SUPPLEMENT GUIDE

REDUCING SUPPLEMENT RISK

TrueSport®

contents

INTRODUCTION & PURPOSE

Many athletes believe they need dietary supplements to perform at their best, but this trust in supplements is undeserved. While it's true that some supplements can be helpful in some circumstances, people regularly overestimate the benefits and safety.

Many use dietary supplements without understanding the supplement industry or talking to a dietitian, and they instead rely on advertisements and labeling. However, people can't trust what many supplements claim to contain or deliver because of ineffective regulation of the supplement industry.

It's easy to assume that if a product is on a store shelf, then it must be safe. However, dietary supplements are regulated in a post-market manner, meaning the Food and Drug Administration (FDA) does not evaluate the contents or effects of supplements before they are sold. Harmful or illegal dietary supplements can stay on store shelves for a long time, sometimes even years, before the FDA can remove them.

Because of this, it's important to be an informed consumer and understand the risks before deciding to use any dietary supplement.

This guide is designed to help athletes decide if the potential benefits of dietary supplements outweigh those risks, and if so, how they can better choose a low-risk product.

Q: What is a dietary supplement?

A: Food provides key nutrients and many other beneficial compounds. The dietary ingredients found in supplements can also be found in foods. In fact, by law, dietary supplements can only contain ingredients that are already in the food supply. However, dietary supplements are highly processed, and there is always a chance of contamination during the manufacturing process. ***Who would you rather have manufacture your calcium: a factory or mother nature?***

WHERE CAN I FIND CALCIUM?

PRODUCED IN A FACTORY

Sold in bulk powder as a dietary ingredient

OR

Sold as a supplement

NATURALLY, IN FOOD

Seeds

Cheese

Yogurt

Sardines

Almonds

Beans & Lentils

Spinach & Kale

Milk

DEFINITION

DIETARY SUPPLEMENT: *According to the Dietary Supplement Health and Education Act (DSHEA) of 1994, a dietary supplement is defined by law as a product taken by mouth (a patch or a cream is not legally considered a supplement) that contains a* ***"dietary ingredient"*** *and is intended only to supplement the diet. A supplement cannot advertise to treat or cure a disease or ailment of any type.*

DEFINITION

DIETARY INGREDIENTS: *The dietary ingredients contained in supplements may include vitamins, minerals, herbs or other botanicals, amino acids, and substances, such as enzymes, organ tissues, glands, and metabolites. Dietary supplements may also contain extracts or concentrates of dietary ingredients, and may be found in many forms, including tablets, capsules, softgels, gelcaps, liquids, or powders. They can also be found in other forms, such as a bar, if the label does not represent the product as a conventional food or as a replacement for a full meal or diet. A dietary supplement can also be a liquid if the information on the label makes it clear that it's not a standard beverage or drink for the sole purpose of rehydration.*

Regardless of the form, the DSHEA places dietary supplements in a special category under the general umbrella of "foods," not drugs, and requires that every supplement be labeled a dietary supplement.

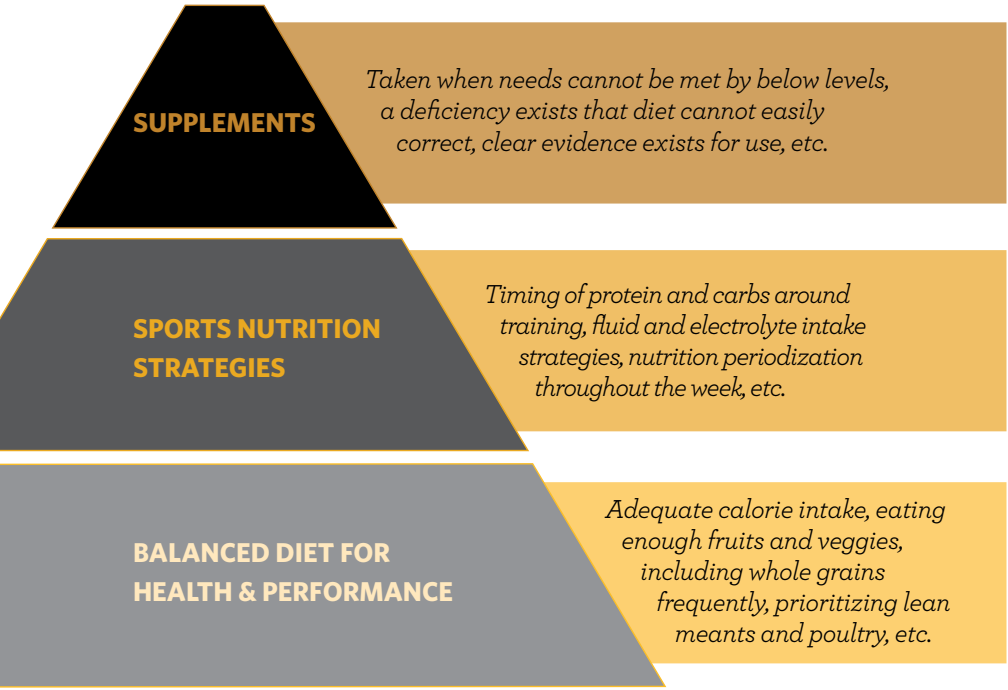
Excerpted and modified from the FDA:
https://www.fda.gov/Food/DietarySupplements/UsingDietarySupplements/ucm480069.htm#what_is

Q: Do athletes need dietary supplements?

A: All athletes need good nutrition, but not all athletes need supplements. Under certain circumstances, some dietary supplements may be helpful to athletes.

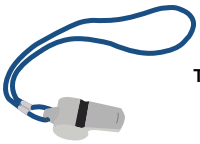
Supplements are meant to be supplemental - or used in addition - to a balanced diet. Athletes are best served by a food-first mindset where supplements are considered after food-based dietary strategies for health and performance. In almost all cases, food choices over time will have a much larger impact on health and performance than any single supplement.

Sport nutrition professionals, like sports registered dietitians, use a tiered high-impact, evidence-based approach to nutrition and supplementation. As you can see from the pyramid, a strong foundation consists of a balanced diet and sports nutrition strategies before turning to supplements.



It is important to first evaluate the nutritional needs of the athlete, and then identify whether increasing the intake of certain vitamins, minerals, or other ingredients is necessary. The steps below can be used to determine if an athlete might need a dietary supplement.

EVALUATING AN ATHLETE'S NUTRITIONAL NEEDS



1

TALK WITH A PROFESSIONAL TO ENSURE THE TRAINING PROGRAM IS OPTIMAL

(and includes proper recovery time)

2

MAKE SURE THE ATHLETE IS GETTING ENOUGH SLEEP

(no supplement can make up for lack of sleep)

3

EVALUATE THE ATHLETE'S DIET

(develop a nutrition plan that includes training & recovery)

4

MEET WITH A DOCTOR

Identify *(through blood or other proper clinical tests)* **any vitamin or mineral deficiencies or other health problems that might limit the variety of foods**

(e.g., food allergies or gluten or lactose intolerance)

WHAT SUPPLEMENTS ARE YOU TAKING?

CASE STUDY

In 2013, a Long Island doctor noticed that his patients were showing symptoms normally associated with anabolic steroid use, such as liver damage, blood clots, muscle pain, masculine features appearing in women, and even testicular shrinkage, infertility, and gynecomastia (breast tissue development) in men. These patients had all gone to the same chiropractor, who prescribed Healthy Life Chemistry vitamins by Purity First to each of them.

REMEMBER, EVERY "SAFE" SUPPLEMENT CAN POSE A RISK.

Although the label of these products appeared normal and didn't list unusual ingredients for a vitamin, regulators discovered anabolic steroids in the products after investigating health complaints. The ensuing warning letter from the FDA was initially ignored by Purity First, and the contaminated products remained on sale until they were finally recalled and destroyed after further federal pressure.

Although Purity First supplements are no longer on the market, stories like this are all too common, and the FDA's list of recalled supplements grows longer all the time. It's important for consumers to remember that the label does not always paint an accurate picture of what is, or isn't, in a supplement.

Even simple, safe-looking products from seemingly reputable companies can be contaminated with dangerous ingredients that can cause serious health problems and violate anti-doping rules.

Q: Should athletes buy supplements that advertise what they want to achieve?

A: Because the benefits of dietary supplements are often inflated, the decision to use a product should be based on nutritional needs and not the often exaggerated promises the product makes.

Despite the claims a dietary supplement company might make in its advertising, there are no regulatory or enforcement agencies that check to make sure the advertisements are accurate or truthful. Federal law does not even require supplement companies to prove to the FDA that their products are safe or effective before they are sold. Because of this, athletes and consumers should ignore advertising and focus instead on the research about the individual dietary ingredients, such as basic vitamins and minerals.

DON'T FALL FOR **FALSE ADVERTISING**

For example, whey protein is advertised to be the key ingredient in both weight-gain and weight-loss products, implying that the same ingredient somehow has opposite effects. The benefits listed on supplement packaging and advertising sound nice, but it's important to remember that what a product can do for an athlete doesn't always match up with the label.

Take a deeper dive at the U.S. Anti-Doping Agency's Supplement Connect site: ***USADA.org/Supplement-Connect****.*

BE SMART

Q: Is there evidence behind the benefits of using dietary ingredients?

A: There is evidence to support the use of some supplements. To determine which, if any, dietary supplements can benefit athletes, it is necessary to first evaluate the athlete's metabolic needs and diet.

Since everyone is different, it is not possible to simply say "all athletes need fish oil/vitamin D/branched chain amino acids (BCAAs)" or that "creatine improves the sport performance of every athlete." For example, creatine can help some athletes, but there is no one-size-fits-all solution as individual and sport- specific performance demands are so variable.

To evaluate whether a specific ingredient would benefit an athlete, it is helpful to consult with a certified sports dietitian or other qualified healthcare provider. If you do not have access to someone with the credentials to help, you can also consult the TrueSport Nutrition Guide at TrueSport.org/Nutrition-Guide for information about dietary ingredients' effects on health and performance.

If an athlete has an identified nutrient deficiency, the question becomes how to address the cause of the deficiency and best increase the intake of that ingredient. USADA recommends that athletes first try to modify what they eat. However, if it is determined that a food-first approach will not do the trick, then an athlete should undertake a thorough evaluation to minimize the risks around supplement use.

Table 1: *POTENTIAL BENEFITS AND RISKS OF COMMON DIETARY INGREDIENTS*

	Potential Benefits	Potential Risks
Vitamins & Minerals	Can provide necessary nutrition for adolescents who do not eat a balanced diet. There are no demonstrated performance benefits beyond general good health.	Mega-doses can cause toxicity leading to nausea, vomiting, organ damage, and other adverse effects.
Calcium	May benefit some female athletes between ages 13-18 or lactose intolerant athletes. Helps build bones and teeth.	High doses can cause kidney stones and heart problems.
Creatine	Can delay muscle fatigue in high-intensity training. Small performance increase for repeated high intensity movements, like sprints. Can support increase of lean body mass along with strength training program.	High doses can cause kidney damage, nausea, diarrhea, cramping, and upset stomach.
Caffeine	Decreases perception of fatigue, can enhance cognitive function in adults. Effects are not well studied in adolescents.	High doses can cause anxiety and shakiness. Effects can be intensified if used with ADHD medications. The American Academy of Pediatrics recommends against kids using caffeine. *There is no recognized safe level in children or adolescents.*
Nitrate *(such as beet root)*	Can reduce the oxygen cost of exercise via vasodilation allowing for increased oxygen flow to working muscles. Effects are smaller in well trained individuals.	If severe, vasodilation can cause a sudden loss of blood pressure, dizziness, lightheadedness, and a loss of balance. Some people may experience some GI upset.
Protein Powder	Helps reach daily protein needs for muscle recovery and building. Not helpful if diet provides adequate protein.	High doses can cause thirst, bloating, cramps, diarrhea, reduced appetite, and fatigue.
Iron	Necessary for production of red blood cells, energy production, oxygen carrying to muscles. In most circumstances, no further benefit if day-to-day iron stores are already sufficient.	High doses can be toxic and side effects include stomach pain, nausea, and vomiting.

(Source: American Academy of Pediatrics and LaBotz et al 2016, Close et al. 2022)

Q: What are the risks associated with dietary supplements?

A: The use of unhealthy, low-quality, or unlisted ingredients, as well as manufacturers' failure to include all of a supplement's ingredients on the label, are big problems in the supplement industry.

Even though there are many high-quality and safe dietary supplements on the market, there is always the possibility that the supplement an athlete chooses could contain dangerous or illegal ingredients. There are often no warning signs that a product is unsafe, and many athletes have suffered health problems or had positive drug tests from using products that are incorrectly labeled or contaminated with dangerous ingredients, such as anabolic steroids, pharmaceuticals, or research drugs.

Sometimes, risky or dangerous ingredients are even listed right on the label or identified by a confusing name. Supplements can also contain low-quality ingredients, or old or unstable ingredients that degrade very quickly.

Other supplements might not even contain the ingredients on the label. The FDA and other organizations list many examples of tested products containing zero amounts of a listed ingredient. In some situations, this could lead to malnutrition or a nutrient deficiency if the athlete relies solely on the supplement for a nutrient it does not actually contain.

ARE YOU *SURE* IT'S WORTH THE RISK?


False Hope
Waste
Money
Time
Energy
Low-Quality
Dangerous
Unhealthy Ingredients
Illegal
DRUG TEST
Contaminated
Unlisted Ingredients
Anabolic Steroids

DETERMINING IF SUPPLEMENTATION COULD OR SHOULD BE CONSIDERED

It is important to remember the risks that are associated with taking supplements. The following questions can help an athlete determine if taking a supplement is worth it and could be considered:

Q: Is there a potential health benefit? **A:** If the answer is YES to any of the following, supplementation could be considered.	• Does the athlete have a nutrient deficiency determined by a blood test, for example? • Will the athlete be training in an environment that is going to add extra stress to the body, such as at altitude? • Does the athlete restrict any foods or food groups, especially for reasons such as intolerance or allergies, that may lead to a deficiency if not supplemented? • Is there a health condition present that would be improved with supplementation? • Is there good evidence of a health benefit for a person like the athlete?
Q: Is there a potential performance benefit? **A:** If the answers are YES to the following, supplementation could be considered.	• Does the supplement/nutrient have sufficient high-quality evidence that it could help maximize performance? • Does the supplement/nutrient support the specific type of performance needs of the athlete (e.g., endurance vs. strength-based performance)? • Would taking the supplement/nutrient make a meaningful difference in performance at the current point in the athlete's competitive career or season? • Have you maximized your diet and exhausted all possibilities of food options for the nutrient in question?
Q: Do potential benefits outweigh potential risks? **A:** If the answers are NO to the following, supplementation could be considered.	• Is any ingredient on the supplement product label banned by sport organizations? • Is the product not certified for sport by a third-party certifier endorsed by USADA? • Is there a high risk for the dietary ingredient to cause negative health impacts? • Would taking the dietary ingredient or supplement negatively impact food choices or fueling habits if taken (e.g., choosing protein powder over a whole food protein like salmon that offers more nutrients)?

Q: Are there other training or lifestyle factors that could be addressed first? **A:** If the answer is YES to any of the following, supplementation could be considered.	• Does the athlete have a properly periodized training program with ample rest and recovery time? • Is the athlete getting consistently good quality sleep and sufficient total sleep? • Is the athlete practicing good sports nutrition habits, such as consuming proper energy and macronutrient quantities at proper times each day?
Q: Are there food-based ways to get the nutrient? **A:** If the answer is NO to any of the following, supplementation could be considered.	• Are there food sources that naturally have meaningful amounts of the nutrient of concern? • Are there foods that are fortified or enriched with the nutrient that can provide meaningful amounts to the diet?
Q: Is it realistic to get enough of the nutrient from food? **A:** If the answer is NO to any of the following, supplementation could be considered.	• Does the athlete like the food rich in the nutrient of concern enough to regularly consume the food? • Does regular consumption of the food provide enough of the nutrient to meet the athlete's health and/or performance needs? • Are there no obstacles, such as cost or preparation, that prohibit the athlete from consuming the food as frequently as needed for benefit?

Q: If a dietary supplement is the most realistic way to obtain necessary nutrients, how do athletes pick the safest one?

A: There is no risk-free way to choose a supplement, as the only way to have zero risk is to not use supplements. But, if athletes choose to use supplements, they can reduce the risk significantly by following the decision-making flow chart to the right.

If using a dietary supplement is necessary, the best way to reduce the risk of using a low-quality or contaminated product is to choose one that is certified by a USADA-recommended third party. Visit Supplement Connect at USADA.org/Supplement-Connect for the most current recommendations.

Q: What types of products should athletes avoid?

A: If athletes choose to use uncertified supplements in spite of the risks, they should avoid using products with red flags, which are listed in the Supplement Red Flags section of this guide. However, an evaluation of red flags is no guarantee. USADA is aware of several dietary supplements that, on initial inspection, did not exhibit any "red flags," but testing later revealed that they were contaminated with harmful compounds. Athletes have also tested positive for performance-enhancing substances from supplements that appear completely safe based on the label.

Because a supplement's label and contents are not checked by the FDA or anyone else before a product is sold, it is completely up to the manufacturer to accurately list the ingredients and the amounts. While many companies make high-quality supplements and spend a lot of time ensuring the labeling on their products is accurate, there are also companies that are sloppy during manufacturing or deliberately spike their products with illegal ingredients that are not on the label.

There have been many cases where seemingly safe or low-risk products ended up containing prohibited performance-enhancing drugs, even though there was nothing on the label that made the product appear unsafe.

1

CONFIRM THE POTENTIAL BENEFITS OUTWEIGH POTENTIAL RISKS.

2

USE PRODUCTS CERTIFIED BY A USADA-RECOMMENDED THIRD PARTY.

*(see **USADA.org/Supplement-Connect** for current recommendations)*

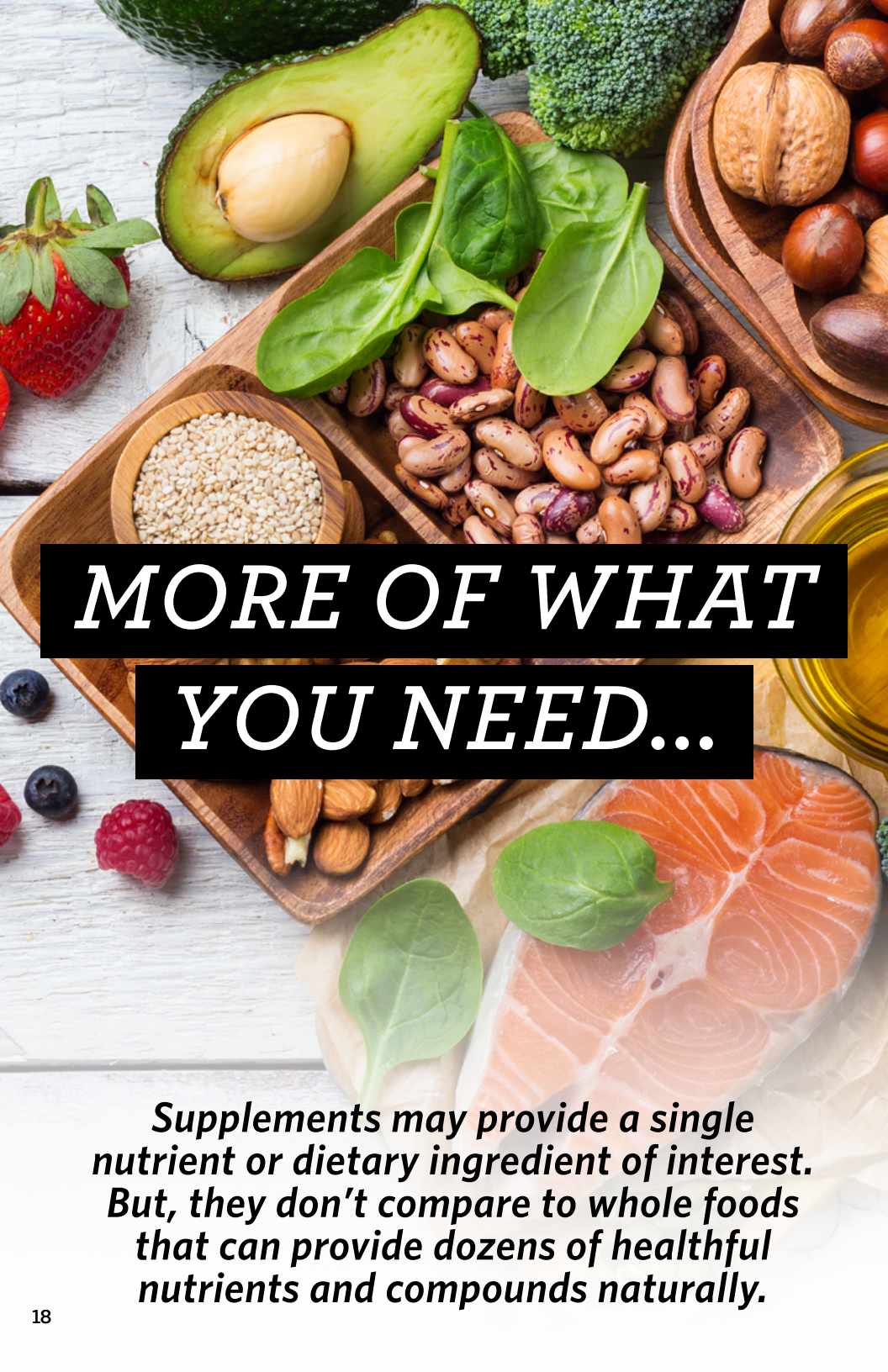
3

IF YOU CHOOSE TO USE AN UNCERTIFIED PRODUCT DESPITE THE RISKS, THEN ELIMINATE PRODUCTS WITH RED FLAGS.

(see the Supplement Red Flags section)

4

MAKE A DECISION KNOWING THAT *IN SPITE OF YOUR DUE DILIGENCE AND CARE IN SELECTING A LOWER-RISK SUPPLEMENT, THERE ARE NO GUARANTEES.* YOU CAN NEVER BE 100 PERCENT SURE THAT WHAT IS LISTED ON THE LABEL IS WHAT'S IN THE BOTTLE.



MORE OF WHAT YOU NEED...

Supplements may provide a single nutrient or dietary ingredient of interest. But, they don't compare to whole foods that can provide dozens of healthful nutrients and compounds naturally.

SALMON FILLET

VS

FISH OIL SUPPLEMENT

FOOD:

Atlantic salmon half a fillet (approx. 150g)

SUPPLEMENT:

Omega-3

NUTRITIONAL FACTS:

Proteins 39.3g

Tryptophan 441mg	Valine 2028mg
Treonine 1725mg	Arginine 2353mg
Isoleucine 1812mg	Histidine 1159mg
Leucine 3197mg	Alanine 2380mg
Lysine 3614mg	Aspartic acid 4028mg
Methionine 1164mg	Glutamic acid 5871mg
Cystine 422mg	Glycine 1889mg
Phenylalanine 1536mg	Proline 1390mg
Tyrosine 1328mg	Serine 1606mg

Vitamins

Vitamin A 89.0IU 2%	Vitamin B 61.2mg 58%
Vitamin C 6.6mg 11%	Folate 60.5mcg 15%
Thiamin 0.6mg 40%	Vitamin B 125.0mcg 83%
Riboflavin 0.2mg 14%	Pantothenic Acid 2.6mg 26%
Niacin 14.3mg 72%	

Minerals

Calcium 26.7mg 3%	Sodium 109mg 5%
Iron 0.6mg 3%	Zinc 0.8mg 5%
Magnesium 53.4mg 13%	Copper 0.1mg 4%
Phosphorus 449mg 45%	Selenium 73.7mcg 105%
Potassium 683mg 20%	

Total Fat 22.0g (34% Daily Value)

Saturated Fat 4.5g 22%
Monounsaturated Fat 7.9g
Polyunsaturated Fat 7.9g
Total Omega-3 fatty acids 4023mg
Total Omega-6 fatty acids 1185mg

This example highlights the nutrient density of whole foods compared to isolated dietary ingredients. It's not that an omega-3 supplement may not be valuable for some athletes, but that taking a supplement cannot replace the nutrition provided in whole food sources of the nutrients of interest.

FOOD SOURCES OF COMMONLY SUPPLEMENTED DIETARY INGREDIENTS

Regularly consuming foods like those in the list below nourishes a healthy body with a wide variety of beneficial nutrients and decreases the need to consider supplementation to meet health and performance requirements.

CALCIUM	Milk, yogurt, cheese, cottage cheese, broccoli, leafy greens, fortified orange juice, almonds, etc.
VITAMIN C	Citrus, berries, mango, guava, papaya, tomatoes, broccoli, cabbage, peppers, leafy greens, Brussels sprouts, kiwi, cantaloupe, cauliflower, etc.
B VITAMINS	Meats, poultry, seafood, eggs, beans, nuts, seeds, whole grains, milk, yogurt, mushrooms, leafy greens, cauliflower, asparagus, potatoes, bananas, prunes, etc.
VITAMIN D	Mushrooms (especially wild types like shiitake), egg yolks, salmon, tuna, fortified milk and juice, etc.
IRON	Meats, poultry, seafood, beans, nuts, seeds, whole grains, tofu and other soy foods, dark chocolate, dried apricots, leafy greens, potatoes, etc.
MAGNESIUM	Seeds like pepitas, nuts like cashews, leafy greens, yogurt, beans, edamame, brown rice, banana, avocado, potatoes, etc.
NITRATES	Beet root, spinach, celery, arugula, bok choy, carrots, Swiss chard, cilantro, parsley, etc.
OMEGA-3S	Salmon, mackerel, herring, sardines, fatty tuna, anchovies, walnuts, almonds, chia seeds, flax seeds and oil, etc.
PROTEIN	Meat, poultry, eggs, beans, soy foods, dairy foods including milk and yogurt, whole grains, nuts, seeds, nutritional yeast, etc.

USE A FOOD-FIRST APPROACH

Supplements can never equal a balanced diet.

A NOTE ON YOUTH ATHLETES AND SUPPLEMENTS

Our knowledge of supplement and dietary ingredient benefits and risks is largely based on research in adults, not children or adolescents. It is therefore difficult to make recommendations for or against supplementation of many dietary ingredients for young athletes simply because there is no available evidence to assess. Out of caution to do no harm and preserve the well-being of young athletes, supplements are generally not recommended. Exceptions should wisely be made in cases such as nutrient deficiencies and in working with qualified health professionals.

Beyond potential safety risks for young athletes, it is important to look at the bigger picture of why most young athletes compete. Unlike adult athletes who may compete for prize money or as professional athletes, young athletes are largely competing to develop sport proficiency, strengthen social skills, spend time with friends, and other non-performance related priorities. Introducing young athletes to supplements with the goal of enhancing their performance is not worth the risk and does not match up with the real reasons these athletes choose to participate in sport.

DIETARY STRATEGIES THAT DECREASE POTENTIAL NEED FOR SUPPLEMENTS

Supplements and dietary ingredients are often considered because of holes in a sound dietary pattern and approach. These simple, yet effective tips below will help you build a well-rounded, nutrient-dense performance diet that minimizes any need for supplementation:

- Eat 3 meals and at least 1 snack per day.
- Have protein, starches, and veggies/fruits at each meal.
- Build most snacks with a protein-rich food and a carb-rich food.
- Eat oily fish such as salmon at least 1-2x per week (if able).
- Have a carbohydrate-rich snack prior to exercise.
- Bring a water bottle with you and stay well hydrated each day.
- Season food with salt or include salty ingredients in meals if you are a heavy and/or salty sweater.
- Aim for 4-5 cups total fruits and veggies daily.
- Include fermented foods like yogurt several times per week.
- Make sure you are meeting your carbohydrate needs for performance.

See the TrueSport Nutrition Guide for more info at TrueSport.org/Nutrition-Guide.

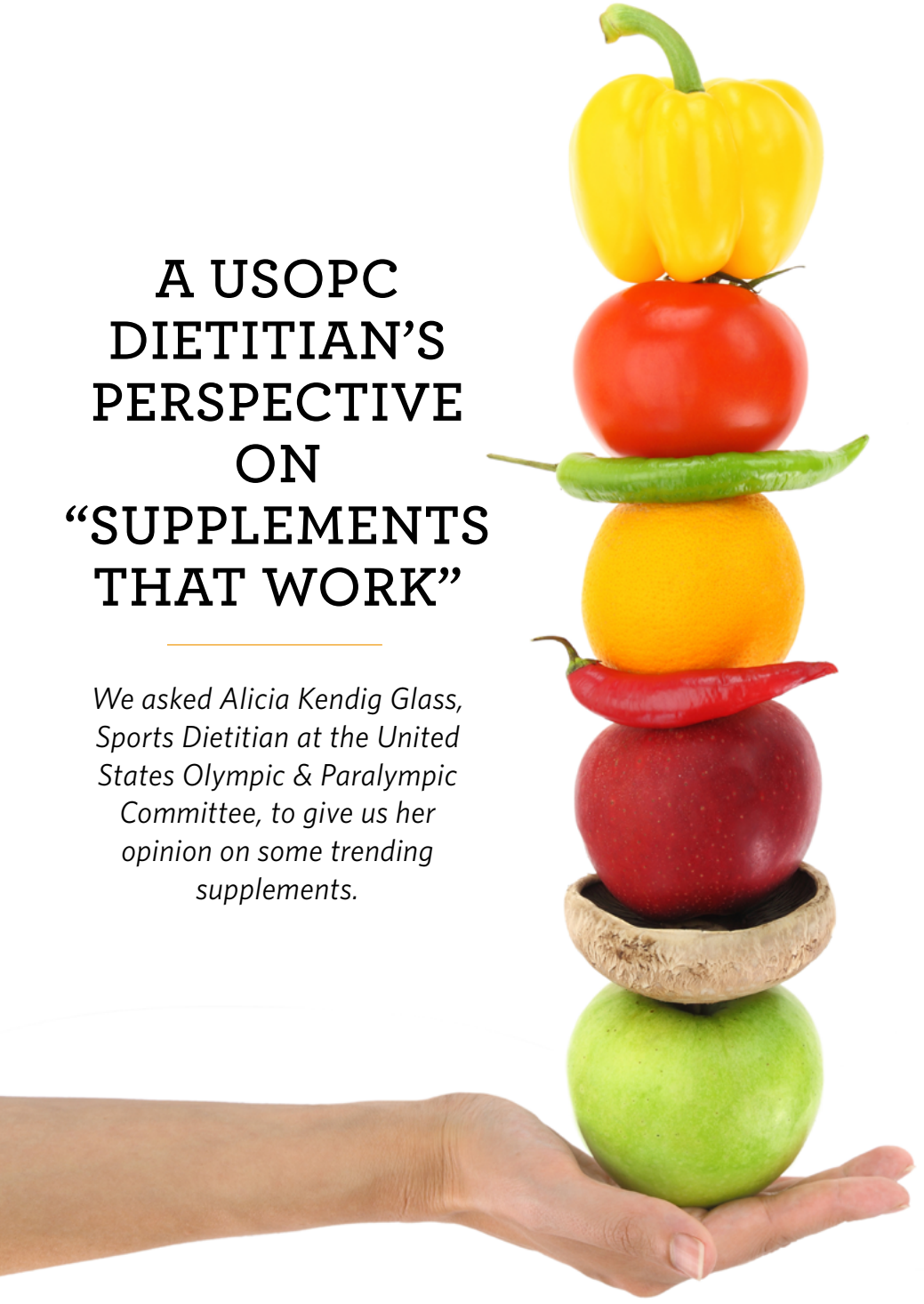
ALTERNATIVES TO SUPPLEMENTATION

While supplementing with dietary ingredients may be beneficial in some situations, often there are simple nutrition and habit fixes that should be considered first.

INSTEAD OF TAKING:	FIRST, TRY THIS:
CAFFEINE	Don't skip meals, especially breakfast. Prioritize getting enough sleep.
GREENS POWDER	Aim for 4-5 cups total fruits and veggies daily.
MASS GAINER	Simply increase calorie intake across the day.
MELATONIN	Practice a bedtime routine that promotes good sleep. Avoid caffeine later in the day.
MULTIVITAMIN	Ensure you are consuming plenty of plant foods in their whole form like fruits, veggies, and whole grains.
PRE-WORKOUT	Have a carb-rich snack, add a coffee if needed.
PREBIOTIC	Aim for at least 25 grams of fiber daily.
PROBIOTIC	Consume fermented foods several times per week.
PROTEIN POWDER *(or BCAAs)*	Include protein-rich foods in each meal and snack.
VITAMIN D	As possible, get outside regularly for some safe sun exposure.

A USOPC DIETITIAN'S PERSPECTIVE ON "SUPPLEMENTS THAT WORK"

We asked Alicia Kendig Glass, Sports Dietitian at the United States Olympic & Paralympic Committee, to give us her opinion on some trending supplements.



What are your thoughts on the use of supplements for athletes?

I won't discuss or utter the word "supplement" until all the most important aspects of an athlete's lifestyle are addressed and optimized. It's crucial to evaluate an athlete's training program, their performance goals, their lifestyle habits, and how their diets can best support all of those factors.

What vitamins and minerals do you recommend?

Many athletes do fine without taking a multivitamin. With their increased caloric needs, they have more opportunities to get the nutrients they need in their food.

However, if an athlete is struggling to prioritize nutrition and food preparation, or they don't have access to high quality foods, then a high quality third-party tested multivitamin may make sense for them. There are a bunch of if's that make a multivitamin recommendation a personalized recommendation. A high quality multivitamin doesn't need be magical, it just needs to have 100% of the RDA of the indicated vitamins/minerals. Also, some formulations may include higher amounts of specific nutrients that not all athletes need. Iron, for example, in a male athlete's multivitamin may not be necessary. Not all multivitamins are created equal and should be evaluated individually by a dietitian or trained medical provider. My approach is always food first.

On the other hand, for athletes with clinical deficiencies, we will aim to treat through diet, or possibly a clinical dietary supplement.

For example, numerous athletes are diagnosed with sport anemias, and we treat those with an oral iron supplement.

Our approach to supplements is very clinical. We don't ever dose an athlete with something unless there is a very good rationale for doing so, which means a blood test to confirm their current nutrients status. There are some athletes who we find have hemochromatosis, a genetic condition where iron levels build to toxic levels in the body. We would never suggest iron for those athletes.

I will also recommend vitamin D to an athlete who has a low blood test value. Depending on the time of the year and if they're training inside or outside, I may recommend a low dose to get them through the winter months when sunlight exposure is limited. But, I warn them that more is not better.

To that point, I had a bobsled athlete who I was treating for low

vitamin D. The next time I saw her she complained of tingling in her fingertips. I sent her for a blood test and she had toxic levels of vitamin D. She admitted that she had tripled her dose because her coach told her she should take more. Her symptoms resolved once we got her back on the correct dose.

Things like this can happen to anyone.

In another case, the father of one of our athletic trainers ended up in the ER because of vitamin D toxicity. He didn't realize it at the time, but all the supplements he was taking for his eyes and skin were adding up to a mega dose of vitamin D, which then exacerbated his symptoms of diabetes. Not only did he not realize vitamin D could be toxic, but he didn't realize how much he was taking.

This is common when people take more than one supplement. Things end up "stacking."

Too much vitamin D can also block the absorption of other fat-soluble vitamins.

What about creatine and protein powder?

Many athletes ask me if they should take creatine. People just think this is a magic ingredient, but they don't know how it works or if their sport demands it. I always ask myself, "Are the demands of the sport going to be supported by what this active ingredient does?"

I did have a vegan athlete who was a sprinter, and she wasn't eating the food sources for creatine. She responded well to creatine. But, if I'm working with vegan or vegetarian athletes, I will often start with making sure they are getting enough quality protein in their diet first.

Another situation where more protein can be helpful is for older athletes who have an increased need for quick recovery and may have a more difficult time maintaining lean muscle mass. In some cases where an athlete must train smarter instead of harder, and they are having a hard time sustaining lean mass or consuming enough calories, a simple whey or plant protein can help.

What is a nitric oxide booster? Would you recommend it to athletes?

Nitric oxide boosters advertise to increase blood flow to your muscles, therefore increasing your ability to perform and recover faster.

I steer clear of any supplement that advertises to be a nitric oxide (NO) booster. Those supplements are too risky for athletes to navigate, as their ingredients claim to deliver the same results as substances prohibited in sport.

On the other hand, there are great functional foods that can offer slight improvements in oxygen uptake

and muscle efficiency. Beet juice, spinach, and celery are all rich in naturally found nitrates to improve muscle efficiency. The research suggests that naturally occurring organic nitrates found in these fresh vegetables work better than adding synthetic forms of nitrate often used as dietary supplement ingredients.

Caffeine and energy drinks are everywhere these days. What should an athlete do if they're fighting sluggishness and fatigue?

Caffeine can be beneficial for those athletes who tolerate it well. Some athletes are distracted or jittery when they ingest caffeine. It's not for everyone.

I do not recommend that athletes obtain caffeine through supplements or energy drinks though, because oftentimes, the caffeine dose is listed as part of a 'proprietary blend,' which doesn't list the individual doses. This makes it difficult to be certain how much caffeine is actually consumed.

Energy drinks are particularly bad because they can also contain hidden sources of caffeine or other stimulants like yohimbine. The cumulative effect of multiple stimulants can harm performance and health.

We know that supplement labels can be inaccurate or unclear, so if an athlete doesn't like coffee (and it's hard to control the dose), we will recommend a No Doz or other over-the-counter product with a known amount of caffeine.

What is carnitine? Can it help an athlete?

I don't actively recommend carnitine. Athletes ask about carnitine because they have heard that it may help the body burn more fat. But a review of research is still not convincing and more evidence is needed to suggest that carnitine does indeed work for an elite athlete population - that principle applies to any dietary supplement ingredient. The evidence needs to be specific to an athlete's sport or discipline, and its effects on performance need to be convincing before actively recommending it.

Can you tell us more about beta-alanine?

When dosed properly, beta-alanine increases carnosine in the muscle, which then acts as a lactate buffer. For athletes whose efforts last 40 seconds to about four minutes, it can help delay anabolic metabolism, which is when your muscle has too much lactic acid built up to function optimally.

Beta-alanine is no magic pill - it just delays this threshold slightly. It can also be beneficial for training. Beta-alanine is found in meats, but in relatively low amounts, so its therapeutic doses can really only be ingested in supplemental form. The most effective supplementation protocols require a loading phase of 3-4 weeks at higher doses, then backing off to a lower dose for numerous weeks. Given this long duration of time needed to dose beta-alanine effectively, taking a high quality beta-alanine product can become rather costly.

I had a high jumper once who was intrigued by beta-alanine because his teammates were taking it. I had to ask him, "How is this going to help you? You are not even doing a lactate-accumulating sport!" For the high jumper, I didn't recommend that he waste his time or money on dosing beta-alanine.

Do you think athletes can benefit from taking probiotics?

I'm a big fan of probiotics. There are many good food sources like yogurt, kefir, ceviche, and other fermented foods.

I often recommend a probiotic supplement for athletes traveling internationally to increase their chances of staying healthy and well while traveling for competition. There is good research suggesting certain strains can decrease prevalence of Upper Respiratory Tract Infections. There is also some evidence that some strains can decrease the severity of travelers diarrhea symptoms.

There is still a lot of research to be done in this area though. We are not in a place where we can pull out a menu of recommendations for probiotics. We have a lot to learn about all the different strains, how they are populated within various individuals, if they benefit or impact everyone in the same ways, and if there are long-term negative impacts of supplementation that

could decrease our eagerness to recommend them.

Research is showing promising results that improved gut health has very wide health effects on the whole body, both mentally and physically.

What is tart cherry? What can it do for athletes?

I'm asked often about antioxidant mega-dosing and the use of functional foods like tart cherry to reduce the stress on the body from heavy training.

Although there is evidence that tart cherry juice has benefits in fighting inflammation for elite athletes, habitual consumption of it may not be necessary. I also remind athletes that tart cherry juice should not take the place of other recovery snacks that contain both carbohydrates and protein. There is no protein in tart cherry juice.

If athletes do want high doses of antioxidants during high stress times of training or competition, it's better to get it through foods. Mega-doses of antioxidants in dietary supplement form can actually stunt training responses. One of the many benefits of training is to apply stress to the various body systems so that the body has the opportunity to recover stronger. Mega-dosing nutrients takes that opportunity away.

Ingesting higher doses of anti-oxidants during heavy training and competition times may help athletes to manage the increase stress loads they are under. Consuming larger servings of tart cherries has been shown to speed up recovery and decrease various informatory markers which can be helpful when recovery time is short or when in the midst of competition. Keep your eye on other dark colored fruits, such as black currants for similar effects for athletes.

Alicia Kendig Glass, MS, RD, CSSD

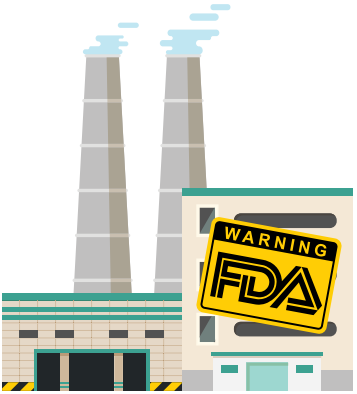
Certified Specialist in Sports Dietetics,
United States Olympic & Paralympic Committee

Alicia Kendig Glass is a U.S. Olympic & Paralympic Committee sport dietitian. Since 2011, she has provided performance nutrition support to the Summer and Winter National and Olympic level athletes. Throughout her career, Kendig Glass has worked with many National Governing Bodies and USADA to educate athletes on performance nutrition and dietary supplements. She continues to help athletes achieve performance goals through well-planned nutrition strategies. Kendig Glass holds a bachelor's in nutrition and a master's in public health nutrition from Case Western Reserve University in Cleveland, Ohio.

SUPPLEMENT RED FLAGS

Learning to recognize red flags is one way for athletes to reduce their risk if they decide to use supplements. Athletes should consider these red flags while evaluating and researching any supplement they might use. Before using any supplement, please also explore all of the educational materials available on TrueSport.org and USADA.org, including lists that identify many supplements and manufacturers that are known to be risky for athletes and consumers.

HIGH RISK COMPANIES



The manufacturer or company has received FDA warning letters or has been subject to other enforcement actions. Search for the company or product name on FDA.gov or FTC.gov.

Products sold exclusively on the internet may raise a red flag. While there are some legitimate dietary supplement companies that only have an online presence, some companies deliberately avoid regulatory agencies by opening and closing websites quickly, or selling products online to the U.S. from other countries.

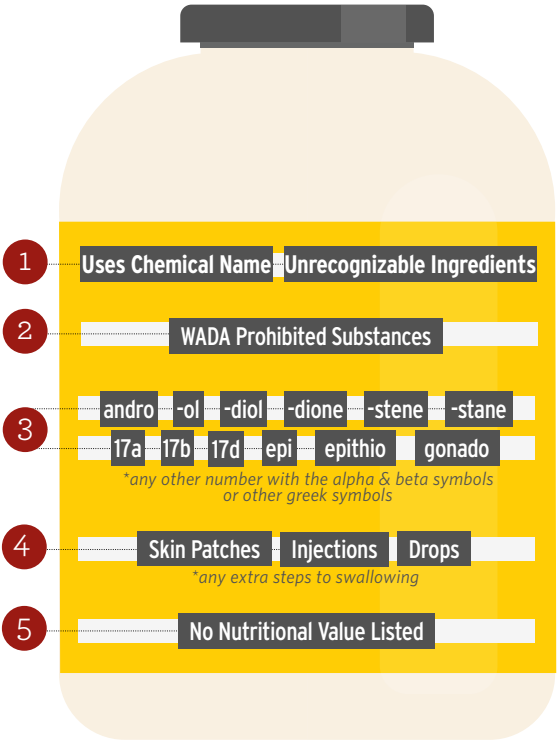
RISKY INGREDIENTS OR UNUSUAL USE INSTRUCTIONS

1

Product lists unrecognizable ingredients that seem out of place, or it lists ingredients by chemical names rather than common names.

2

The supplement label or advertising includes substances on the WADA Prohibited List, or in a general category of the WADA Prohibited List, such as anabolic agents or stimulants.



3

Any of the following phrases or characters on a bodybuilding/muscle building product label should be considered a red flag because they might indicate the presence of steroids: andro, -ol, -diol, -dione, -stene or –stane, epi, epithio, gonado, or any ingredient that is listed as a chemical formula.

4

Any product that is taken or applied to the body in a way other than simply eating it or swallowing it, such as skin patches, creams, injections, and drops. Also be wary of extra steps before swallowing, including placing the product under the tongue or swishing it around in your mouth.

5

Ingredients have no clear, well-documented nutritional value. If you've never heard of an ingredient, then you should stop and do research first.

RED FLAG MARKETING

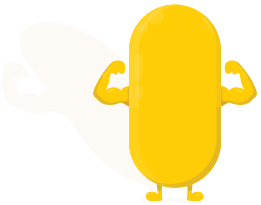
Product claims to be "FDA Approved," "WADA Approved," or "USADA Approved." These organizations do not approve dietary supplements.

Advertising contains phrases like "newest scientific breakthrough," "secret formula," "money back guarantee," "quick fix," "used for thousands of years," or "what the experts don't want you to know."

Product claims to be an "alternative to prescription medication."

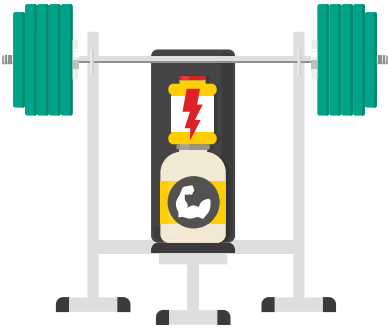
The supplement is advertised to be a thermogenic or stimulant-based weight loss or energy product, a sexual enhancement product, or a hormonal or anabolic product. Companies often add stimulants, Viagra-like drugs, or steroids to their products so they "work," but they might not list those ingredients on the label.

Product claims to treat or prevent a disease, such as hormone imbalances, the common cold, flu, diabetes, and inflammation.



The product claims to deliver the same results as a performance-enhancing drug, such as increased or decreased hormone levels, or increased muscle mass.

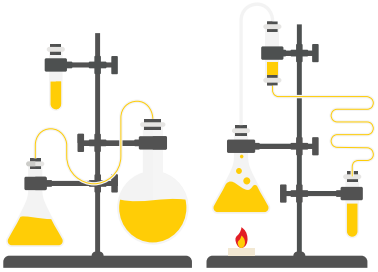
Product is recommended by a gym trainer instead of a healthcare provider or dietitian.



Product is not certified by a third-party certifier recommended by USADA. See USADA.org/Supplement-Connect for the most current recommendations.

The product is sold "for research purposes only." Some companies evade FDA scrutiny by telling consumers their products are not for human use so they can claim it's not their fault if a consumer gets sick from it.

The company website or blog sites claim the products are legal because the ingredients are not on the Controlled Substances Act. For example, the company may market their products as "legal steroids" or "legal prohormones."



Bottom Line

While you may have picked up this guide hoping to get a simple yes or no as to whether you should use supplements, ***there is not an easy answer.***

This resource has introduced the potential benefits and risks of using supplements, but at the end of the day, it is up to each individual to figure out if the benefits of using supplements outweigh the risks.

Regardless of whether you are a recreational athlete, elite-level athlete, or support an athlete, we encourage you to:

- *Be aware of everything you use and consume. Athletes are responsible for everything that goes in and on their body, whether through the eyes, ears, nose, mouth, or skin.*
- *Start checking medications, from cold medicines to asthma inhalers, on GlobalDRO.com to see if they are permitted or prohibited in sport.*
- *Learn more about the risks associated with using supplements and visit Supplement Connect at USADA.org/Supplement-Connect to find ways to reduce your risk.*

If you think incorporating a supplement into your routine could be helpful, do your due diligence to research that supplement and manufacturer. And, keep in mind that there are no guarantees. The use of any dietary supplement is at your own risk.

Resources

acsm.org American College of Sports Medicine

eatright.org Academy of Nutrition and Dietetics

USADA.org/Supplement-Connect USADA's Supplement Education Center

fda.gov/food U.S. Food and Drug Administration

fda.gov/safety/recalls FDA Recalls, Market Withdrawals, & Safety Alerts

fns.usda.gov/cnpp Center for Nutrition Policy and Promotion

dietaryguidelines.gov Dietary Guidelines for Americans, 2020-2025

nutrition.gov National Agricultural Library, U.S. Department of Agriculture

health.gov/nhic National Health Information Center - U.S. Department of Health and Human Services

sportsrd.org Collegiate and Professional Sports Dietitian Association

opss.org Operation Supplement Safety, a Supplement Safety Initiative of the Department of Defense

Acknowledgement:

Amy Eichner, PhD

Special Advisor on Drug Reference and Supplements, USADA

Dr. Amy Eichner earned her PhD in neuroscience from Australian National University in 2001 and continued in neuromedical research at various institutions, including Harvard University and Massachusetts General Hospital. In 2008, she joined the Therapeutic Goods Administration in Australia to head up an ISO17025 laboratory in biocompatibility testing of medical devices. She has worked with USADA in the Drug Reference Department since 2009 on the Drug Reference Hotline, Global Drug Reference Online database, Therapeutic Use Exemptions, and supplement education resources. She is now the Special Advisor on Drugs and Supplements for USADA.

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