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The Best Supplements For

MUSCLE GROWTH & EXERCISE PERFORMANCE



A comprehensive guide to help you choose supplements that work and avoid ones that don't

Contents

Introduction
How to use this guide
S Tier
- Creatine
- Protein powders

A Tier
- Caffeine
- Nitrate-rich vegetables

B Tier
- Citrulline
- Ashwagandha
- Beta-alanine

C Tier
- Magnesium
- L-arginine
- MSM
- Rhodiola rosea
- Carnitine

Other Promising Supplements
- Water
- Sodium and potassium
- Choline donors
- Phosphatidylserine
- Agmatine sulfate
- Spirulina

Useless or Overhyped
- BCAA
- EAA
- CLA
- HMB
- Omega 3
- Taurine
- Tribulus terrestris
- DHEA
- Glutamine
- Chrysin

Supplements to Avoid

- Turkesterone
- Ecdysterone
- Leucine, isoleucine, or valine
- Sodium bicarbonate
- Dextrose
- Resveratrol
- Vicamin C
- Most stimulants

Creating the best supplement stack

Introduction

Not all supplements are created equal. Many are widely regarded as beneficial despite providing little to no benefit. Many are considered safe despite a questionable safety profile. Many might help you achieve a specific goal but harm other aspects of your health. On the other end of the spectrum, you can find supplements with 1000x higher possible benefits that may simultaneously be much safer and cheaper. This guide will help you find the safest and most effective supplements for optimizing muscle growth and exercise performance. We will also provide you with a list of chemicals or extracts to avoid because of their lack of benefits or poor safety profiles.

These are the things we took into consideration when creating this guide and ranking different supplements:

- **Safety**
  Substances with significant side effects will not rank high, no matter how effective they might be.
- **Possible benefits**
  Along with safety, efficacy is the most important variable we considered. We focused on how beneficial the supplement can be and how reliably it helps you achieve those benefits.
- **Scientific evidence**
  The more high-quality scientific studies the supplement has, the better. Understudied substances or extracts may get a lower score than they otherwise would.
- **Anecdotal evidence**
  Anecdotal evidence and personal reports can be less reliable than high-quality scientific evidence. However, when many individuals claim the supplement was helpful to them in similar ways, we cannot disregard this information, even if it is unsupported by scientific studies yet. We emphasized anecdotal evidence when considering where to rank supplements with limited scientific research.

Because we primarily based the ranking on how safe and effective each supplement is, we did not put much emphasis on some other important metrics. Here are the variables that did not influence this tier list:

- **Price per dose**
  High-ranking supplements are generally among the most cost-effective ones. However, this is not always the case because some can be expensive. If you are on a tight budget, you can experiment with cheaper, lower-raking supplements instead.
- **Individual needs**
  We all have different diets, genetics, lifestyles, and other variables that can drastically change our biological needs and how we respond to each supplement. Even some of the best supplements may not do much for you, while some lower-ranking ones may do wonders. That said, supplements from higher tiers have a higher likelihood of helping you meet your goals.
- **Non-oral usage**
  Some chemicals and extracts below can be used topically, intravenously, intramuscularly, and through other routes of administration. Many of them can be safe and effective through one route of administration but not the others. As such, we have decided to only focus on oral administration.
- **Sustainability**
  We did not account for sustainability and environmental impact when creating the rankings because this guide focuses mainly on the biological impact of different supplements. The sustainability of these substances and extracts also depends on the specific brand and sourcing. Before you buy anything, it is best to check what the supplement is extracted or made from and how caring or uncaring the brand synthesizing it is.
- **Social stigma**
  Some supplements and other substances get a bad rap despite their high safety profile and many possible benefits. Some examples of this phenomenon include creatine and other muscle-building supplements, brain enhancers like modafinil and racetams, and psychedelics like psilocybin mushrooms. While none of these substances are without side effects, people often exaggerate the risks and underemphasize the benefits. We did not let cultural stigmatization influence the ranking.
- **Legality**
  We did not take legality into consideration because the legal status can differ from country to country and because legal does not always mean safe, and illegal does not always mean unsafe. With that said, most, if not all, supplements mentioned below should be legal in your country.

How to use this guide

The supplements in this guide are divided into six groups:

S tier is reserved for only the best supplements on the market. They have the best safety and efficacy profile and are highly useful for improving exercise performance and muscle growth.

A tier contains supplements most people can greatly benefit from with little to no downside.

B-tier supplements have a high safety profile and can be very helpful for some people.

C-tier supplements are generally safe and worth experimenting with if you are a serious athlete or prioritize muscle growth and have a high budget for supplements.

Other promising supplements are supplements that do not necessarily fall into any of the tiers but can also be helpful. These supplements may impact exercise performance and muscle growth indirectly, or they may be a good choice for some people but a poor choice for others. This category may also contain promising but understudied supplements or supplements with high efficacy but questionable safety profiles, or vice versa.

Useless or overhyped supplements probably would not do much harm but also have little to no benefits, often contrary to popular belief. Don't waste your money on them unless you have a good reason to. If you buy them, do not expect them to be too effective.

Supplements to avoid are either terribly ineffective, unsafe, or highly under-researched. Only consider them if you have a fantastic reason to and are familiar with their risks and benefit profiles. This category may also contain supplements that can worsen exercise performance or the growth of muscle mass.

By the end of this guide, we outline a step-by-step process to help you create the best supplement stack for you using the information from this guide.

S Tier

Creatine

Creatine is by far the most useful supplement for improving power output and anaerobic exercise performance. This supplement can nearly double the increases in strength and power from working out. Creatine may be the most beneficial supplement in general, as it also has a variety of benefits outside of training. For example, it can be helpful for people with osteoarthritis, traumatic brain injury, and depression. It is also extremely safe and relatively cheap to take.

Most effective for: Sprinters and anyone who works out

The best type of creatine: The type of creatine you take doesn't matter much. The only type to avoid is creatine ethyl ester. Besides that, all types are great and creatine monohydrate is usually the cheapest and the most studied one, which is why it's probably the best one to take.

Dosage: 2-10 grams a day - Most of the benefits will come from the first gram or two but to maximize the benefits, 5 grams are usually more reliable. If you are a very muscular person, you may need to take as much as 10 grams to get the most out of creatine.

Best time to take it: The time of the day doesn't matter much if at all.

Protein powders

Protein powders contain a variety of essential and non-essential amino acids that have many functions in the body, including the formation of muscle mass.

Most effective for: People who prioritize muscle growth and those who don't get much protein from food

The best type of protein powder: The differences are generally exaggerated as most protein powders have similar amino acid profiles and effects on the body. Soy protein is the best choice for most people as it is about as effective as whey protein and more people digest it well. This type also costs significantly less than whey and most other protein powder.

The best dose to take: This depends greatly on how much protein you already get from food. Assuming the daily target for optimal performance and muscle growth is about 0.7-1 gram of protein per lb of body weight, you want to find out roughly how much protein you're getting from food and then get the rest from protein powders. The best amount to take is usually about 20-40 grams daily.

The best time to take it: If you train fasted, take the protein powder before or right after an exercise session. If you don't train fasted, don't worry about timing too much.

A Tier

Caffeine

Caffeine can improve both anaerobic and aerobic exercise by suppressing fatigue and increasing dopamine and adrenaline levels. It is very effective and reliable for increasing endurance and power output when taken prior to an exercise session.

Most effective for: People experiencing fatigue during exercise

The best source of caffeine: If your goal is to optimize exercise performance, the source of caffeine doesn't matter much. However, it's better for your long-term health to get your caffeine from coffee, tea, yerba maté, or other natural sources than taking isolated caffeine supplements. If you do decide to take caffeine-containing pills or capsules to know exactly how many milligrams you're consuming, it is still better to go for a coffee extract or guarana.

The best dose to take: How much you should take depends greatly on your tolerance level and how fast you metabolize caffeine. For most people, a dose of about 100-200 mg before a workout or an exercise session works best.

The best time to take it: The best time to take caffeine for exercise performance is about 45 minutes before an exercise session. If you exercise later at night, caffeine is generally not a good choice because of its negative impact on sleep and long half-life (typically about 6 hours).

Nitrate-rich vegetables

Nitrates from vegetables like beetroot and leafy greens can greatly improve both anaerobic and aerobic exercise capacity by increasing blood

flow and helping the body produce ATP (the body's main energy source) from food.

Most effective for: People with poor blood flow, sprinters

The best sources of nitrates: Beetroot, radish, turnip, celeriac, rhubarb, and leafy greens are all great sources of nitrates. Other vegetables generally only contain small amounts.

The best dose to take: The ideal amount to consume is about 3-6 mg/lb or 6-12 mg/kg of body weight. This amount can generally be found in about 300 grams of the vegetables mentioned above.

The best time to take it: The best time to consume nitrate-rich vegetables is about 2-4 hours before an exercise session.

B Tier

Citrulline

This non-essential amino acid comes in two main forms (L-citrulline and citrulline malate) and they are both very effective at increasing blood circulation. This can lead to improvements in energy levels and training volume during a workout and faster muscle recovery with less soreness after a workout. These benefits are mostly limited to weight training as the amino acid doesn't impact aerobic exercise much.

Most effective for: Improving blood circulation and reducing fatigue during a workout and speeding up muscle recovery

The best type of citrulline: The difference between L-citrulline and citrulline malate is small. They are both effective and regular citrulline is generally cheaper and works at lower doses, which is why it's a better option for most people.

The best dose to take: 4-6 grams of L-citrulline or 6-9 grams of citrulline malate

The best time to take it: 30 minutes before an exercise session

Ashwagandha

This adaptogenic herb is one of the most beneficial supplements in general. Even though it is mainly taken for other reasons, ashwagandha can greatly improve power output and exercise performance. Improvements in power output were found in all groups of people, whether trained or untrained.

Most effective for: Improving power output and hormone levels in men who do strength training

The best form of ashwagandha: While each form of ashwagandha (regular root powder, Sensoril, Shoden, etc.) has its own benefits, KSM-66 is generally considered to be the most beneficial form. Feel free to experiment with different forms as well to find out which one fits you best.

The best dose to take: The best dose of a typical extract is about 300-600 mg/d. Make sure to cycle ashwagandha for about 2 days a week to stay sensitive to it and keep getting the benefits in the long term.

The best time to take it: The time of the day doesn't matter much if at all.

Beta-alanine

Beta-alanine is a non-essential amino acid that creates carnosine, another amino acid that can delay muscle fatigue. This makes beta-alanine great for improving muscle endurance, especially during longer workouts or workouts with long isometric or high-rep sets.

Most effective for: Muscular endurance, long or intense workouts get fatigued the most

The best dose to take: 2-4 grams a day taken regularly (not just on the days you work out)

The best time to take it: With food. Otherwise, the time of the day doesn't matter much. Spread the daily dose to 2+ smaller doses if beta-alanine gives you a tingling sensation.

C Tier

Magnesium

Magnesium supplementation can greatly improve aerobic endurance and muscle oxygenation. Interestingly, these effects are more pronounced in athletes than in untrained people.

Most effective for: Endurance athletes, people deficient in magnesium

The best type of magnesium: Magnesium citrate is very well absorbed and generally the most cost-effective form of magnesium. Most other forms are great as well, with the exceptions of magnesium oxide, hydroxide, and sulfate, which have poor absorption and can cause diarrhea.

The best dose to take: 200-400 mg/d

The best time to take it: The time of the day doesn't matter much but it's better to take magnesium with food if it causes diarrhea when you take it on an empty stomach.

L-arginine

Arginine has similar effects to those of citrulline (mentioned in the B tier). In order for citrulline to improve blood flow, it has to first convert into L-arginine. Interestingly, citrulline is better at increasing arginine levels in the body than arginine itself. L-arginine would deserve a higher tier but most of it doesn't reach the muscles, which is why citrulline is a better choice for muscle growth and exercise performance.

Most effective for: Improving blood circulation and reducing fatigue during a workout, speeding up muscle recovery

The best dose to take: 4-6 grams

The best time to take it: 30 minutes before an exercise session

MSM

When MSM is taken before a workout, it can reduce muscle damage and speed up muscle recovery. This can be helpful if you work out many times a week.

Most effective for: Speeding up muscle recovery

The best dose to take: 1-3 grams

The best time to take it: 30 minutes before a workout

Rhodiola rosea

Rhodiola rosea is more often considered a nootropic rather than an exercise supplement. However, this herb's main cognitive benefits stem from its ability to reduce fatigue. This can be helpful if you exercise in the evening or experience mental fatigue during your exercise sessions. If you don't, Rhodiola won't affect your exercise performance much.

Most effective for: Reducing mental fatigue

The best dose to take: About 300 mg daily (with tolerance breaks about 2 days a week)

The best time to take it: In the morning

Carnitine

L-carnitine shows some promise for improving anaerobic running capacity, lean mass formation, and muscle recovery in older and untrained individuals. It would likely be of little to no benefit to anyone trained.

Most effective for: Older and untrained people

The best type of carnitine: For the purpose of improving exercise performance, L-carnitine tartrate (LCLT) and glycine propionyl-L-carnitine (GPLC) are the most studied and reliable forms. However, other forms like ALCAR may be just as effective.

The best dose to take: 500-2000 mg of L-carnitine (which can be found in about 630-2500 mg of ALCAR or 1-4 grams of LCTC or GPLC)

The best time to take it: Right before or right after a workout

Other Promising Supplements

Water

It's always useful to have a bottle of water next to you during an exercise session. When you exercise in a dehydrated state, your body will try to slow you down through various evolutionary mechanisms so you don't become even more dehydrated.

Most effective for: Longer workouts and exercise sessions where you sweat a lot

How much water to drink: How much you should drink per day or prior to a workout session is highly variable but as a general rule of thumb, you want to drink enough so you don't feel thirsty. Thirst is a much better indicator of how much you should drink than any specific recommendation like 2 l/d.

The best time to take it: When you are thirsty

Sodium and potassium

Water is not the only thing you need to hydrate the cells of your body. Water can only travel through the body when bound to sodium and it enters the cells through the sodium-potassium pump. Getting enough sodium and potassium is just as important for hydration as getting enough water, especially before an exhausting exercise session where you are going to sweat a lot.

Most effective for: People deficient in these two electrolytes, longer exercise sessions where you sweat a lot

How much to take: Just like with water, the body will tell you how much salt it wants or needs through taste. Once salt stops tasting good, you probably don't need more of it. With potassium, the body generally doesn't tell you how much it wants so try to get at least 1 mg of potassium from food for every 1 mg of sodium (or about 3 mg of salt) you consume.

The best time to take it: When you consume potassium doesn't matter much. The best time to consume salt is when you enjoy the taste of it.

Choline donors

Choline is a very important nutrient for producing the neurotransmitter acetylcholine, which plays a great role in exercise performance. Taking choline donors before an exercise session can be of much help, especially for people deficient in choline. For example, alpha-GPC was shown in one human study to increase power output by 14%.

Most effective for: Mental energy during workouts, power output

The best cholinergic for exercise performance: Alpha-GPC, CDP-choline, and phosphatidylcholine are all very good options.

The best dose to take: 300-500 mg of alpha-GPC or CDP-choline, or 500-1000 mg of phosphatidylcholine

The best time to take it: 45 minutes before an exercise session

Phosphatidylserine

This supplement is also mainly seen as a nootropic but one study found it can increase anaerobic exercise capacity at 85% of VO2 max by an average of 29%. This is a huge improvement but the study requires replication to confirm the effect. Until then, PS is still worth experimenting with because of its wide variety of other beneficial effects.

Most effective for: Anaerobic exercise capacity

The best dose to take: 200-400 mg/d, although the study showing 29% improvements in anaerobic capacity used 750 mg

The best time to take it: Before exercise or a cognitively demanding task

Agmatine sulfate

Agmatine is a metabolite of arginine that may lead to similar benefits in regard to improving blood flow. However, it is still relatively understudied, and taking L-citrulline instead makes more sense before more agmatine studies come out.

Most effective for: Improving blood circulation and reducing fatigue during a workout and speeding up muscle recovery

The best dose to take: 0.5-1.5 grams

The best time to take it: 30 minutes before an exercise session

Spirulina

Spirulina is understudied in regard to exercise performance and muscle growth. However, one study found that this type of algae can improve power output by 20-30%. The improvements were more notable in beginning lifters but also applied to trained individuals. Spirulina is definitely worth the experimentation as it can be useful for many areas of health.

Most effective for: Increasing power output in untrained people

The best dose to take: 2-6 grams daily

The best time to take it: Doesn't matter

Useless or Overhyped

BCAA

BCAA is possibly the most overhyped muscle-building supplement on the market. Studies suggest BCAA supplements are ineffective and almost useless for strength training and building muscle mass. They could be of a small benefit if you exercise fasted or if you consume very little protein but in each of these scenarios, a protein powder is a better choice anyway. BCAAs can be slightly effective for improving aerobic performance at doses of about 10g but there are much safer and more effective supplements in this regard.

EAA

EAA is a combination of all essential amino acids. It isn't entirely useless but it's basically an overpriced source of protein with unnatural amino acid ratios. Unlike protein powders, EAA supplements also lack non-essential amino acids, many of which are helpful for exercise performance and muscle growth. There is little to no reason to take EAA instead of a protein powder.

CLA

The only reasonable benefit of conjugated linoleic acid (CLA) is that it can help preserve lean mass in obese individuals. Even for these people, the benefit is tiny and unreliable.

HMB

HMB is a metabolite of leucine that shows some promise for its anti-catabolic effects. However, the supplement is ineffective in practice and seems to have no impact on lean muscle mass.

Omega 3

Omega 3 supplements can improve some aspects of your health but they have no direct impact on lean mass or exercise performance.

Taurine

Taurine may be slightly beneficial for improving endurance in people with heart problems. Other than that, it is basically useless.

Tribulus terrestris

Tribulus terrestris and most other "testosterone boosters" have no impact on exercise performance and muscle growth whatsoever. Tribulus doesn't even increase testosterone levels in most people but it can be helpful for libido and sex drive.

DHEA

There is no quality evidence to support the use of DHEA for muscle growth. It could theoretically help people with poor hormonal health.

Glutamine

This supplement is useless for muscle growth as nearly everyone gets more than enough from food.

Chrysin

Chrysin is an extract from honey and bee pollen often taken to improve testosterone and muscle growth. Human studies have not shown any benefits related to chrysin supplementation so it is probably a waste of money.

Supplements to Avoid

Turkesterone

Despite its popularity, turkesterone is heavily understudied and the studies we have available aren't promising at all. We also don't know whether or not long-term supplementation is safe.

Ecdysterone

Turkesterone and ecdysterone are structurally very similar to each other. Ecdysterone is even more understudied and appears to be a waste of money at best.

Leucine, isoleucine, or valine

The three essential amino acids comprise the BCAA stack. Unfortunately, taking either of them separately does very little to improve muscle growth or any other aspect of health. Supplementation of these can also lead to amino acid imbalances over time and easily do more harm than good.

Sodium bicarbonate

Sodium bicarbonate (baking soda) was shown in some studies to improve both aerobic and anaerobic performance. However, these studies used extremely high doses that are unsafe to take in the short term, let alone in the long term. Low doses are probably about as effective as talking salt.

Dextrose

Dextrose is a type of sugar often used by serious athletes before an exercise session. However, the possible benefits are rather small and the health risks are quite high in the long term. There are much better alternatives to increase your glycogen stores before exercise, such as eating fruit.

Resveratrol

While resveratrol can be helpful for some aspects of health, it can also greatly reduce exercise adaptations and metrics like power output and VO2 max. If you exercise, the benefits of resveratrol almost certainly wouldn't outweigh the side effects, even if your primary focus is general health and longevity.

Vicamin C

High doses of vitamin C (typically over 500 mg) can reduce adaptations to exercise. Lower doses should have little to no impact on exercise and could even improve exercise performance if you are deficient in vitamin C.

Most stimulants

Psychostimulants like nicotine and amphetamines may increase energy levels during an exercise session, which can lead to better outcomes and physical adaptations. However, these substances are certainly not for everyone as their safety profiles generally aren't great and the side effects often outweigh the benefits. Many of these stimulants are also banned in sports competitions. If you are going to use stimulants to improve exercise performance, please put a lot of emphasis on safety and risk mitigation and first experiment with stimulants that have a lower risk for harm, such as modafinil and racetams. Even nicotine can be quite safe but most sources of it are among the most harmful substances on the planet.

Creating the best supplement stack

Here is perhaps the most reliable and cost-effective way we came up with to create a great, individualized stack for muscle growth and exercise performance. Following these steps will allow you to get as much as 80% of the benefits for less than 20% of the price while minimizing any possible side effects.

1) Order the S-tier and A-tier supplements except those you think aren't a good fit for you.

2) Try them for about a month to be sure they don't cause any adverse reactions. If they do, learn about that reaction and what exactly caused it. In most cases like this, it makes sense to discontinue taking the supplement. In other cases, this may be a xenohormetic effect that allows your body to adapt and become more resilient in the long term. Unless mentioned otherwise, you can combine the supplements mentioned in this guide, and they may act additively or synergistically.

3) Order small quantities of B-tier supplements. Only buy those supplements you believe are a good fit for you and scratch the ones you have a good reason to believe could harm you. Do not order high quantities of these right away because they may not be particularly effective for you, so you don't want to spend too much money on them initially.

4) Take each B-tier supplement you bought for at least 2-4 weeks to see if it benefits you. Do not combine it with other B-tier supplements before you try it out in isolation as this would make it harder to find what works and what doesn't. However, you can keep taking the S-tier and A-tier supplements during this process.

5) If you have a high budget for supplements or have yet to find anything of much help, try experimenting with chemicals and extracts from the C tier or the "Other promising supplements" section. Be careful that supplements from these tiers are not for everyone, and you will need to research them more before you buy them. If some B-tier supplements

have worked great for you, you can keep taking them while simultaneously experimenting with the later tiers.

6) After this experimentation phase, you will hopefully have found at least a few supplements that work great for you. Feel free to take them for as long as they keep making your life better.