

What supplements a powerlifter should (and should not) consider

Power Output Production

The most direct and obvious supplement for a powerlifter would be something that simply increases power output and strength. Unfortunately, most supplements are either beneficial indirectly to strength (aiding in recovery from workouts or enhancing muscle protein synthesis) or there isn't enough evidence to recommend them.

Creatine

Creatine is almost too obvious to mention due to its efficacy being so well known. Creatine is an energy substrate (similar to glucose and fatty acids) that is used to create the cellular energy store (known as ATP). It is much faster than the other two sources at producing ATP, and thus can be used in instances where even carbohydrate usage would be too slow. This is essentially power related activities such as powerlifting, olympic lifting, and sprinting.

It is safe, cheap enough that even if you're a nonresponder to it the 5 cents a day or so isn't going to put you back much, and well proven.

Caffeine

Caffeine was the pre-workout that existed before the concept of pre-workouts existed, as taking a coffee or espresso to the gym was (and still is) seen as a strength enhancing wake-me-up.

Caffeine at relatively high doses (400mg or above) in persons who do not routinely consume caffeine appears to reliably increase power output, and while this is about 10% in untrained or lightly trained persons, the exact level of improvement in well trained athletes is not known (most likely it is less than that, probably around 2-5% depending on training level).

Caffeine may be less effective when taken every day and tolerance develops, so usage of caffeine for the purpose of power output (rather than something like anti-sleep or anti-fatigue, which do not get reduced with tolerance) should be limited to only intense training days.

Alpha-GPC (honorable mention)

Alpha-glycerophosphocholine (simply called Alpha-GPC) gets an honorable mention since, while there is evidence to suggest that single doses can increase power output (as assessed by bench throws) the quality of evidence is quite preliminary and needs to be replicated.

Regardless, alpha-GPC is known as a cholinergic compound (something that provides choline to the body in order to help produce acetylcholine, a neurotransmitter that mediates muscle contraction and learning) and it seems to be one of the better options for increasing brain concentrations of acetylcholine.

Work Volume

There are a few supplements that can honestly be said that they improve physical performance, but they outright fail on 1 rep max tests or other measurements of maximal strength or power output. While these supplements are more catered towards workout routines like crossfit or intermittent intensity sports, they would have a role in any day where volume work is being conducted.

Beta-Alanine (and Sodium Bicarbonate)

Beta-alanine is a lactic acid buffer, working vicariously through its metabolite known as carosine. This is similar to sodium bicarbonate, a direct acid buffer that has a long history of being an ergogenic aid.

Both beta-alanine reach the same goal (with the only difference being that beta-alanine reduces acidity in muscle tissue while sodium bicarbonate does this as well as in the blood) and in regards to physical performance they are both of a somewhat comparable potency. Additionally, they do *not* seem to be complementary. Due to this, beta-alanine tends to be recommended since sodium bicarbonate (possibly a bit cheaper) has a much more difficult dosing strategy and possible stomach and intestinal side-effects.

Finally, it seems that both of these molecules can slightly increase lean mass gain and the rate of fat loss when used alongside a workout routine. It is not known why this occurs, and it doesn't seem to be due to an increased work load since (at least with beta-alanine) it still occurs when you control for the amount of work done. The increase in muscle gain isn't by any means remarkable, but it could be a nice push in the right direction.

Nitric Oxide Boosters (Citrulline and Agmatine)

Nitric oxide boosters are great in concept as they can increase work capacity and efficiency of cells while promoting blood flow (and as a side-effect, erections). That being said, the first choice of nitric oxide boosting was l-arginine, which came with a host of problems and sort of dampened the enthusiasm on the topic somewhat.

Arginine has two main problems with it. Firstly, it is poorly absorbed from the intestines. Secondly, it seems that we got the mechanism of action wrong and the thing it likely does act on is a relatively weak action.

The first problem is alleviated with citrulline supplementation, which is well absorbed from the intestines and then simply goes to the kidneys to be converted *into* arginine. This is a reason citrulline is sometimes called Arginine 2.0.

The other problem is the mechanism of action. We thought initially that putting in more arginine would mean that there was more substrate for the nitric oxide synthase enzymes to work on, but later realized the enzymes were already maxed out. For a nitric oxide booster to work, it needs to accelerate this enzyme and it does seem that arginine does this very weakly (by acting on the alpha-adrenergic receptors). Agmatine, however, does this better and may have a pain killing effect as well (but due to no studies in athletes, it is just an honorable mention at this point).

The other possible option is nitrate ingestion, from either leafy green veggies or beetroot. Very simply put, this increases nitric oxide by a completely different mean (not involving the aforementioned enzymes) and is proven in most studies conducted in aerobic and anaerobic study populations.

Joint Pain and Repair

Fish Oil

Fish oil is perhaps one of the most commonly used supplements for joint relief among powerlifters, and higher than average doses of fish oil do appear to be able to reduce soreness (thought to be secondary to a slight immunosuppressive effect).

NSAIDs

NSAIDs are the tried and true option, and when all else fails a serving of aspirin or naproxen seems to do wonders.

There are some other supplements that, while technically not called NSAIDs, inhibit the activity of the same enzymes and can be considered useful. Curcumin (in some bioavailability enhanced form) is a good example as it can reduce joint pain quite nicely, and where it lacks in the body of literature (relative to aspirin) it exceeds in how it can *reduce* ulcer formation.

Pycnogenol (honorable mention)

Pycnogenol is maritime pine bark extract (and may be the exact same thing as 'grape seed extract'; very similar molecules) and is known as a procyanidin supplement. It has an honorable mention due to not having any research currently in athletes, but there are a few studies currently conducted in osteoarthritis that suggest very significant pain killing and anti-inflammatory effects, and similar to curcumin, there is a host of other benefits associated with pycnogenol mostly related to circulatory health.

General things everybody should consider taking

Vitamin D and Vitamin K

Vitamin D and Vitamin K are two vitamin compounds that meet a few requirements that make them ideal supplements:

1. People aren't really 'deficient' in them, as evidenced by the lack of rickets and uncontrollable hemorrhaging in society.
2. People aren't really 'optimal' in them either. Vitamin D has an RDI of 600-800 IU and a recommended 'optimal' intake of 2,000-4,000 IU (lowest estimates) while Vitamin K has an RDI of 60-120mcg and an optimal intake of up to 1,000mcg.
3. Aside from a very few select foods in somewhat high servings (salmon or cod liver oil for vitamin D, natto or pulverized kale for Vitamin K) it is really difficult to get enough in the diet.

They are both cheap and tend to support calcium metabolism (bone and cardiovascular health), with vitamin D having additional benefits towards fertility and a possible very small testosterone booster while vitamin K may benefit pancreatic health and glucose metabolism.

Neither will benefit athletic performance, both are cheap health protective compounds with ample support for their supplementation.

Magnesium

Magnesium is an important mineral in the body that you *may* be deficient in (unlike vitamin D and vitamin K, it is wholly possible that you can eat enough magnesium in your diet). A deficiency of magnesium may predispose you to some neuronal damage, higher blood pressure, and an increased rate of osteopenia (they will all take many decades to manifest) but most notable you might cramp more.

Supplementation of magnesium simply negates the bad stuff that occurs with deficiency. There isn't really much more to it than that, as all possible beneficial effects of superloading are traced back to the form called Magnesium-L-Threonate and it is preliminary research.

There is also one *very questionable* study from Germany on magnesium orotate pretty much saying it is amazing for triathletes, but this has not been replicated in the 15 years it has been published and likely falls into the 'too good to be true' category.

Spirulina (honorable mention)

Spirulina is an honorable mention due to it having a good deal of evidence for it, but most of it preclinical and none in athletes (and thus limiting how much faith can be put into a recommendation). For all intents and purposes, consider it the least important recommendation in the list but still notable enough to be included.

The benefits of spirulina from a health perspective are:

- Appears to reduce liver fat buildup pretty potently (large scale trials on this topic are currently being conducted)
- Appears to effectively prevent the link between the immune system and oxidative damage, exerting a potent antioxidative effect
- While the aforementioned effect is immunosuppressive, spirulina seems to circumvent itself and support the immune system (hasn't been fully assessed, but the immunosuppression probably negates the immunosupport)
- Effective mineral chelator with at least one study confirming efficacy in humans, perhaps one of the few supplements with confirmed 'detox' properties
- In animal research on arthritis, spirulina *abolishes* inflammation and edema
- May be more hepatoprotective and antiviral than milk thistle

Additional benefits that may be of interest include:

- An increase in muscular performance may exist (studies are pretty heterogenous), but the one study using resistance training failed to note this effect; it may simply be secondary to the antioxidant effect on improving aerobic exercise
- The lone study to assess power output noted an increase in both trained and untrained athletes; needs confirmation with powerlifting exercises though

So there is a small chance spirulina could be ergogenic, but for the moment it appears very healthy.

Notable Exceptions

For every one supplement that is proven to work, there are about two that are proven to not work for their respective claims and about 10-20 that we simply do not have enough research on to put them in either the 'works' or the 'does not work' category. The following are a few popular examples of supplements that have been researched enough to be placed from the 'unknown' category to the 'probably doesn't work' category.

[Tribulus Terrestris](#)

This is a notable example of when an otherwise awesome herb is marketed for something it really should not have been marketed for. It seems that many people jumped onto either the 'tribulus is crap' bandwagon or the 'tribulus is awesome' bandwagon, but few jumped on the 'tribulus can be potentially useful for certain things, just not what it is marketed for' bandwagon.

Overall, tribulus is a pretty good libido enhancer. It also seems to have some promising preliminary evidence for urogenital health (kidney antioxidant, reduces kidney stone formation,

enhances diuresis) and cardiovascular health (may benefit cardiac tissue specifically) as well as having some analgesic properties.

It just does *not* boost testosterone in otherwise healthy men. There is currently one study in infertile men noting a weak boost in testosterone of around 15%, but in this particular cohort (male infertility) any antioxidant compound increases testosterone; even vitamin E and CoQ10 increase testosterone in this instance.

Otherwise healthy athletes? No boost in testosterone.

Glutamine

Another example of a supplement that is good, but just not for its marketed claims. Glutamine is a pretty nice amino acid for intestinal health insofar as it seems to be the amino acid in protein that is beneficial to persons with inflammatory bowel disorders such as Crohn's disease.

However, it does not increase muscle protein synthesis in practical settings. This is in part *because* it works so well in the intestines, and the intestines and liver sequester most ingested glutamine for their own usage and only give the muscles as much as is required.

While a huge influx of glutamine into a muscle cell will cause muscle protein synthesis, this cannot occur with orally supplemented glutamine in healthy persons; the only way oral supplementation could work is in states of glutamine deficiency such as third degree burn victims (and in those persons, it does nicely promote muscle protein synthesis).

BCAAs and EAAs

Another conditional 'useless' but a bit different from glutamine and tribulus. BCAAs and EAA supplement is more than anything useless from a *practical* standpoint rather than a *scientific* standpoint.

I mean, when looking at the evidence all the EAAs and BCAAs appear to promote muscle protein synthesis when given to otherwise normal persons. If we stopped reading right now, then it would seem like a great idea.

Thing is, most powerlifters have a very high dietary protein intake and the EAAs and BCAAs are *already in* dietary protein. There is not much evidence to say that taking either of these supplements in addition to an already protein rich diet is beneficial (very mixed evidence on the subject matter, with the idea that a large leucine pulse might benefit elderly persons when added to a mixed meal being the only one that appears to be consistent).

If you have not consumed anything yet that day, then EAAs and BCAAs should work well. The studies that found protein synthesis with these supplements did exactly that.

Glucosamine

Glucosamine is an interesting molecule, in part because it is one of the world's most well known and sold supplements and in part because it might not even work. To recap the current state of evidence on glucosamine:

- Glucosamine hydrochloride does *not* work at all
- Glucosamine sulfate *does* seem to work, albeit unreliably
- There is absolutely no difference in overall glucosamine exposure between the two aforementioned forms (both give free glucosamine in the intestines, and absorption is the same as well)
- Sulfate by itself, or by another supplement such as MSM or N-acetylcysteine, seems to benefit joint health and are similarly unreliable
- Sulfur deficiency results in joint pain and increased disease progression of osteoarthritis, and due to not occurring in everybody it can explain said unreliability

It seems that glucosamine may be a red herring for sulfur, and that sulfur is the beneficial molecule in this equation. This is currently a reasonable hypothesis that awaits further testing (specifically, testing glucosamine sulfate in a large cohort of older persons with osteoarthritis and then seeing what percentage of people respond with and without controlling for sulfur status).

If that wasn't enough of a nail in the coffin for glucosamine for the power athlete, it should be noted that the *vast* majority of studies on glucosamine are not in youth nor in athletes; they are in persons over the age of 50 with osteoarthritis.

That about sums it up. A list of supplements to consider taking, and a list of supplements to avoid. It's important to remember what the word "supplement" means itself, and its role in your overall nutritional strategy. If you want to learn more about which supplements work and which don't, check out our PowerliftingWatch recommended [Supplement-Goals Reference Guide](#).