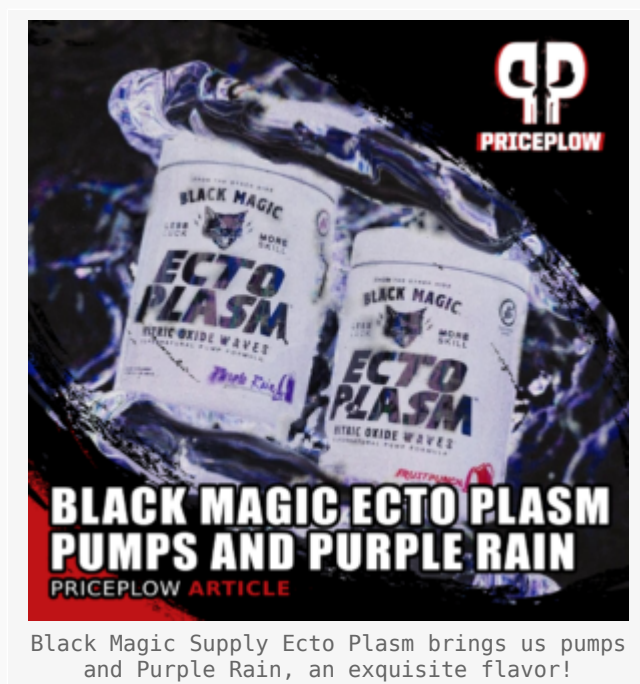


Black Magic Supply ECTO PLASM: All about Pumps and Purple Rain

written by Mike Roberto | February 28, 2022

If you don't know what we're talking about, then it's time you check out **Ecto Plasm**, Black Magic Supply's incredible stimulant-free pre-workout supplement that plays *numerous* nitric oxide / pump angles. Aside from a Fruit Punch flavor, it also has a unique *Purple Rain* flavor that has become a fan (and PricePLOW) favorite.

Ecto Plasm: All about the pumps... and *Purple Rain*



Purple Rain, Purple Rain!

Ecto Plasm is a stim-free pre workout that includes two nitric oxide boosting ingredients in citrulline malate *and* Nitrosigine that are both bolstered by nitric oxide *protective* ingredients in agmatine and S7. Topping it off, there are hydration agents here in betaine and glycerol – making for quite a potent stim-free pre.

After our recent Black Magic Supply updates for 2022, Ecto Plasm is one of the first supplements we wanted to catch up on – especially given the new research on Nitrosigine improving working memory in *healthy young adults*. We're to the point where Nitrosigine is not only a top-tier NO booster, but also a *nootropic* ingredient, thanks to the blood flow improvements it brings *everywhere*.

Below we get into the full 20 gram serving formula, just after some price checks and notifications so you can find out about new deals, flavors, and Black Magic Supply news:

Black Magic Ecto Plasm – Deals and Price Drop Alerts

Get Price Alerts

Get Ecto Plasm Price Alerts Get Black Magic alerts Get Nitric Oxide Supplements price drops
 Also get hot deal alerts

No spam, no scams.

Disclosure: PricePLOW relies on pricing from stores with which we have a business relationship. We work hard to keep pricing current, but you may find a better offer.

Posts are sponsored in part by the retailers and/or brands listed on this page.

Ecto Plasm Ingredients

Each 20 gram scoop gets you the following:

- **Citrulline Malate – 8,000mg**

SUPPLEMENT FACTS		
Serving Size: 1 Scoop (20g) Servings Per Container: Approximately 20 Scoops		
Amount Per Serving	1 Scoop	%DV*
Sodium (as Himalayan Pink Sea Salt)	44mg	2%
Potassium (from inositol-stabilized arginine silicate)	25mg	1%
ECTOPLASM™ MATRIX		
Citrulline Malate	8,000mg	**
Betaine Anhydrous	2,500mg	**
Glycerpump® (65% Glycerol Powder)	2,000mg	**
Nitrosigine® (Inositol-Stabilized Arginine Silicate)	1,500mg	**
Agmatine Sulfate	1,250mg	**
S7™ (Green Coffee Bean Extract, Green Tea Extract, Turmeric Extract, Tart Cherry, Blueberry, Broccoli, Kale)	150mg	**
Himalayan Pink Sea Salt	44mg	**
* Percent Daily Values (DV) are based on a 2,000 calorie diet. ** Daily Values (DV) not established.		

*Tons of nitric oxide production here, but don't forget that Nitrosigine is also doubling as a *nootropic* too!*

Ecto Plasm begins like any stim-free pre-workout should: with a healthy dose of **citrulline**! It comes from 8 grams of **citrulline malate**, which will give us roughly *4.5 grams of citrulline* if just looking at the molar masses. This is a solid, above-clinical dose for improving nitric oxide (NO) levels.[1]

Citrulline works through its conversion to *L-arginine*, which then gets converted into nitric oxide.[2] This is useful because nitric oxide induces a blood vessel widening effect known as *vasodilation*, which increases blood flow.[3,4] That in turn allows for better nutrient delivery, lower blood

pressure, and for our purposes in the gym... *pumps!*

Long ago, arginine was used in pre-workouts for this purpose, but it turned out that citrulline actually outperformed direct arginine supplementation! [3] This is because straight L-arginine is not the best nitric oxide booster since the gut and its enzymes break it down too quickly before it can get converted into NO. [5-8] We *do* have a better form of arginine below, so Ecto Plasm still hits both angles.



While many of us are here for the pumps, citrulline then provides multiple athletic benefits, including improved recovery, better cellular energy production, and more overall work output. [9-12]

Overall, this is a solid (and generally *expected*) way to start off a nitric oxide boosting stim-free pre. What we love is that we're also going to hit the improved arginine side of this equation with Nitrosigine as well. Stay tuned.

- **Betaine Anhydrous – 2,500mg**

Next on the label are two *hydration* boosting ingredients that have numerous benefits. First, we get a full clinical dose of **betaine**, which is also known as *trimethylglycine*. Betaine has a plethora of benefits because it serves multiple functions – both as a *methyl donor* for important biochemical

processes and also as an *osmolyte* to improve water balance and cellular hydration in the body.[13,14]

These effects lead to several benefits, including but not limited to:

- **Athletic performance enhancement**[15-20]
- **Muscle building**[21,22]
- **Weight loss / fat loss**[23,24]
- **Cardiovascular support**[14,15,25-27]
- **Heat protection**[15,28]



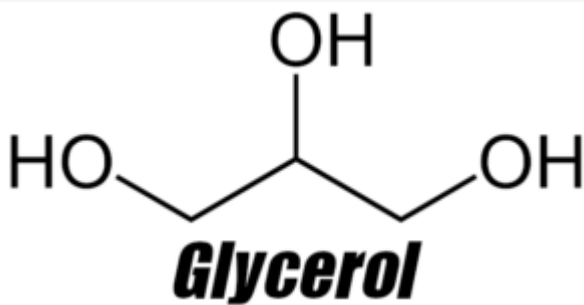
The trick to supplements like Ecto Plasm that have betaine (as well as glycerol below) is that you have to drink tons of water! The osmotic effects increase water retention, and can hydrate the area between cells,[13] giving better pumps that are completely different from the nitric oxide ones from citrulline and Nitrosigine.

What's great is that several of the benefits cited above, including those regarding muscle building, weight loss, and performance enhancement used this 2.5 gram dosage in a day.[17-23] Last, betaine assists with nitric oxide production as well.[27]

A couple of the studies, however, used even more,[15,16] so they're only slightly applicable to us here unless you stack it with a pre-workout like *BZRK*.

This incredible body of research is why we see betaine at this dose in so many pre-workouts, both stimulant and stimulant-free.

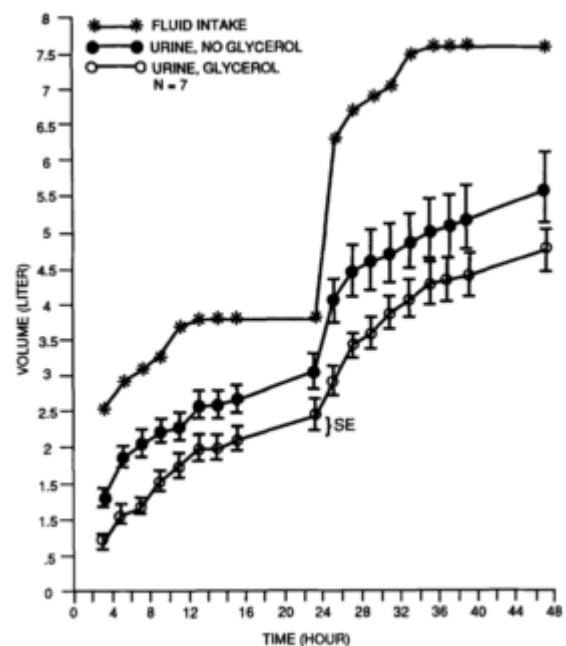
- **GlycerSize (65% Glycerol Powder) – 2,000mg**



No doubt, the simple **glycerol** molecule has “mission critical” status with the body. But when we supplement far more, incredible benefits related to *hydration* occur!

Betaine’s not the only hydration booster! Ecto Plasm keeps your plasm fully hydrated with added **glycerol**, also known as *glycerin*.^[29] This sugar alcohol molecule bonds to water, and then drives that water across the body, including into blood, plasma, and muscle tissue.^[30] This increases the body’s total water volume (assuming you *drink* plenty of water, which you should do with a supplement like this), causing a synergistic hydration pump alongside betaine.

Most of the research has been done in terms of *endurance* – trained athletes can last significantly longer with glycerol, where they consistently train for longer periods of time before hitting total exhaustion.^[31] While glycerol may provide some calories, the combination of glycerol and water with carbohydrates outperforms water with only carbohydrates and no glycerol, so its effects go well beyond its caloric energy.^[31]



Interesting bonus for big water drinkers: the

glycerol group has far less urine output, despite same water *input!*[32]

Other studies have shown that 20 days of glycerol consumption can not only improve aerobic power, but *anaerobic* power as well,[33] so it's not just for endurance athletes.

Additionally, to synergize with the nitric oxide boosters inside, glycerol has been shown to lead to *better blood flow* in forearm tests and reduced cardiovascular stress.[34]

Again, drink plenty of water with Ecto Plasm – otherwise you won't get the most out of betaine and glycerol. If you're worried about trips to the bathroom, note that glycerol has been shown to *reduce* urination thanks to the improved water retention![32,35] Additionally, we consider this to be a must-use ingredient if training in extreme heat, due to its thermal protective qualities.[34,35]

With the hydration-based duo set, it's time to get back to nitric oxide generation:

- **Nitrosigine (Inositol-Stabilized Arginine Silicate) – 1,500mg**

Above when we were discussing how L-citrulline outperforms straight L-arginine,[3] we also didn't mention that taking high-dose L-arginine can lead to GI distress.[36,37] Clearly, there were some roadblocks to overcome, but arginine is worth fighting for because it *is* the precursor to nitric oxide, after all!

The graphic is a vertical rectangular banner. At the top, there is a red bar with the 'PP' logo in white and the text 'PricePlow Blog Post' in white. Below this is the Nitrosigine logo, which includes a red shield with a white building icon and the text 'Nitrosigine® Bonded Arginine Silicate'. Underneath the logo is the 'UNIVERSITY OF ARKANSAS' logo. A diagonal line of text reads 'The Acute Effects of Citrulline Malate and Bonded Arginine Silicate Supplementation on Vasodilation of Young Adults'. At the bottom, there is a black bar with the text 'Arkansas Study: Nitrosigine Compares to 5x Citrulline Malate Dose!' in white, with a small 'PP' logo to the right. Below the graphic, there is a short paragraph of text.

A new study found that 1.5g of Nitrosigine was just as effective at boosting nitric oxide levels as 8g of citrulline malate! Black Magic, of course, decides to use *both*.

While some were testing citrulline, ingredient developers at *Nutrition21* instead made arginine work the way we always hoped it would – patenting *inositol-stabilized arginine silicate*. [38] Most of its research is on this 1500 milligram dose, so we can cite a ton of research showing improved bioavailability over L-arginine, nitric oxide improvements, *and* even cognitive performance gains:

First, thanks to its stabilized composition, Nitrosigine outperforms L-arginine in terms of nitric oxide production – *and* it leads to significantly higher plasma arginine levels for *six* hours! [39,40] One cool effect is that Nitrosigine reduces the activity of arginase, [41] which is the enzyme that breaks down arginine. Citrulline also has this effect, [42-44] leading to some incredible synergistic effects between these two ingredients.

There was also a study showing that Nitrosigine improves blood flow as much as 8 grams of citrulline malate, [45] which is exactly what we have here. Rather than choosing one or the other, Ecto Plasm contains both. Also similar to citrulline, Nitrosigine has been shown to reduce muscle damage and inflammation. [46]

Nitrosigine's cognitive benefits

Nitrosigine®
Patented Form of Banded Arginine Silicate™

Nutrition21

A New Study Published in Nutrients Supports the Cognitive Benefits of Nitrosigine®

Nitrosigine® enhances working memory and cognitive function in healthy adults.

A double-blind, placebo-controlled crossover study.

Participants: **Young Healthy Adults**
Ages: **18-28**

Cognitive tests performed: **3**
(RBANS, Digital Image Pairs, and Digital Symbol Match)

THE COGNITIVE TESTS

- Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)**
measures immediate memory, working/short-term memory, language, attention, and delayed memory.
- Digital Image Pairs**
measures visual recognition and memory.
- Digital Symbol Match**
tests processing speed and executive functioning.

WHAT THE RESULTS SHOW

Nitrosigine® supplementation resulted in:

- 11%** ↑ Increase in total RBANS scores.
- 27%** ↑ Increase in immediate memory scores.

When compared to the placebo group, Nitrosigine®:

- Significantly improved working memory performance.
- Maintained delayed memory scores.

The results align with previous findings where Nitrosigine® supplementation increased nitric oxide levels, which improved mental focus, working memory, and acuity.

Nitrosigine® is a patented complex of Banded Arginine Silicate that is designed to deliver benefits essential to peak sports performance.

To learn more and find products featuring Nitrosigine®, visit Nutrition21.com/Nitrosigine.

© 2022 Nutrition21, Inc. All rights reserved. | www.nutrition21.com | [@nutrition21](https://www.instagram.com/nutrition21)

It's not just for muscle pumps, though – researchers are continually finding that Nitrosigine's blood flow boosting effects work in the *brain* as well, with numerous studies demonstrating improved cognitive flexibility, mental energy, and focus.[40,47-52]

Nutrition21 has been adding to the research, too. We recently covered a study published at the end of 2021 where *healthy young adults* had a short-term memory score boost compared to placebo.[47] You can read about it in our article titled *Study: Improved Working Memory from Nitrosigine in Healthy Young Adults*.

This was in addition to other useful studies, such as one that showed Nitrosigine preventing cognitive decline after strenuous exercise.[40,48] This means that your day shouldn't be ruined if you "blow a gasket" setting a PR in the weight room with the help of Ecto Plasm.

You can read more about Nitrosigine in our article named *Nitrosigine: The Nitric Oxide Booster That Enhances Brain Function*. We love to see it alone, and we *really* love to see it paired with citrulline!

- **Agmatine Sulfate – 1,250mg**

We're not done with nitric oxide enhancement just yet! While citrulline malate and Nitrosigine boost NO, **agmatine sulfate** is here to synergize with Nitrosigine in *protecting* our nitric oxide levels! This is because agmatine, which is a *metabolite* of arginine, functions as an *arginase inhibitor*. [53] Recall from our citrulline section that arginase is the enzyme that breaks arginine down, so if we can prevent that, we're going to get more of it to convert into nitric oxide downstream.

Citrulline, Nitrosigine, and agmatine all work in this fashion, so we're really playing some defense in keeping arginine from "disappearing" on us.



In addition, agmatine itself can also stimulate nitric oxide *synthase* production[54] – this is an enzyme that gets endothelial cells to produce more nitric oxide. This gives us a two-pronged boost in this ingredient.

Research has also shown that agmatine functions as a neurotransmitter – in fact many researchers *call* it a neurotransmitter – and that it can help boost mood in some situations.[55] Since Ecto Plasm is all about pumps, this and Nitrosigine are the two more effective nootropic ingredients inside.

Also a bit special is the dose – normally we see 500 or 1000 milligrams of agmatine. With Ecto Plasm, we're treated to 25% more, with a nice 1,250 milligram dose. It won't make you Mr. Olympia but we're definitely not complaining here!

- **S7 – 150mg**

Short for *SPECTRA 7*, **S7** is a trademarked antioxidant ingredient made of seven botanical extracts: *green coffee bean, green tea, turmeric, tart cherry, blueberry, broccoli, and kale.*

A study was published showing that it increases nitric oxide's

bioavailability. [56] To explain, you must first understand that nitric oxide is actually a *free radical* [57] that has a short half-life and is going to bind to other molecules. S7, however, works in a unique way by *offsetting* many of the other free radicals that would have otherwise bound to nitric oxide – keeping nitric oxide around longer to do what we want in our vascular system.

This is a different and separate defensive play working alongside agmatine. And again, just like with agmatine, we have a seriously large dose – normally we see 50 to 100 milligrams... and we're at 150 here!

- **Himalayan Pink Sea Salt – 44mg**



Ecto Plasm includes a small dose of **Himalayan Pink Sea Salt**, contributing to just 2% daily value of sodium. This isn't a huge deal, but to us, it's better than nothing.

If you're still on the fence about sodium, we encourage you to read the paper titled "*The Importance of Salt in the Athlete's Diet*". [58] After doing so, you may just want to add *more*.

Flavors available

With no funky botanicals or unfamiliar ingredients, Ecto Plasm tastes *incredible* – as this is being written, we're currently polishing off a tub of *Purple Rain*. Below are the flavors:

Ecto Plasm is all about the pump



This is an incredible stacking partner to the insane *BZRK* pre workout. If you're all about adding *pumps* and keeping them around for a long time, look no further than Ecto Plasm, because it stays in its lane as a stimulant-free nitric oxide / pump supplement.

However, the body of research on Nitrosigine's cognitive effects is constantly growing, to the point where we *do* consider it to be a nootropic ingredient. This is mainly thanks to that cerebral blood flow it helps with.

Ecto Plasm has quietly been putting in work, and is one of the first things we wanted to catch up on after our recent Black Magic Supply updates for 2022. Sign up for the alerts below and we'll notify you when there are new flavors, deals, studies, and more:

Black Magic Ecto Plasm – Deals and Price Drop Alerts

Get Price Alerts

Get Ecto Plasm Price Alerts
Get Black Magic alerts
Get Nitric Oxide Supplements price drops

Also get hot deal alerts

No spam, no scams.

Disclosure: PricePLOW relies on pricing from stores with which we have a business relationship. We work hard to keep pricing current, but you may find a better offer.

Posts are sponsored in part by the retailers and/or brands listed on this page.

References

1. Sureda, Antoni, et al. "L-Citrulline-Malate Influence over Branched Chain Amino Acid Utilization during Exercise." *European Journal of Applied Physiology*, vol. 110, no. 2, 25 May 2010, pp. 341–351, 10.1007/s00421-010-1509-4; <https://pubmed.ncbi.nlm.nih.gov/20499249/>
2. Stamler, Jonathan S., and Gerhard Meissner. "Physiology of Nitric Oxide in Skeletal Muscle." *Physiological Reviews*, vol. 81, no. 1, 1 Jan. 2001, pp. 209–237, 10.1152/physrev.2001.81.1.209; <https://journals.physiology.org/doi/full/10.1152/physrev.2001.81.1.209>
3. Schwedhelm, Edzard et al.; "Pharmacokinetic and pharmacodynamic properties of oral L-citrulline and L-arginine: impact on nitric oxide metabolism."; *British journal of clinical pharmacology* vol. 65,1 (2008): 51-9.; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2291275/>
4. Archer, S L, et al. "Nitric Oxide and CGMP Cause Vasorelaxation by Activation of a Charybdotoxin-Sensitive K Channel by CGMP-Dependent Protein Kinase." *Proceedings of the National Academy of Sciences of the United States of America*, vol. 91, no. 16, 1994, pp. 7583–7, 10.1073/pnas.91.16.7583; <https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC44446/>
5. Castillo, L, et al. "Splanchnic Metabolism of Dietary Arginine in Relation to Nitric Oxide Synthesis in Normal Adult Man." *Proceedings of the National Academy of Sciences of the United States of America*, vol. 90, no. 1, 1 Jan. 1993, pp. 193–197; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC45626/>
6. Wu, Guoyao. "Intestinal Mucosal Amino Acid Catabolism." *The Journal of Nutrition*, vol. 128, no. 8, 1 Aug. 1998, pp. 1249–1252, 10.1093/jn/128.8.1249; <https://academic.oup.com/jn/article/128/8/1249/4722724>
7. O'sullivan, D., et al. "Hepatic Zonation of the Catabolism of Arginine and Ornithine in the Perfused Rat Liver." *Biochemical Journal*, vol. 330, no. Pt 2, 1 Mar. 1998, p. 627, 10.1042/bj3300627; <https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC1219183/>
8. van de Poll, Marcel CG, et al. "Interorgan Amino Acid Exchange in Humans: Consequences for Arginine and Citrulline Metabolism." *The American Journal of Clinical Nutrition*, vol. 85, no. 1, 1 Jan. 2007, pp. 167–172, 10.1093/ajcn/85.1.167; <https://pubmed.ncbi.nlm.nih.gov/17209193/>
9. Giannesini B., et. al.; *European Journal of Pharmacology*; "Citrulline malate supplementation increases muscle efficiency in rat skeletal muscle;" September 2011; <http://www.ncbi.nlm.nih.gov/pubmed/21664351>
10. Perez-Guisado J, Jakeman PM; *Journal of Strength and Conditioning*; "Citrulline malate enhances athletic anaerobic performance and relieves muscle soreness;" May 2010; <http://www.ncbi.nlm.nih.gov/pubmed/20386132>
11. Hickner RC. et. al.; *Medicine and Science in Sports and Exercise*; "L-citrulline reduces time to exhaustion and insulin response to a graded exercise test;" 2006; <http://www.ncbi.nlm.nih.gov/pubmed/16679980>
12. Rhim, Hye Chang, et al. "Effect of Citrulline on Post-Exercise Rating of Perceived Exertion, Muscle Soreness, and Blood Lactate Levels: A Systematic Review and Meta-Analysis." *Journal of Sport and Health Science*, Feb. 2020, 10.1016/j.jshs.2020.02.003. <https://www.sciencedirect.com/science/article/pii/S2095254620300168>
13. Boel De Paepe; "Osmolytes as Mediators of the Muscle Tissue's Responses to Inflammation: Emerging Regulators of Myositis with Therapeutic Potential"; *EMJ Rheumatol.* 2017;4[2]:83-89; <https://www.emjreviews.com/rheumatology/article/osmolytes-as-mediators-of-the-muscle-tissue-s-responses-to-inflammation-emerging-regulators-of-myositis-with-therapeutic-potential/>
14. Olthof, M. R., & Verhoef, P. (2005). Effects of betaine intake on plasma homocysteine concentrations and consequences for health. *Current drug metabolism*, 6(1), 15-22; Retrieved from <https://pubmed.ncbi.nlm.nih.gov/15720203>
15. Roti, M; "Homocysteine, Lipid and Glucose Responses to Betaine Supplementation During Running in the Heat"; *Medicine & Science in Sports & Exercise*: May 2003 – Volume 35 – Issue 5 – p S271; https://journals.lww.com/acsm-msse/Fulltext/2003/05001/HOMOCYSTEINE,_LIPID_AND_GLUCOSE_RESPONSES_T0.1501.aspx
16. Armstrong, Lawrence E, et al. "Influence of Betaine Consumption on Strenuous Running and Sprinting in a Hot Environment." *Journal of Strength and Conditioning Research*, vol. 22, no. 3, May 2008, pp. 851–860, 10.1519/jsc.0b013e31816a6efb; <https://pubmed.ncbi.nlm.nih.gov/18438230>
17. Hoffman, Jay R, et al. "Effect of Betaine Supplementation on Power Performance and Fatigue." *Journal of the International Society of Sports Nutrition*, vol. 6, no. 1, 27 Feb. 2009, 10.1186/1550-2783-6-7; <https://jissn.biomedcentral.com/articles/10.1186/1550-2783-6-7>

18. Lee, Elaine C, et al. "Ergogenic Effects of Betaine Supplementation on Strength and Power Performance." *Journal of the International Society of Sports Nutrition*, vol. 7, no. 1, 2010, p. 27, 10.1186/1550-2783-7-27; <https://jissn.biomedcentral.com/articles/10.1186/1550-2783-7-27>
19. Trepanowski, John F, et al. "The Effects of Chronic Betaine Supplementation on Exercise Performance, Skeletal Muscle Oxygen Saturation and Associated Biochemical Parameters in Resistance Trained Men." *Journal of Strength and Conditioning Research*, vol. 25, no. 12, Dec. 2011, pp. 3461–3471, 10.1519/jsc.0b013e318217d48d; <https://pubmed.ncbi.nlm.nih.gov/22080324/>
20. Pryor, J Luke, et al. "Effect of Betaine Supplementation on Cycling Sprint Performance." *Journal of the International Society of Sports Nutrition*, vol. 9, no. 1, 3 Apr. 2012, 10.1186/1550-2783-9-12; <https://jissn.biomedcentral.com/articles/10.1186/1550-2783-9-12>
21. Cholewa, Jason M et al. "Effects of betaine on body composition, performance, and homocysteine thiolactone." *Journal of the International Society of Sports Nutrition* vol. 10,1 39. 22 Aug. 2013, doi:10.1186/1550-2783-10-39; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3844502/>
22. Cholewa, Jason M., et al. "Effects of Betaine on Performance and Body Composition: A Review of Recent Findings and Potential Mechanisms." *Amino Acids*, vol. 46, no. 8, 24 Apr. 2014, pp. 1785–1793, 10.1007/s00726-014-1748-5; <https://pubmed.ncbi.nlm.nih.gov/24760587/>
23. Jason Michael Cholewa, et al; "The Effects of Chronic Betaine Supplementation on Body Composition and Performance in Collegiate Females: a Double-Blind, Randomized, Placebo Controlled Trial"; *Journal of the International Society of Sports Nutrition*; BioMed Central; 31 July 2018; <https://jissn.biomedcentral.com/articles/10.1186/s12970-018-0243-x>
24. Gao, Xiang et al.; "Effect of Betaine on Reducing Body Fat—A Systematic Review and Meta-Analysis of Randomized Controlled Trials."; *Nutrients* 2019, 11, 2480; <https://www.mdpi.com/2072-6643/11/10/2480>
25. Morrison, L. M. "Results of Betaine Treatment of Atherosclerosis." *The American Journal of Digestive Diseases*, vol. 19, no. 12, 1 Dec. 1952, pp. 381–384, 10.1007/BF02881126; <https://pubmed.ncbi.nlm.nih.gov/12996486/>
26. Craig, Stuart AS. "Betaine in Human Nutrition." *The American Journal of Clinical Nutrition*, vol. 80, no. 3, 1 Sept. 2004, pp. 539–549, 10.1093/ajcn/80.3.539; <https://academic.oup.com/ajcn/article/80/3/539/4690529>
27. Iqbal, O., Fareed, D., Cunanan, J., Hoppensteadt, D., Messadek, J., Baltasar, F., & Fareed, J. (2006). Betaine induced release of tissue factor pathway inhibitor and nitric oxide: implications in the management of cardiovascular disease. *The FASEB Journal*, 20(4), A655; https://www.fasebj.org/cgi/content/meeting_abstract/20/4/A655-a
28. Willingham, Brandon D et al. "Betaine Supplementation May Improve Heat Tolerance: Potential Mechanisms in Humans." *Nutrients* vol. 12,10 2939. 25 Sep. 2020, doi:10.3390/nu12102939; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7599524/>
29. PubChem. "Glycerol." [Pubchem.ncbi.nlm.nih.gov](https://pubchem.ncbi.nlm.nih.gov), <https://pubchem.ncbi.nlm.nih.gov/compound/753>
30. Nelson, Jeff L, and Robert A Robergs. "Exploring the Potential Ergogenic Effects of Glycerol Hyperhydration." *Sports Medicine*, vol. 37, no. 11, 2007, pp. 981–1000, 10.2165/00007256-200737110-00005. <https://www.ncbi.nlm.nih.gov/pubmed/17953468>
31. Montner, P., et al. "Pre-Exercise Glycerol Hydration Improves Cycling Endurance Time." *International Journal of Sports Medicine*, vol. 17, no. 1, 1 Jan. 1996, pp. 27–33, 10.1055/s-2007-972804. <https://pubmed.ncbi.nlm.nih.gov/8775573/>
32. Koenigsberg, Peter S., et al. "Sustained Hyperhydration with Glycerol Ingestion." *Life Sciences*, vol. 57, no. 7, July 1995, pp. 645–653, 10.1016/0024-3205(95)00316-x. <https://pubmed.ncbi.nlm.nih.gov/7637536/>
33. Patlar, Suleyman, et al. "The Effect of Glycerol Supplements on Aerobic and Anaerobic Performance of Athletes and Sedentary Subjects." *Journal of Human Kinetics*, vol. 34, no. 1, 1 Oct. 2012, pp. 69–79, 10.2478/v10078-012-0065-x. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3590833/>
34. Anderson, M. J., et al. "Effect of Glycerol-Induced Hyperhydration on Thermoregulation and Metabolism during Exercise in the Heat." *International Journal of Sport Nutrition*, vol. 11, no. 3, 29 Sept. 2001, pp. 315–333. <https://research.monash.edu/en/publications/effect-of-glycerol-induced-hyperhydration-on-thermoregulation-and>
35. Lyons, T. P., et al. "Effects of Glycerol-Induced Hyperhydration prior to Exercise in the Heat on Sweating and Core Temperature." *Medicine & Science in Sports & Exercise*, vol. 22, no. 4, 1990, pp. 477–483; https://journals.lww.com/acsm-msse/Abstract/1990/08000/Effects_of_glycerol_induced_hyperhydration_prior.10.aspx

36. Grimble, George K. "Adverse Gastrointestinal Effects of Arginine and Related Amino Acids." *The Journal of Nutrition*, vol. 137, no. 6, 1 June 2007, pp. 1693S1701S, 10.1093/jn/137.6.1693s; <https://pubmed.ncbi.nlm.nih.gov/17513449/>
37. Kaore, Shilpa N., et al. "Citrulline: Pharmacological Perspectives and Its Role as an Emerging Biomarker in Future." *Fundamental & Clinical Pharmacology*, vol. 27, no. 1, 31 July 2012, pp. 35–50, 10.1111/j.1472-8206.2012.01059.x; <https://pubmed.ncbi.nlm.nih.gov/23316808/>
38. Vijaya Juturu V., Komorowski, JR. 2002. US7576132B2 – "Arginine Silicate Inositol Complex and use Thereof." The United States Patent and Trademark Office. <https://patents.google.com/patent/US7576132>
39. Sandler, D., et al. June 2016. "Absorption of Bonded Arginine Silicate Compared to Individual Arginine and Silicon Components." *Journal of the International Society of Sports Nutrition* vol. 13. <https://jissn.biomedcentral.com/articles/10.1186/s12970-016-0144-9>
40. Komorowski, J., et al. Apr. 2016. "A Pharmacokinetic Evaluation of the Duration of Effect of Inositol-Stabilized Arginine Silicate and Arginine Hydrochloride in Healthy Adult Males." *The Journal of the Federation of American Societies for Experimental Biology* vol. 30. https://www.fasebj.org/doi/abs/10.1096/fasebj.30.1_supplement.690.17
41. Komorowski, J., Perez, S., & Sylla, S; "Arginase Inhibition by Inositol-stabilized Arginine Silicate (ASI; Nitrosigine); A Novel Mechanism by which ASI Enhances Arginine Bioavailability"; Poster Presentation; Retrieved from: <https://www.eventscribe.com/2018/Nutrition2018/ajaxcalls/PosterInfo.asp?efp=UlhTRFpZVVI00DYw&PosterID=146640&rnd=0.1401379>
42. Takashi Suzuki, Masahiko Morita, Toshio Hayashi, Ayako Kamimura, The effects on plasma L-arginine levels of combined oral L-citrulline and L-arginine supplementation in healthy males, *Bioscience, Biotechnology, and Biochemistry*, Volume 81, Issue 2, 1 February 2017, Pages 372–375; <https://academic.oup.com/bbb/article/81/2/372/5955995>
43. Suzuki, I., Sakuraba, K., Horiike, T. et al. A combination of oral l-citrulline and l-arginine improved 10-min full-power cycling test performance in male collegiate soccer players: a randomized crossover trial. *Eur J Appl Physiol* 119, 1075–1084; 2019; <https://link.springer.com/article/10.1007/s00421-019-04097-7>
44. Morita, Masahiko, et al. "Oral Supplementation with a Combination of L-Citrulline and L-Arginine Rapidly Increases Plasma L-Arginine Concentration and Enhances NO Bioavailability." *Biochemical and Biophysical Research Communications*, vol. 454, no. 1, Nov. 2014, pp. 53–57, 10.1016/j.bbrc.2014.10.029; <https://www.sciencedirect.com/science/article/pii/S0006291X14018178>
45. Rogers, JM. et al. Feb. 2020. "Acute effects of Nitrosigine and Citrulline Malate on Vasodilation in Young Adults." *Journal of the International Society of Sports Nutrition* vol. 17, 12. <https://jissn.biomedcentral.com/articles/10.1186/s12970-020-00343-y>
46. Ojalvo, P., Komorowski, S. Oct. 2017. "Effect of Bonded Arginine Silicate on Inflammatory Markers and Arthritis." *FASEB Journal* vo. 31. https://www.fasebj.org/doi/abs/10.1096/fasebj.31.1_supplement.166.5
47. Gills, Joshua L., et al. "Acute Inositol-Stabilized Arginine Silicate Improves Cognitive Outcomes in Healthy Adults." *Nutrients*, vol. 13, no. 12, 1 Dec. 2021, 10.3390/nu13124272; <https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC8703995/>
48. Rood-Ojalvo, S. et al. Sep. 2015. "The Benefits of Inositol-Stabilized Arginine Silicate as a Workout Ingredient." *Journal of the International Society of Sports Nutrition* vol. 12(S1). <https://jissn.biomedcentral.com/articles/10.1186/1550-2783-12-S1-P14>
49. Kalman, D. et al. 2015. "A Clinical Evaluation to Determine the Safety, Pharmacokinetics, and Pharmacodynamics of an Inositol-Stabilized Arginine Silicate Dietary Supplement in Healthy Adult Males." *Clinical Pharmacology: Advances and Applications*, vol. 103. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4603712/>
50. Evans, M., et al., June 2018. "An Evaluation of the Effects of Inositol-Stabilized Arginine Silicate (ASI; Nitrosigine) in Preventing the Decline of Cognitive Function Caused by Strenuous Exercise." *International Society of Sports Nutrition 2018 Conference*. <https://blog.priceplow.com/wp-content/uploads/nitrosigine-preventing-cognitive-decline-caused-by-strenuous-exercise.pdf>
51. Evans, M. et al. July 2020. "Inositol-Stabilized Arginine Silicate Improves Post Exercise Cognitive Function in Recreationally Active, Healthy Males: A Randomized, Double-Blind, Placebo-Controlled Crossover Study." *Journal of Exercise and Nutrition* vol. 3,3. <https://www.journalofexerciseandnutrition.com/ManuscriptUploadsPDF/142.pdf>
52. Kalman, D. et al. June 2018. "An Evaluation of the Effects of Inositol-Stabilized Arginine Silicate (ASI; Nitrosigine) On Cognitive Flexibility." *Nutrients* <https://blog.priceplow.com/wp-content/uploads/nitrosigine-cognitive-flexibility-issn-2018.pdf>

53. Legaz, M. et al. Feb. 1983. "Endogenous Inactivators of Arginase, L-Arginine Decarboxylase, and Agmatine Amidinohydrolase in *Evernia prunastri* Thallus." *Plant Physiology* vol. 71,1; 300-2. <https://pubmed.ncbi.nlm.nih.gov/16662821>
54. Morrissey J. et al. Jan. 1997. "Agmatine Activation of Nitric Oxide Synthase in Endothelial Cells." *Proceedings of the Association of American Physicians* vol. 109,1;51-7. <https://pubmed.ncbi.nlm.nih.gov/9010916/>
55. Freitas, Andiara E., et al. "Agmatine, a Potential Novel Therapeutic Strategy for Depression." *European Neuropsychopharmacology: The Journal of the European College of Neuropsychopharmacology*, vol. 26, no. 12, 1 Dec. 2016, pp. 1885–1899, 10.1016/j.euroneuro.2016.10.013; <https://pubmed.ncbi.nlm.nih.gov/27836390/>
56. Nemzer, B. V., Centner, C., Zdzieblik, D., Fink, B., Hunter, J. M., & König, D. (2017). Oxidative stress or redox signalling – new insights into the effects of a proprietary multifunctional botanical dietary supplement. *Free Radical Research*, 52(3), 362–372. doi:10.1080/10715762.2017.1390228 <https://www.ncbi.nlm.nih.gov/pubmed/29110555>
57. Corpas, Francisco J., et al. "Nitric Oxide: A Radical Molecule with Potential Biotechnological Applications in Fruit Ripening." *Journal of Biotechnology*, vol. 324, 20 Dec. 2020, pp. 211–219, 10.1016/j.jbiotec.2020.10.020; <https://pubmed.ncbi.nlm.nih.gov/33115661/>
58. Valentine, V. 2007. "The Importance of Salt in the Athlete's Diet." *Current Sports Medicine Reports* vol. 6,4 (2007): 237-40; <https://pubmed.ncbi.nlm.nih.gov/17617999/>