood flow and skeletal muscle function.¹⁰ Common dietary sources of nitrate include leafy green vegetables and root vegetables such as spinach, arugula (rocket), celery, and beetroot. Acute performance benefits are typically observed when a dose of approximately 5–9 mmol (310–560 mg) of nitrate is consumed 2–3 hours before exercise.¹⁰ Longer supplementation periods lasting more than three days may also improve performance and may be particularly useful for highly trained athletes, who often experience smaller performance gains from supplementation. Studies have demonstrated improvements in exercise time to exhaustion ranging from approximately 4 to 25%, as well as enhancements of 1 to 3% in sport-specific time-trial performance for activities lasting less than 40 minutes.¹⁰ Because nitrate may enhance type II muscle fiber function, supplementation has also been associated with improvements of roughly 3–5% in high-intensity, intermittent activities commonly seen in team sports. However, evidence supporting benefits for very short-duration exercise (<12 minutes) remains inconsistent. Nitrate supplementation appears to have a favorable safety profile, with few reported adverse effects.¹⁰ Some individuals may experience gastrointestinal discomfort, so supplementation strategies should be tested during training before use in competition. Research also suggests that increasing the dose beyond approximately 8.4 mmol (521 mg) does not provide additional performance benefits.¹⁰ Furthermore, the magnitude of performance improvements may be smaller in highly trained athletes compared with recreationally trained individuals.

Beta-alanine

Beta-alanine is a non-essential amino acid that may enhance performance during sustained high-intensity exercise by increasing the body's ability to buffer acid accumulation within muscles.¹⁰ Its primary role is serving as the rate-limiting precursor to carnosine, a naturally occurring compound found in skeletal muscle that helps neutralize hydrogen ions produced during intense exercise.¹⁰ By increasing muscle carnosine concentrations, beta-alanine may delay the onset of muscular fatigue and improve exercise capacity. To effectively increase muscle carnosine stores, beta-alanine should be consumed consistently over an extended period. A commonly recommended protocol is approximately 65 mg/kg of body weight per day, divided into smaller doses of 0.8–1.6 g every 3–4 hours for 10–12 weeks.¹⁰ Research suggests that beta-alanine may provide modest but potentially meaningful improvements in performance, generally ranging

from 0.2 to 3%, during continuous or intermittent exercise lasting between 30 seconds and 10 minutes.¹⁰ These benefits are most relevant for activities that rely heavily on anaerobic energy systems, such as middle-distance running, rowing, swimming, and repeated sprint efforts. Several factors may influence the effectiveness of beta-alanine supplementation. Large differences in individual responses have been observed, and a direct relationship between increases in muscle carnosine levels and performance improvements has not been fully established. Benefits may also be less pronounced in highly trained athletes. Common side effects include temporary tingling sensations (paresthesia), flushing, and occasionally mild skin irritation, which can often be minimized by dividing the daily dose into smaller servings.¹⁰

Sodium bicarbonate

Sodium bicarbonate is a buffering agent that may improve performance during high-intensity exercise by increasing the body's extracellular buffering capacity.¹⁰ Unlike beta-alanine, which primarily buffers acid within muscle cells, sodium bicarbonate acts in the bloodstream to help regulate pH and reduce the accumulation of hydrogen ions associated with fatigue.¹⁰ By increasing blood bicarbonate concentrations and raising extracellular pH, sodium bicarbonate creates a gradient that facilitates the movement of hydrogen ions and lactate out of working muscles.¹⁰ This process may help maintain muscle function and delay fatigue during intense exercise. The most common supplementation strategy involves consuming a single dose of 0.2–0.4 g/kg of body weight approximately 60–150 minutes before exercise.¹⁰ Alternative approaches include dividing the total dose into smaller portions taken over several hours or using a loading protocol consisting of multiple smaller doses consumed over 2–4 days before competition.¹⁰

Research indicates that sodium bicarbonate can improve performance by approximately 2% during short-duration, high-intensity efforts lasting around one minute. Benefits tend to diminish as exercise duration extends beyond 10 minutes.¹⁰ The primary limitation of sodium bicarbonate supplementation is gastrointestinal distress, which may include nausea, bloating, stomach cramps, and diarrhea.¹⁰ Several strategies may help reduce these side effects, including consuming the supplement with a small carbohydrate-rich meal, splitting the total dose into smaller servings, or using alternative buffering agents such as sodium citrate. Because gastrointestinal tolerance varies considerably between individuals, athletes should thoroughly test supplementation protocols during training before using sodium bicarbonate in competition.

Protein

Protein supplements are commonly derived from isolated protein sources, with whey and soy protein among the most frequently used.¹⁰ Protein plays a critical role in muscle growth, repair, and recovery by providing the amino acids necessary for muscle protein synthesis.¹⁰ In particular, leucine acts as a key trigger for stimulating muscle protein synthesis while also helping to reduce muscle protein breakdown.¹⁰ Current evidence suggests that a daily protein intake of approximately 1.6 g/kg of body weight is optimal for maximizing gains in muscle mass and strength.¹⁰ Intakes of up to 2.2 g/kg/day have also been shown to be safe and may be beneficial for some individuals, particularly athletes with high training demands.¹⁰ To optimize muscle protein synthesis throughout the day, protein should be distributed across multiple meals, with each meal providing approximately 0.3–0.5 g/kg of body weight.¹⁰ Consuming protein three to four times daily, especially in close proximity to exercise, appears to be most effective, with post-exercise intake consistently demonstrating benefits. Protein supplementation during resistance training programs has been shown to enhance increases in lean body mass by

providing additional amino acids needed for muscle repair and growth.¹⁰ Meta-analyses involving both younger and older adults have demonstrated positive effects on muscle mass gains; however, the magnitude of these improvements is generally modest.¹⁰ Overall, protein supplementation is most beneficial when it helps individuals achieve their daily protein requirements, particularly during periods of intense training or when dietary protein intake may be insufficient.¹⁰

Conclusion:

Dietary supplement use continues to increase in the United States, despite ongoing concerns regarding product quality, adulteration, and limited regulatory oversight. The presence of undeclared pharmaceutical ingredients in products marketed for weight loss, sexual enhancement, and muscle building poses significant risks to patient safety, particularly when these ingredients are withdrawn medications, controlled substances, or compounds capable of causing serious drug interactions and adverse events. Pharmacists are uniquely positioned to help patients navigate this complex marketplace by recommending products that have undergone reputable third-party testing, screening for potential supplement-related adverse effects, and educating patients on evidence-based supplement use. While many marketed supplements lack robust clinical support, products such as creatine monohydrate, protein, caffeine, dietary nitrate, beta-alanine, and vitamin D in deficient individuals have demonstrated favorable evidence for specific performance and health-related outcomes. By combining vigilance regarding supplement quality with evidence-based recommendations, pharmacists can play a critical role in promoting both the safety and effectiveness of dietary supplement use.

References:

1. National Center for Health Statistics (US). Dietary supplement use: United States, August 2021–August 2023 [Internet]. Hyattsville (MD): National Center for Health Statistics; 2026 May [cited 2026 Jun 2]. (NCHS Data Brief; No. 561). Available from: <https://www.cdc.gov/nchs/products/databriefs/db561.htm>
2. Tucker J, Fischer T, Upjohn L, Mazzer D, Kumar M. Unapproved pharmaceutical ingredients included in dietary supplements associated with US Food and Drug Administration warnings. *JAMA Netw Open*. 2018 Oct 5;1(6):e183337. doi: 10.1001/jamanetworkopen.2018.3337. Erratum in: *JAMA Netw Open*. 2018 Nov 2;1(7):e185765. doi: 10.1001/jamanetworkopen.2018.5765. PMID: 30646238; PMCID: PMC6324457.
3. FDA. US Food and Drug Administration. Information for consumers using dietary supplements [Internet]. Silver Spring (MD): FDA; 2024 [updated 2024 May 22; cited 2026 Jun 2]. Available from: <https://www.fda.gov/food/dietary-supplements/information-consumers-using-dietary-supplements>
4. Sibutramine. In: Lexi-Drugs [Internet]. Hudson (OH): Lexicomp, Inc.; 2026 [updated 2026 May 15; cited 2026 Jun 2]. Available from: <https://online.lexi.com/lco/action/doc/retrieve/docid/lexier/7634661>
5. James WP, Caterson ID, Coutinho W, et al; SCOUT Investigators. Effect of sibutramine on cardiovascular outcomes in overweight and obese subjects. *N Engl J Med*. 2010 Sep 2;363(10):905-17. doi: 10.1056/NEJMoa100311.
6. Gardin JM, Schumacher D, Constantine G, Davis KD, Leung C, Reid CL. Valvular abnormalities and cardiovascular status following exposure to dexfenfluramine or phentermine/fenfluramine. *JAMA*. 2000 Apr 5;283(13):1703-9. doi: 10.1001/jama.283.13.1703. PMID: 10755496.
7. FDA. US Food and Drug Administration. Tainted products marketed as dietary supplements [Internet]. Silver Spring (MD): FDA; 2017 [cited 2026 Jun 2]. Available from: <https://www.fda.gov/media/80108/download>

8. Santhanam R, Jose J, Thomas J, Al-Mundheri A. Safety evaluation, authentication, and quality control of dietary supplements: a review of third-party testing protocols. *J Food Drug Anal.* 2022;30(4):485-502. doi:10.1016/j.jfda.2022.03.001.
9. Rawson ES, Miles MP, Larson-Meyer DE. Dietary supplements for health, adaptation, and recovery in athletes. *Int J Sport Nutr Exerc Metab.* 2018 Mar 1;28(2):188–99. doi:10.1123/ijsnem.2017-0340
10. Maughan RJ, Burke LM, Dvorak J, Larson-Meyer DE, Peeling P, Phillips SM, et al. IOC consensus statement: Dietary supplements and the high-performance athlete. *Br J Sports Med.* 2018 Mar 14;52(7):439–55. doi:10.1136/bjsports-2018-099027
11. Tucker J, Fischer T, Upjohn L, Mazzer D, Kumar M. Unapproved pharmaceutical ingredients included in dietary supplements associated with US Food and Drug Administration warnings. *JAMA Netw Open.* 2018;1(6):e183337. doi:10.1001/jamanetworkopen.2018.3337.
12. Pope HG Jr, Wood RI, Rogol A, Nyberg F, Bowers L, Bhasin S. Adverse health consequences of performance-enhancing drugs: an Endocrine Society scientific statement. *Endocr Rev.* 2014;35(3):341-375. doi:10.1210/er.2013-1058.
13. Geller AI, Shehab N, Weidle NJ, Lovegrove MC, Wolpert BJ, Timbo BB, et al. Emergency department visits for adverse events related to dietary supplements. *N Engl J Med.* 2015;373(16):1531-1540. doi:10.1056/NEJMsa1504267.
14. Starr RR. Too little, too late: ineffective regulation of dietary supplements in the United States. *Am J Public Health.* 2015;105(3):478-485. doi:10.2105/AJPH.2014.302348.
15. Chameleon Pharma Consulting Group. What are the FDA regulations for food supplements in the USA? *Chameleon Pharma Consulting Group.* Published August 16, 2023. Accessed June 18, 2026. Available from: <https://www.chameleon-pharma.com/what-are-the-fda-regulations-for-food-supplements-in-the-usa/>



The last “dose” ...

“My supplements are similar to my training – I always commit to being a better version of myself.” –

Ronnie Coleman 1964 - [American former professional bodybuilder]



Health Professional with a Question? Drugs – Therapeutics – Pharmacy Practice?

Please contact us. We can help resolve your issue.

Please call **344-844-4400** Monday-Friday 8:00 to 5:00 pm (some holidays excepted)

or visit our website, 24/7 at: <http://pharmacy.auburn.edu/di/>

An electronic bulletin of drug and health-related news highlights, a service of ...

Auburn University, Harrison School of Pharmacy, Drug Information Center

• Phone 334-844-4400 • <http://pharmacy.auburn.edu/di/>

Bernie R. Olin, Pharm.D., Director

Archived issues are available at: <http://pharmacy.auburn.edu/di/auinformed.php>