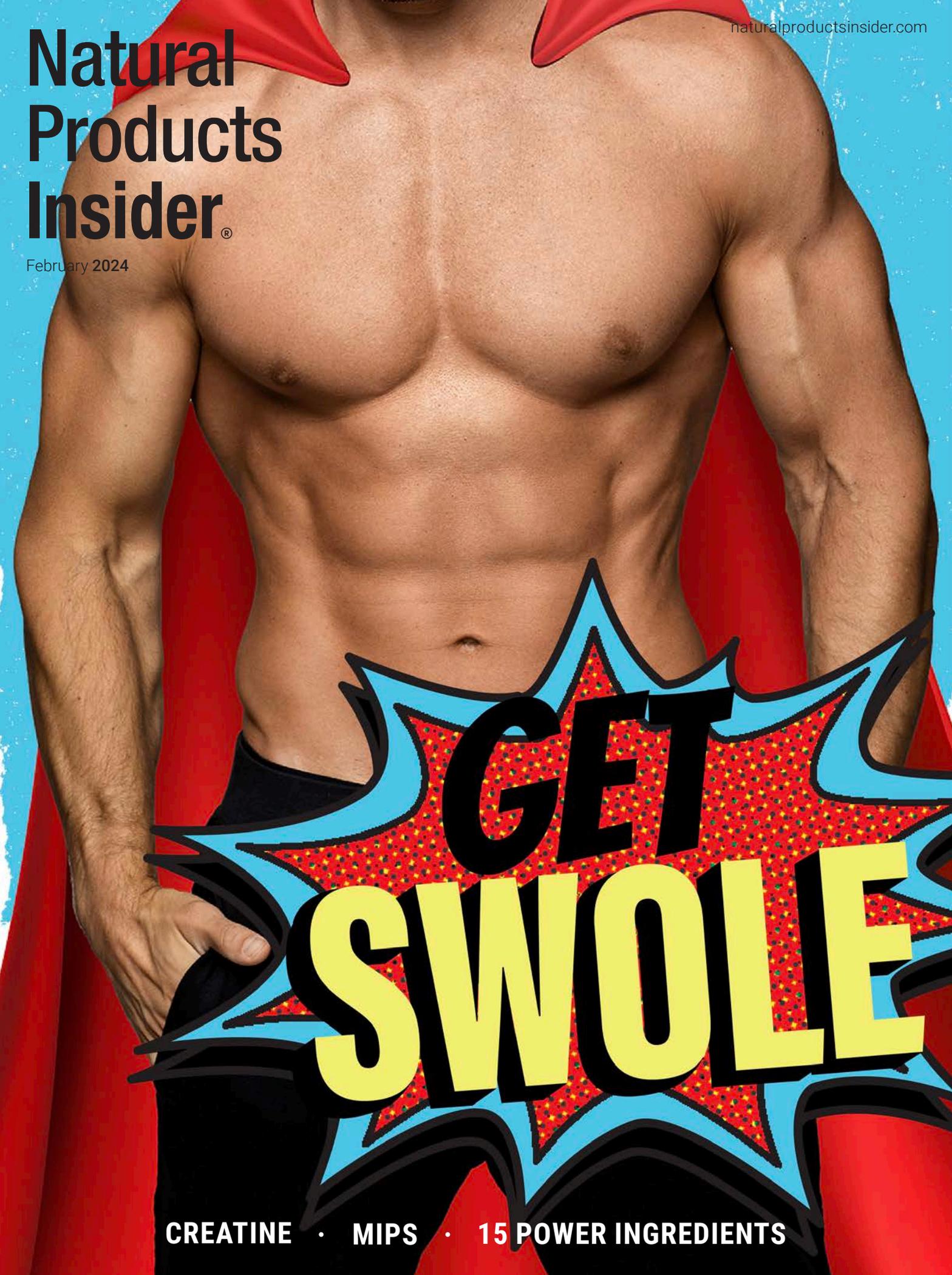


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February 2024



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4 VIEWPOINT

Third-party certification weeds out banned ingredients

Certification programs promote fair competition and protect athletes and brands, Content Director **Todd Runestad** surmises, but rigorously testing supplements for banned substances also ensures quality control.

14 INGREDIENT SCIENCE

Hits from the NFL (Nutrition Formulation League)

Douglas Kalman recounts the sports nutrition ingredient draft held at SupplySide West 2023, which showcased five trending ingredients: creatine, whey protein, hobamine, HMB and BCAAs. Formulators shoot, and score!

24 FOCUS

The creatine renaissance

Once mainly used by athletes for bulking, creatine is now gaining popularity for its wider health benefits, **Denis Faye** explains. Research reveals potential benefits for muscle health, brain function, aging and even women's health.

5 PRE-WORKOUT

5 MIPS key ingredients for 2024

From hardcore bodybuilders to everyday athletes, students and gamers, the target audience for pre-workout products is expanding, **Nick Collias** reports. As such, today's best pre-pump formulas are focused on multiple benefits, including endurance, mood, focus and energy.

19 INNOVATIONS

New ingredient advances with big market potential

Todd Runestad pulls together four innovative plant-based protein solutions, each targeting distinct needs in the health and wellness industry.



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Third-party certification weeds out banned ingredients

For competitive athletes, optimum nutrition and select supplements can mean the difference between a finish on the podium or being just another also-ran.

Supplements can also be a convenient scapegoat when a competitor gets busted for using banned substances.

The question is, do sports supplements frequently contain adulterated compounds, or do competitors use supplements as just a convenient excuse for their illicit behavior?

The U.S. and World Anti-Doping Agencies develop policies and test athletes. Third-party certifiers work with supplement brands to ensure their products are clean. These are the likes of Informed Sport, Informed Choice and NSF Certified for Sport.

The problem always starts with suppliers, and then problems continue with supplement brands that don't have effective quality control (QC) procedures. Supplement companies that get certified go through a meticulous quality review.

"They look at critical control points and hygiene points in processing," said Bryan Morin with NOW Sports, a line of sports-related supplements certified by Informed Sport. "They request a lot of information and do label verification. We did know there are multiple third-party certifiers. Adding a third party would only help us in that area."

TYM Athletic Performance is another supplements brand that went through the certification process, for its protein SKUs.

"We wanted to communicate that our products were banned-substance-free," said CEO Rob Wildman. "Our claim for protein is meeting the label claim at the very least. What's on the label is definitely in there. And on banned substances, what we hope is not in there is certified not in there."

Quality and marketing messaging are of course vital metrics for brands considering going through the effort to certify products.

But really, it's all about supporting the athlete.



If an athlete tests positive for a banned substance, the investigation will head back to the supplement company. And certified brands are invaluable in determining the source of the banned substance.

"The biggest reason why our investigations could not tag the source was utter chaos at the supplement company," said Amy Eichner, Ph.D., special advisor on drugs and supplements at the U.S. Anti-Doping Agency.

She said some are good companies but didn't retain samples, or they used multiple suppliers and don't know for sure which supplier provided which ingredient in which lot.

"We advise athletes to only use third-party certified products," Eichner said. "In the event of a positive test, there's a much better likelihood that the company with the help of a third-party certifier can identify or disprove to the athlete that your supplement was the culprit."

By certifying supplements that are aimed at high-intensity athletes, brands can protect themselves — as well as from athletes who might claim their cheater is because of a supplement when it's not.

Cheers,

Todd Runestad
CONTENT DIRECTOR



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5 MIPS key ingredients for 2024

MULTI-INGREDIENT PRE-WORKOUT SUPPLEMENTS ARE FILLING A NEED FOR ATHLETES ACROSS THE FITNESS SPECTRUM.

by Nick Collias

Pre-workout supplements are no longer solely for hardcore bodybuilders. A new generation of customers are looking for ergogenic benefits both inside and outside of the gym, and they place a premium on transparency and efficacy.

Here's what's inside the bottles of the best MIPS blends for 2024, and how to dose them for maximum effectiveness – all while meeting the demands of discerning buyers.

DEFINING MIPS

Research into pre-workouts often refers to these popular supplements using the acronym MIPS. But depending on the scientific study, that could stand for one of two things:

- Multi-ingredient **pre-workout** supplement; or
- Multi-ingredient **performance** supplement.

That may look like two words for the same thing, but Susan Hewlings, Ph.D., VP of research affairs at contract research organization (CRO) Radicle Science, explained the shift toward “performance” is an important one that typifies “the entire sports nutrition market.” She continued, “When sports nutrition first started, pre-workouts were all about the bros. But there’s been a realization that regular, unassuming people are out there running, lifting and getting it done. And they want better performance, too.”



“Pre-workout” brings to mind a 2010s-era bodybuilder interested primarily in stimulants and muscle pumps, and who perhaps doesn’t mind that a supplement’s precise ingredients and dosages are concealed in a proprietary blend. But “performance” expands the customer base to include competitive athletes, students, gamers and everyday people using MIPS instead of energy drinks.

The expanded audience brings increased scrutiny on both what is in MIPS blends – and how much of the key ingredients they contain.

HOW MIPS WORK

A person doesn’t have to dig very deep at a sports nutrition store to find a blend whose basic recipe is “stims, stims and more stims.” But [studies](#) looking into the most effective uses of MIPS point to their ability to check multiple boxes, utilizing several related but not completely

click to go!

Pre-workout



overlapping mechanisms of action. These include:

- Improving muscular endurance.
- Maintaining or improving mood during training.
- Boosting strength and power production.
- Enhancing mental focus.
- Providing energy.

Digging into the research and expert commentary brings context around which MIPS ingredients to consider for a formulation.

1. BETA-ALANINE FOR WORK CAPACITY

A 2019 [study](#) published in *Nutrients* ranked the most popular ingredients and dosages in 100 commercially available MIPS blends, which produced a surprise winner: beta-alanine. This nonessential amino acid appeared in 87% of pre-workouts, even beating out almighty caffeine by a percentage point.

One reason for its popularity is its most prominent side effect, paresthesia – a skin-tingling sensation around the face and neck that lifters have been known to “seek and enjoy,” as a sign that their MIPS is taking effect, said Di Tan, Ph.D., director of scientific affairs for CarnoSyn brands, maker of the only beta-alanine to have obtained NDI (new dietary ingredient) status per FDA.

Beta-alanine also has decades of [research](#) showing it can help delay fatigue and increase muscles’ work capacity, especially during the type of intense training that produces high amounts of blood lactate and hydrogen ions.

“CarnoSyn beta-alanine is fundamental for sports nutrition, as it’s the rate-limiting factor of carnosine production,” Tan maintained. “Carnosine is naturally produced in our body and provides a unique mechanism for buffering the hydrogen ions generated by intense training. Beta-alanine works well alongside other ingredients”





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Several researchers and brands are leaning away from simply leucine or the BCAAs, and toward a **balanced amino** approach.

like NO [nitric oxide] boosters, caffeine, amino acids and creatine, based on different but complementary mechanisms.” He suggested this makes it a natural fit for both higher-rep lifting and sprint-heavy track, team or racquet sports.

DOSE: Experts recommend taking beta-alanine in a 3.2 g daily dose for athletic performance (other health-focused uses, like potentially helping [prevent cognitive decline](#), may require lower doses). However, the ingredient is only thought to be effective after a loading phase of at least 90 g over a 28-day period.

2. CAFFEINE FOR POWER AND ENERGY

Caffeine may no longer be the only performance-enhancing ingredient that athletes are looking for, but rest assured, the world’s most popular stimulant isn’t going anywhere. According to the NBJ (Nutrition Business Journal) “Sports Nutrition

and Weight Management [Report 2023](#),” 27% of surveyed active people reported they “always” consume caffeine before training, and 27% do so “often.” Also, 23% cited preparing for workouts as a primary reason they consume caffeine.

Keeping different users in mind, premium MIPS are jettisoning a “more is better” approach to caffeine and trying to dial in the user experience via a blend of short-acting and longer-release caffeine.

“Formulators can create unlimited types of energy profiles by combining immediate-release, delayed-release and extended-release ingredients,” explained Steve Fink, VP of marketing at PLT Health Solutions, maker of zümXR Targeted Release Caffeine. “These energy profiles can be targeted to specific product types – the morning pick-me-up, the pre-workout formula or the all-night study aid.”

In light of these targeted release times, brands can also create MIPS that avoid the extreme





“Citrulline malate has been shown to increase training volume in the weight room, and beetroot has been shown to improve endurance performance.”

- Krissy Kendall, Ph.D., lecturer in exercise and sports science at Edith Cowan University in Australia



highs and lows associated with old-school pre-workouts. “A key driver for development of these products was to control and extend the level of caffeine in the blood, so that the common complaint of ‘peaks and crashes’ related to standard (immediate release) caffeine consumption is evened out into a steadier level,” Fink stated.

DOSE: Caffeine tolerance is highly personal, but a commonly cited “low end” for athletic performance enhancement is 3 mg per kg of body weight. For an 80 kg (176 lb.) man, that’s 240 mg – and 180 mg for a 60 kg (132 lb.) woman – of standard-release, extended-release or a blend of caffeines.

3. L-CITRULLINE FOR FATIGUE FIGHTING AND MUSCLE PUMPS

The nonessential amino acid L-citrulline has become a near-mandatory inclusion in MIPS in recent years, ranking only behind beta-alanine and caffeine in popularity in the Nutrients study. Its major appeal comes not from what it does on its own, but from its ability to help the body produce another compound: NO.

A potent vasodilator, NO [helps](#) relax the arteries, which in turn can increase muscle pumps and help control fatigue. In the world of

MIPS, NO boosters could easily be viewed as their own class of nutrients, the most popular of which also include citrulline malate (L-citrulline bonded with malic acid) and the increasingly popular beetroot. (Arginine, another NO-boosting amino which came in at No. 8 on the Nutrients ranking list, has been replaced by citrulline in many MIPS due to [concerns](#) that it could cause digestive distress at high doses.)

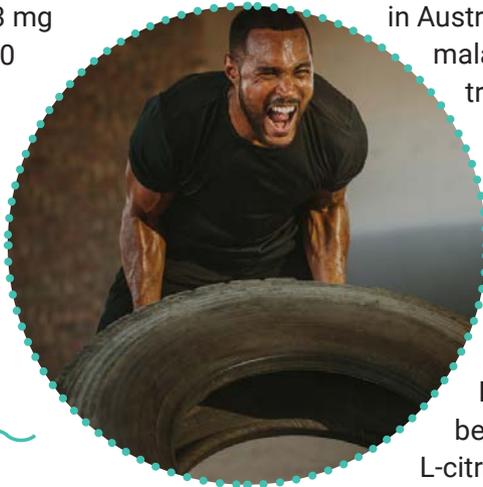
Krissy Kendall, Ph.D., a lecturer in exercise and sports science at Edith Cowan University

in Australia, pointed out, “Citrulline malate has been [shown](#) to increase training volume in the weight room, and beetroot has been [shown](#) to improve endurance performance.” The supplement researcher continued, “Couple those results with something like caffeine, and you’re sure to have a winner.”

DOSE: 6-8 g taken 30-45 minutes before a workout, of either L-citrulline or citrulline malate. A number of [studies](#) have shown additional benefit from loading 8 g L-citrulline for seven days or more for endurance-focused training.

4. ESSENTIAL AMINO ACIDS (EAAS) FOR MUSCLE SORENESS

The term “amino acids” may bring to mind the branched-chain amino acids (BCAAs) leucine, isoleucine and valine, but these sports nutrition



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Pre-workout

stalwarts are not the most common essential aminos in today's pre-workouts. That title goes to taurine, a conditionally EAA that's also highly popular in energy drinks.

Taurine is one of the most abundant amino acids in the brain, retina and muscle tissue, and contributes to numerous crucial bodily processes. For workouts, research has linked it to decreased [post-exercise muscle soreness](#), in addition to a longer [TTE](#) (time to exhaustion) in training. Similar to other ingredients on this list, taurine has also shown promise as an anti-aging supplement; some researchers have gone so far as to call it an "[elixir of life](#)."

BCAAs, which are also considered essential aminos, remain popular due to research linking them to decreased muscle soreness and decreased fatigue. But in recent years, a growing amount of [research](#) has indicated that supplementing the other six EAAs — histidine, lysine, methionine, phenylalanine, threonine and tryptophan — may contribute more to protein synthesis than previously thought. As such, several researchers and brands are leaning away from simply leucine or the BCAAs, and toward a balanced amino approach.

"If someone wants a pre-workout, essential aminos are actually where I'm going to go first," Hewlings shared. "I'd even put them above caffeine, because caffeine is so individual in its effects, and depends on the time of day."

DOSE FOR ESSENTIAL AMINOS: 5-10 g total, with at least 3 g leucine.

DOSE FOR TAURINE: An August 2021 systematic



[review](#) in *Frontiers in Physiology* found that a taurine dose as low as 50 mg was sufficient to decrease muscular fatigue during strength training. Other benefits, like decreased muscle soreness and improved aerobic performance, might require higher doses, around 1-3 g.



5. ALPHA-GPC FOR FOCUS AND MENTAL FATIGUE

Like L-citrulline, the compound alpha-glycerylphosphorylcholine (GPC) is the leader of a whole class of ergogenic aids: nootropics. Doug Kalman, Ph.D., RD, a co-founder of the International Society of Sports Nutrition (ISSN), noted these cognition-boosting nutrients are in a growing number of MIPS — both the caffeinated and non-caffeinated varieties.

"A huge change in pre-workouts is the idea that being focused and 'getting into flow' are so important," Kalman stated. "People are looking beyond caffeine for that, and nootropics are only going to increase in popularity."

Unlike beta-alanine or creatine, which need to be "loaded" for days or weeks to work, most popular nootropics like alpha-GPCs work acutely, meaning their impact is felt within



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Pre-workout

30-60 minutes. This can be felt as added mental clarity, or simply a resilience to fatigue as the body uses up its available supplies of certain neurotransmitters. Alpha-GPC works by providing dietary choline, which is the main precursor to the neurotransmitter acetylcholine.

Mike Petteruti, president of Chemi Nutra, maker of the patented alpha-GPC ingredient AlphaSize, noted, “Your brain is arguably more important than your muscles when you’re working out, because it tells your muscles what to do. We know when you work out, choline depletion is a huge issue. Having

more choline available helps the brain and the muscle work better, restore better, recover better and perform better. So you’re thinking clearer, and your muscles are getting the compounds they need in order to work.”

DOSE: At least 250-300 mg of alpha-GPC. Certain nootropic-heavy MIPS blends contain as much as 600 mg. According to Petteruti, “300 mg is a very popular and research-backed dose.” ✦



Dosage *matters* in MIPS

The Nutrients [study](#) of the top 100 pre-workout ingredients contained a table of what the researchers called “prevalence of ergogenic quantity” of its top ingredients. It showed what percentage of the pre’s on the market contained efficacious dosages of top ingredients. And the results were underwhelming, to say the least.

Only 37.5% of studied pre-workouts contained the recommended dose of L-citrulline. For beta-alanine, the result was a paltry 1.85%. In a Bodybuilding.com podcast in 2018, I asked Jose Antonio, Ph.D., one of the co-founders of the International Society of Sports Nutrition, if that was problematic. His response was that dosage definitely matters – especially when it comes to MIPS.

“There’s a saying in the pharmaceutical industry: drug, dose, duration. In this case, it’s supplement, dose, duration. And dose is key,” he explained. “I mean, a lot of products are underdosed, which can be a problem. Now, if they’re underdosed, could you take them long enough to get a dose? Conceivably you could.”

Consistent underdosing may work for select supplements that get taken daily, like creatine monohydrate, which has benefits at just 2 g per day. But a pre-workout isn’t something that athletes consume like a multivitamin. For the pre-workout ingredients that get consumed only acutely rather than chronically, a higher dose is necessary.

“For an amino acid like L-citrulline, for example, you need to get gram amounts of it, not milligram amounts,” Antonio said. “If you look at a lot of these pre-workout products, it’s milligram amounts.”

Of course, every brand has to navigate the gauntlet of transparency vs. intellectual property (IP) for itself. But many of today’s science-savvy athletes already know what dosages have been shown to work, and they reward the brands that are open about their formulations.

“It’s important that you work with a dose that at least shows some clinical promise,” Antonio said. “Otherwise, it’s just ‘fairy dusting,’ which is not fair to the consumer.”



Nick Collias is a writer and editor with over a decade of experience working in the health and fitness industry. From 2016 to 2021, he was the host of the Bodybuilding.com Podcast, interviewing elite athletes and training thought-leaders on a wide range of exercise, nutrition and lifestyle topics. Additionally, he has worked for the last 20 years as a longform print and online journalist, as well as a book author, ghostwriter and editor.

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**Pudasainee P, Anjum F. Protein Intolerance. [Updated 2023 Apr 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK562306/>

***Team, W. (2023, July 21). Is it possible to eat too much protein?. Cleveland Clinic. <https://health.clevelandclinic.org/can-you-eat-too-much-protein/>

†Percentage values represent the relative increase in amino acid liberation from whey protein by OPTIZIOME[®] P³ HYDROLYZER[™] compared to two top competitors in a standard in vitro gastric digestion simulation.

††Based on in vitro enzymatic assays (BIO-CAT Microbials Data on File).

‡Garvey, S. M., et al. (2022). *Gut Microbes*, 14(1), 2122668.



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Hits from the NFL (Nutrition Formulation League)

A SUPPLYSIDE WEST VENTURE

by Todd Runestad

SupplySide West 2023, held in Las Vegas last October, offered many educational and informational sessions. In fact, the educational component and the opportunity to meet with so many individuals and companies face to face is a driving force for why so many people attend. During the event, I was fortunate to take part in a session titled “Sports Nutrition quits the gym and goes mainstream” — during which we held the legendary National Formulation League draft. Yes, the draft is modeled after the National Football League’s draft, except ours has more pizzazz, personalities, data and even substantiation!

While the NFL-style draft at SupplySide West covered 30 dietary ingredients, this brief article will recap the exciting, expanding and informative science surrounding five of them: creatine, whey protein, hobamine, beta-hydroxy-betamethylbutyrate (HMB) and branched-chain amino acids (BCAAs).

In addition to the science, other factors influenced these select ingredients making it to the “big board” for draft day.

CREATINE

Creatine is one of the most popular nutritional ergogenic aids for athletes. A member of the guanidine phosphagen family, creatine is a naturally occurring non-protein amino acid compound found primarily in red meat and seafood. Studies have consistently



shown that creatine supplementation increases the amount of creatine stored within a muscle, as well as increasing overall circulating amounts.

Some data also indicate that creatine supplementation can positively benefit brain creatine levels. The brain is one of the specific organs that utilizes creatine for energy processes.

Having greater levels of creatine in the muscle and even circulating in the blood has been [tied to](#) enhanced exercise performance and recovery, reduction of injury risks, increased thermoregulation capabilities, aids in gaining lean muscle mass, protection of bone, potential influence on mood states and much more.

Newer [research](#) also points to creatine as having cognitive and positive mood state impacts, while also being “muscle protective” as the body ages.

The more that’s learned about creatine and its roles in the human body, the more the data is convincing of the true utility of this ingredient. Creatine is the sage grandfather of the sports nutrition playbook; however, its benefits throughout the life cycle are now getting even better known. It’s an exciting area to work in, with creatine’s utility as a sports nutrition ingredient second to none.

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If **whey protein** worked for Miss Muffet, it can also work for others.



WHEY PROTEIN

Did you know Little Miss Muffet was the first well-known person to supplement with whey protein? You laugh, but the proof is in the classic nursery rhyme: “Little Miss Muffet sat on a tuffet, eating her curds and whey.” If whey protein worked for Miss Muffet, it can also work for others.

Whey protein might just be the most ubiquitous protein marketed and sold in the sports and active nutrition markets. Sufficient protein intake supports muscle growth, tone and appearance.

Whey protein is a byproduct of the cheese-making process. When the liquid portion is strained off the curdled milk, that liquid portion is known as whey. Whey protein is a complete protein, and in fact is very rich in BCAAs.

Whey protein has been [found](#) not only to help with supporting muscle growth and lean body mass, but also with body fat reduction and healthy lipid levels. It also has [demonstrated](#) the following properties: antimicrobial, antiviral actions, immune system stimulation,

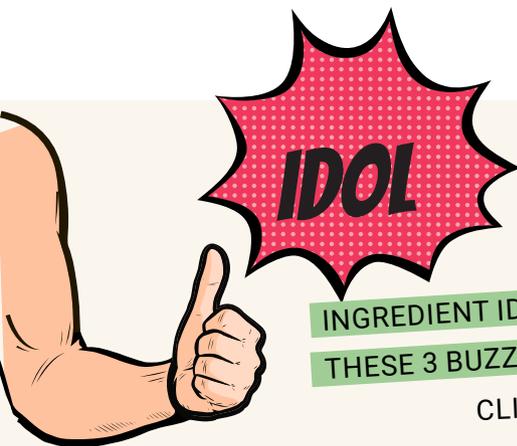
anticarcinogenic activity and other metabolic health promotion effects.

In sports nutrition, whey is often a go-to ingredient as it contains little to no lactose, is rich in all of the essential amino acids (EAAs), is readily absorbed and quickly digested, has at least 25% BCAAs and is both easily mixed and used by the body.

HOBAMINE

Derived from buckwheat seeds, hobamine is also known as 2-hydroxybenzylamine. In other words, hobamine is an extracted isolated ingredient found in buckwheat.

Early [science](#) suggests this ingredient may be the game changer for not only helping to maintain cellular health, but for also managing healthy inflammatory responses, promoting antioxidant defense systems (helping to maintain



INGREDIENT IDOL AT SUPPLYSIDE WEST FEATURED
THESE 3 BUZZWORTHY INGREDIENTS FOR ENERGY.

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Creatine is the sage grandfather of the sports nutrition playbook; however, its benefits throughout the life cycle are now getting even better known.

cellular integrity and immunity) and thus in an overall way, being a longevity promoter.

Pharmacokinetic [studies](#) have demonstrated hobamine is absorbed and can impact cellular health within two hours of ingestion. The ingredient also offers antioxidant impacts while not actually being an antioxidant. Overall safe and beneficial effects were observed with dosages around 825 mg hobamine per day.

Because of the multifunctional [effects](#) of hobamine (impacts antioxidant status, the immune system, inflammatory response and more), its use as a sports nutrition recovery ingredient comes into play. Preliminary preclinical research points to the potential nootropic effects of hobamine, meaning with more research, the unique ingredient may be positioned not only to promote cellular health and recovery for athletes, but also as a cognitive function supportive foundational nootropic (e.g., to aid in memory).

HMB

HMB is a metabolite of the EAA leucine that has been reported to have anabolic effects on protein metabolism. When leucine is oxidized, it becomes HMB – a substance that is physiologically and biologically active in humans.

HMB acts in the body to decrease protein breakdown (muscle loss), while being able to stimulate the mTOR (mammalian target of rapamycin) pathway, which increases muscle protein synthesis (MPS). So far, HMB appears to have anabolic and anticatabolic properties, two things of great interest in the athletic and sports performance world.

Studies have [demonstrated](#) HMB supplementation provides an enhanced ability to recover on the cellular level, overall tissue recovery and repair is quicker, and positive

impacts occur on aerobic exercise performance. Data also [indicate](#) that HMB, while decreasing muscle loss or catabolism, also reduced muscle soreness levels, making it a great nutritional ingredient for the athlete who trains with great intensity.

What makes HMB a player in the sports nutrition ingredient world is that the data over the past 15 or so years has been consistent. HMB has positive [impacts](#) on biomarkers of inflammation and muscle damage, while also [decreasing](#) perceptions of muscle soreness, thus positioning the ingredient – based on the science – to be a good recovery nutrient for consideration.

BCAAS

Foods contain protein, and proteins are made up of amino acids – the latter of which can be essential or nonessential. “Essential” means the body needs to obtain it from the diet, whereas nonessential amino acids can be synthesized by



Ingredient science

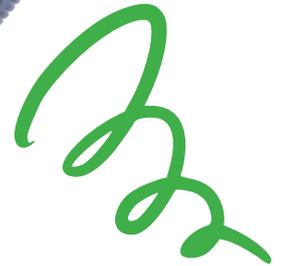
the body from other nutrient sources. The BCAAs are leucine, isoleucine and valine. BCAAs are not only among the EAAs, but also comprise the greatest proportion of them.

BCAAs are oxidized in the muscle and **result** in stimulating anabolic signals – which in turn may optimize performance, body composition and recovery. Meaning, when BCAA intake is combined with the stimulus of exercise training, the **result** can be enhanced body composition (less fat, better muscle tone), reduced feelings of fatigue (experiential) and reduced muscle soreness.

As BCAA products are frequently in powder form, when flavored well, they often become part of a person's overall hydration strategy. This could give flavored BCAA muscle health products a leg up for inclusion within a sports nutrition program.

NEXT DRAFT IN VIEW

It's easy to see why these five leading sports nutrition ingredients are either popular now, have always had an audience, or are emerging with a



growing audience of potential consumers who would benefit from the product as part of their exercise, nutrition and lifestyle program.

Heading into 2024 – in anticipation of the next SupplySide West – it's time to start lining up which ingredients will be up for the next National Formulation League draft. I know I have a few new ones in mind! ♦



Douglas S. Kalman, Ph.D., RD, FISSN, is a clinical associate professor in the College of Osteopathic Medicine at Nova Southeastern University in Fort Lauderdale, Florida. He is also a co-founder of the consultancy Substantiation Sciences. He can be reached via dkalman@nova.edu.



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New ingredient advances with big market potential

by Todd Runestad



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INNOVATION: EverPro is made using a proprietary process to upcycle barley protein from brewer’s spent grain (BSG) – the most plentiful byproduct of the beer industry. Currently available in two formats, both are labeled on sports nutrition beverages and other consumer goods as barley rice protein.

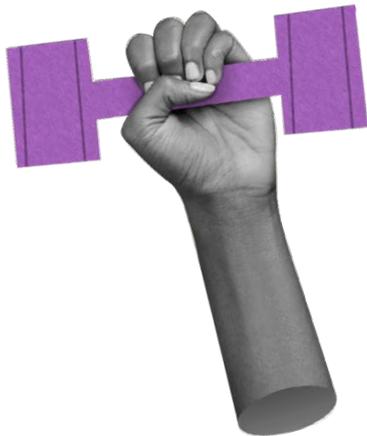
At 35 grams per 8-ounce serving, EverPro exhibits smooth mouthfeel with low to no astringency or chalkiness, reducing the need for the addition of expensive (and often chemical) masking agents or bitter blockers. Its unmatched solubility and viscosity eliminates the thickness, grittiness and bitterness typical of protein powders.

EverPro Clear, an evolution of EverPro Original, is lighter in color while still delivering on the brand’s core benefits that give it a competitive advantage, including 20 g protein per 10-ounce serving; mild taste that enables the higher protein content in ready-to-mix (RTM) format, where others in the category max out at 10 g per serving, as well as a full spectrum of flavor profiles, including those that are fruit forward.

MARKET POTENTIAL: EverPro was created to meet the growing needs of athletes and active/health-conscious consumers who are

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looking to enhance athletic performance and long-term health through plant-forward eating. Plant-based eating is up 17% in the United States this year as some consumers show increasing concern about the environment, animal welfare and their overall well-being. This shift counters the traditional thinking that animal protein is necessary for muscle growth. In fact, plant-based sources are just as [effective](#), if not more so, in building muscle mass and promoting recovery in athletes.

SCIENTIFIC MERIT: EverPro has superior solubility and viscosity levels compared to whey or pea and is at or above parity in absorption and digestibility. That makes it a great fit for sports and nutrition beverage applications. Compared with the gold standard of plant protein isolates, soy and pea protein, EverPro [has been shown](#) to have the highest solubility, the highest foaming capacity, the lowest sedimentation activity and low emulsion stabilizing activity. EverPro has a similar protein content to pea and soy isolates but far exceeds them in terms of protein solubility – 100%, compared to 22% and 52% for pea and soy isolates, respectively. That means up to 2x higher protein inclusion in beverages per serving. [In vitro studies](#) confirmed EverPro as one of the fastest-absorbed proteins. This result is similar to whey and high-end pea. EverPro also [has been shown](#) to have high levels of all three branched-chain amino acids (BCAAs), which are important in boosting muscle growth and performance.

PURIS
PURIS HiLo



INNOVATION: Traditionally, plant proteins have been incompatible in acidic environments due to protein precipitation, which creates a gritty mouthfeel. PURIS HiLo is changing the game by creating a solution for protein fortification in acidic beverages and foods. Stability in acidic environments means that PURIS HiLo imparts a clean taste along with a smooth, non-chalky mouthfeel in low pH applications. With 80% protein purity and low water hold, PURIS HiLo makes it easier to hit protein claims without contributing to viscosity.

MARKET POTENTIAL: PURIS HiLo is an acid-stable plant protein optimized for low pH/high acid applications. Ultra-high solubility allows for seamless addition to products without imparting viscosity. The ingredient also can help fill the protein gaps in applications like fruit juices, fruit purees, coffee, soups, sauces, dressings/dips, gummies, sports nutrition beverages, functional and carbonated waters, as well as acidic products (pH ≤ 4.5).

Nura USA
YESTEIN
fermented yeast protein



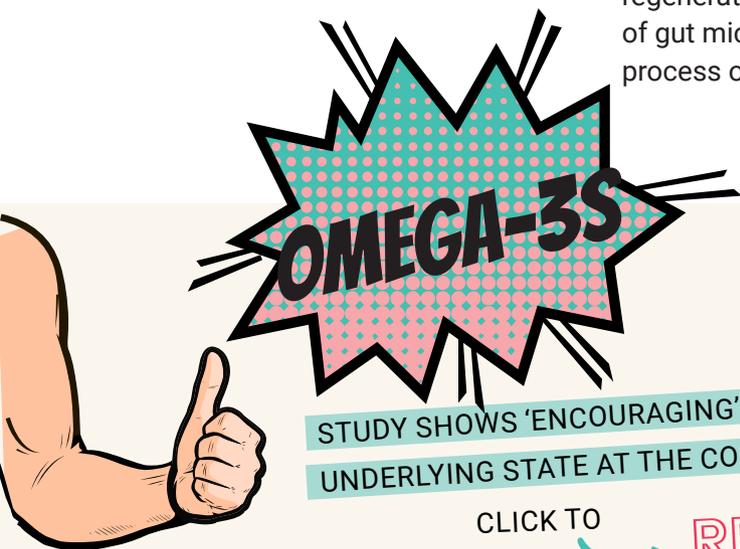
INNOVATION: Meeting the demands of the growing alt-protein trend – along with a transition of some people’s eating habits to reduce animal consumption – YESTEIN fermented yeast protein serves as a high-quality, vegan, bioavailable protein source. This 100% fermented yeast protein from *Saccaromyces cerevisiae* contains more than 80% protein, 5% dietary fiber and a PDCAAS (protein digestibility-corrected amino acid score) of 1.0, all while utilizing certified upcycled and sustainable processing methods.

YESTEIN is a complete protein with all nine essential amino acids (EAAs) and more than 21% BCAAs – of which, a significant amount are leucine, isoleucine, valine and the four limiting amino acids (lysine, threonine, methionine and tryptophan), all of which [play an important role](#) in muscle protein synthesis (MPS).

As a natural flavor masker to pulse proteins, YESTEIN plays an important role in minimizing expensive flavor maskers while contributing to the overall nutritional quality, making YESTEIN an optimum complementary protein to any vegan formulation. YESTEIN fermented yeast protein is an option for any formulator or brand when developing and promoting high-quality, clean-tasting functional protein products.

MARKET POTENTIAL: With a neutral to mild umami flavor profile, low viscosity, moderate to high water-holding capacity and high solubility, YESTEIN provides nutrition and function to foods such as breads, crackers, yogurt and alternative meats; beverages such as RTM, ready-to-drink (RTD) and dairy alternatives; supplements such as bars, capsules and protein cookies; or pet applications such as foods, treats and supplements.

SCIENTIFIC MERIT: Yeast protein promoted MPS and muscle regeneration, as well as altering the composition and diversities of gut microbiota – especially microbiota involved in the process of muscle aging.



STUDY SHOWS 'ENCOURAGING' RESULTS FOR THIS ONE UNDERLYING STATE AT THE CORE OF SPORTS INJURIES.

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3DPump Breakthrough



NutraShure

INNOVATION: 3DPump Breakthrough was developed using proper synergy and provided comparable results at nearly half of the active ingredient dose. For manufacturers looking to formulate with benefits that include muscle pump while also providing effects on aerobic and anaerobic exercise performance, 3DPump Breakthrough delivers innovation to the next generation of sports and active nutrition products.

MARKET POTENTIAL: The positive results and the synergistic mechanism of action compared to that of L-citrulline make the branded ingredient a new innovative choice for formulators in the growing sports nutrition space for both pre- and post-workout benefits.

SCIENTIFIC MERIT: 3DPump Breakthrough is a triple-action pump ingredient combining L-citrulline, high-yield glycerol and a standardized extract of amla fruit (*Phyllanthus emblica*) that fuels muscle pump through three complementary mechanisms of action. The result of the 3-in-1 non-stimulant pump includes enhanced blood flow and nitric oxide (NO) production for optimal performance benefits.

A randomized, single-blind crossover [study](#) evaluated the efficacy of 3DPump Breakthrough on biomarkers of hydration, muscle size, inflammation and muscle endurance. Healthy recreational active male and female subjects with an average age of 29.4 years old were randomized to either 3DPump Breakthrough (3 g L-citrulline, 1.2 g glycerol, 165 g of amla fruit extract) or 8 g of L-citrulline alone 45 minutes before an aerobic and resistance-training workout. Testing measures included body fluid shifts, markers of hydration and appendicular girth, which were taken before and after exercise. Markers of damage and inflammation were also measured and taken 24 hours after exercise. The results showed 3DPump Breakthrough, containing 3 g of L-citrulline, achieved similar results on acute muscular endurance, muscle damage and inflammation as well as appendicular muscle girth compared to 8 g of L-citrulline alone while having 50% fewer adverse events reported. ♦





The creatine renaissance

by Denis Faye

For years, creatine was the province of young gym rats looking to get swole, even before the term “get swole” existed. Perception has shifted lately, with consumers now looking to this proven supplement for healthy aging, better cognition, women’s issues and points beyond.

“Creatine is no longer just people looking to add a few plates to their bench,” claimed Scott Dicker, director of market insights at SPINS. “The biggest trend is taking it out of the gym and bringing it into daily routines everywhere.”

The numbers attest to this. According to SPINS’ “The State of Supplements in 2023” [report](#), creatine sales in 2022 experienced a 120% increase compared to 2021, from \$16 million to \$36 million.

Could this surge in sales possibly be due to excessive love from influencers like tennis superstar Novak Djokovic, whose desperate cry for “[Creatina!](#)” during the Cincinnati Masters final in August 2023 went viral? While this sort of PR certainly doesn’t hurt sales, more substantial reasons are likely behind creatine’s renaissance.

A CREATINE REFRESHER

Creatine occurs in the body as phosphocreatine and plays an important [role](#) in energy metabolism. Cells use adenosine triphosphate (ATP) for energy. Any “fuel” consumed eventually becomes ATP. The muscles usually generate ATP with help from oxygen, but during extra-challenging efforts when a person can’t get enough oxygen, the body switches pathways, using phosphocreatine to make ATP.

This high-intensity pathway can only work for a few seconds, as the body stores a limited amount of phosphocreatine. Once it runs out, access to ATP is diminished. “Creatine is involved in every cell in the body in every living organism,” explained Richard Kreider, Ph.D., director of Texas A&M’s Exercise & Sport Nutrition Laboratory. “It’s kind of the foundation for energy. So, when you provide adequate energy to a cell, it can function more optimally.”

Robert Alber, VP of human nutrition at AlzChem — makers of go-to creatine monohydrate ingredient Creapure — put it this way: “We sell electricity.”

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- Decreases body fat
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For Connective Strength

Joint Health

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The Joint Health Revolution

Bone Health

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The liver, kidneys, pancreas and parts of the brain can generate around 1-2 grams of creatine daily. Creatine can also be obtained from meat and fish, which contain about 1-2 grams per pound. Considering active individuals [require](#) around 2-4 grams of creatine daily to maintain their stores, that would require a lot of pork chops.

This all speaks to the benefits of supplementing creatine monohydrate, the most proven form of creatine. Specifically, .03 grams per kilogram of body weight or about 3-5 grams daily is [believed](#) to help assure maximum stores.

CREATINE'S LONG RESEARCH HISTORY

As previously noted, pinning creatine's rising popularity on one inciting incident such as the Djokovic clip would be impossible. Rather, a series of interrelated factors is likely at work.

Research certainly played a role, but much of it already existed. The 67,000 results found when searching creatine on PubMed didn't all pop up overnight. "It's not brand-new," Kreider concurred, "The research has been accumulating over the last 30 years."

However, the consistent success of all this creatine research begat more investigation. In the world of supplement science, research is often inconclusive. According to Kreider, "When we do studies, 95% don't work as well as we thought they might."

Studies focused on supplementing creatine, though, often hit paydirt. "When they work like creatine, we start saying, 'If it works in a healthy person with fitness, what about in a rehab setting? What about in an older person? What about in a heart patient?' That's where we're at with creatine now. The focus is on, 'How can we optimize creatine availability throughout the life span?'"

This scientific flywheel has translated into an ever-growing body of research with positive results. Creatine may [benefit](#) women's health, including issues related to menopause. It's been [linked to](#) favorable effects on aging muscle, bone and fat mass in healthy older adults. And it's [shown](#) potential to improve cognitive function, especially when a brain creatine deficit has been brought on by acute stressors like sleep deprivation or chronic conditions such as mild traumatic brain injury, Alzheimer's disease or depression.

From there, the research goes in dozens of directions, ranging from chronic fatigue to immune response (see related sidebar).

That said, the fitness market is still creatine's sweet spot. "Active nutrition is the category that's driving sales and creatine is a staple of that space," Dicker confirmed. "It makes sense that one of the staple ingredients is going to do well – but it's growing much faster than the overall category."

He suggested interest in the newer findings could be playing a role. "When you layer these new use cases and expanding demographics on top of the core category, it's really a great situation for creatine."

THE COVID CONNECTION

As all this science emerged, so did the global pandemic. "Covid was a big factor," Kreider acknowledged. "People were at home and they started thinking, 'How can I improve my health? What can I do at home for fitness?'"

While researching creatine's fitness benefits, consumers had easy access to learn what

Article continues on p.28



3 exciting areas of creatine research

Creatine's continued scientific success has spurred all kinds of investigation. Texas A&M's Richard Kreider, Ph.D. — who literally wrote the book on the naturally occurring compound — is especially excited about the following three areas.

POST-VIRAL CHRONIC FATIGUE

A [review](#) published February 2021 in the journal *Nutrients* claimed “supplemental creatine and related guanidino compounds appear to impact both patient- and clinician-reported outcomes in syndromes and maladies with chronic fatigue.”

Kreider noted, “I’m excited about the applications for long Covid and fatigue syndromes — anything that limits the mitochondria’s ability to function, including disease. Creatine seems to be a very important backup molecule.”

IMMUNE RESPONSE

Another February 2021 [review](#) in *Nutrients* looked at creatine’s potential impact beyond the musculoskeletal system, providing data “demonstrating that creatine can impact both innate and adaptive immune responses.”

Kreider pointed out that, again, this could influence long Covid. “Some studies now show that T-cells, lymphocytes, your main fighting agents for infections and things like that are dependent on creatine.”

T-CELLS, TUMORS AND MORE

Creatine’s T-cell-boosting benefits are also being investigated with some heavy hitters. “There’s some fascinating data coming out of UCLA on cancer and creatine as an important nutrient to prevent the growth and development of tumors,” Kreider stated.

This UCLA [review](#) — which appeared in *Nutrients* in May 2021 — looked at anti-tumor T-cell activity in mice and concluded this line of research warranted further investigation.

“The benefits of creatine supplementation go well beyond enhancing high-intensity exercise and training adaptations,” Kreider shared. “Research has clearly shown several health and/or potential therapeutic benefits as we age and in clinical populations that may benefit by enhancing creatine and phosphocreatine levels.”

AlzChem’s Robert Alber added, “People claim so often, ‘You’re trying to sell me a silver bullet because there’s so much you say your product can do.’ Basically, what we’re selling is energy — and whether you use electricity for a toaster or for a Tesla, that’s your decision.”



Creatine may benefit **women's health**, including issues related to menopause. It's been linked to favorable effects on aging muscle, bone and fat mass in healthy older adults.

Continued from p.26

else it might do. Mirko Holzmüller, AlzChem's human nutrition marketing and sales manager, suggested, "People during Covid had a lot of time to inform themselves about how they can boost their immune system. They read about which supplements really help and which are not really scientifically proven. At number one, creatine came up."

THE MARKETING FACTOR

With a solid scientific foundation and a pandemic acting as a catalyst, the supplement industry has been in a great position to benefit.

"The data's been there, but the general use and application hasn't been as well known. Scientists tend to talk to scientists," Kreider said. "A few years ago, Texas A&M's Exercise & Sport Nutrition Lab teamed up with AlzChem to get people more aware of the research that's out there."

This included a book, "Creatine Supplementation for Health and Clinical Diseases," edited by Kreider and Jeffrey R. Stout, Ph.D., as well as the website creatineforhealth.com, which AlzChem asked the university to publish independently.

The company is also working to expand the use cases for creatine with the recent launch of Creavitalis, an ingredient focused more on functional foods. "It's still creatine monohydrate produced in our plants," Alber explained. "The difference is mainly marketing. With the benefits you expect on the performance and athletic side, you are not addressing people concerned about general health or specific health issues."

Ultimately, creatine's rise in popularity might be simply because its time has come. "There's no need of pushing anything," Alber said. "Creatine works." ♦

Learn more about creatine monohydrate – the undisputed leader when it comes to research, as compared to all other forms of creatine – on the next page.



Denis Faye is a nutrition communications consultant and committed competitive athlete who splits his time between writing, riding, running and raising his family. Occasionally, he sleeps.



Creatine monohydrate: Top of the research *mountain*

Creatine has shown to be safe and solid in studies as a sports nutrition ingredient – but form matters.

Creatine monohydrate is the one type with strong evidence around safety, efficacy and bioavailability. Some others enjoy only limited research on them. And a large quantity of others have no evidence whatsoever.

Responsible supplement formulators should consider tried-and-true creatine monohydrate. Creatine monohydrate enjoys almost universal endorsement among academic sports nutrition researchers.



Source: Kreider, Jager, Purpura. Nutrients. 14, 1035, 2022.

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