Kyowa.
Quality.
L-Citrulline.

Ingredient Overview

Made in USA | Fermentation | Non-GMO | Pure | Allergen-free | GRAS

Kyowa Quality®

Why Kyowa Quality L-Citrulline?

L-Citrulline is a naturally occurring amino acid that converts to L-Arginine and is more efficiently absorbed by the body than L-Arginine itself. L-Citrulline is also known for its ability to support Nitric Oxide (NO) metabolism and regulation.* Increased production of Nitric Oxide promotes vascular dilation which improves oxygen and blood circulation throughout the body.*

Substantiated by Science

Our L-Citrulline has been clinically studied to support endurance, power output, BCAA utilization, and cardiovascular health.* It has also shown to reduce muscle fatigue through ammonia elimination.*

227% Increase in L-Arginine levels with L-Citrulline[1] (2.4g)

1.5% Reduction in cycling completion time[2] (2.4g)

2.0% Increase in power output[2] (2.4g)

Study References

1. Schwedhelm E. et al. Br J Clin Pharmacol. 65: 51-9, 2008
2. Suzuki T.et. al., Journal of the International Society of Sports Nutrition. 13:6, 2016

L-Citrulline Claims:

Exercise Performance

1. Supports exercise efficiency*
2. Improves BCAA utilization/absorption to the muscle*
3. Supports blood flow to the muscles*
4. Improves endurance performance*
5. Supports reduced muscle soreness*
6. Reduces muscle fatigue*
7. Supports muscle protein synthesis*
8. Supports Nitric Oxide metabolism*

Clinically Studied Dose: 2.4 grams

Vascular Health

1. Supports cardiovascular health*
2. Supports blood pressure*
3. Supports pulmonary health*

Clinically Studied Dose: 6 grams

To find the very best, get closer to the source

Here at Kyowa Hakko USA, we draw on 60-years of pioneering innovation to produce our premium quality Citrulline. We make our Citrulline right here in the USA. It all starts in our facility at Cape Girardeau, Missouri. We rely on our advanced fermentation and purification technology to produce our Citrulline.

Pioneering fermentation & purification technology

Fermentation is a natural process that uses microorganisms to bring about desirable change to foods and beverages. Think kombucha, kefir, and beer. Kyowa Hakko is the first to develop industrial fermentation processes to produce amino acids.

Our amino acid fermentation process begins with a unique microbial strain. We cultivate and test the strain in our state-of-the-art labs. Our microbial culture then moves from a sterile lab to large bioreactors where we ferment Citrulline. Following the fermentation process, we purify, crystallize, dry and package our Citrulline to ship all over the world.

Born in Japan. Made in Missouri.

Why is it important that our Citrulline is made in the USA?

- No customs or transportation delays
- No tariffs or extra shipping costs
- Complete quality and purity control
- Made in USA claim for your label

We're ready to fulfill your order at our ISO 9001 and HACCP accredited facility in Cape Girardeau, Missouri.

Made in the USA

Cardiovascular & Sports Nutrition Benefits

Innovative Fermentation

For non-GMO, self-affirmed GRAS, and allergen-free L-Citrulline that's made in the USA visit Kyowa-USA.com

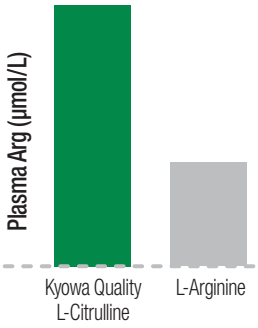
***These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.**

L-Citrulline Science Snapshot

Key Studies on Kyowa Quality L-Citrulline

L-Citrulline more effective at raising L-Arginine levels

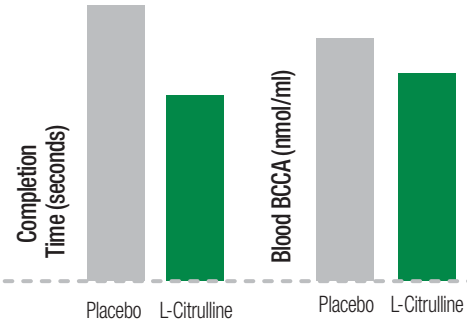
Researchers studied twenty healthy individuals with six different dosing regimes of placebo, L-Arginine, and L-Citrulline. Standard pharmacokinetic parameters were used to evaluate the results.[1]



Kyowa Quality L-Citrulline (3g) raised plasma L-Arginine levels to about 227% (within 4 hours) compared to only 90% with equivalent dose of L-Arginine.*

Improved performance and BCAA absorption with L-Citrulline

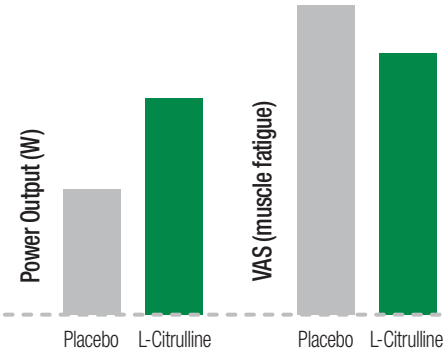
Researchers studied cycling performance and BCAA utilization of twenty-two trained men who supplemented with 2.4g of L-Citrulline or placebo in a randomized double-blind placebo controlled study*[2]



Kyowa Quality L-Citrulline reduced cycling completion time of a 4km trial by 1.5% compared to placebo and improved BCAA absorption to the muscle.*

Increased power output and reduced muscle fatigue with L-Citrulline

Researchers utilized pedaling test and visual analogue scale (VAS) questionnaire to detect how subjects felt during and after exercise with 2.4g of L-Citrulline or placebo supplementation.[2]



Kyowa Quality L-Citrulline increased power output and reduced muscle fatigue when compared to placebo.*

Study References

1. Schwedhelm, E., et al. Pharmacokinetic and pharmacodynamic properties of oral L-citrulline and L-arginine: Impact on nitric oxide metabolism. British Journal of Clinical Pharmacology, 65: 51-59 (2008).
2. Suzuki, T., et al. Oral L-citrulline supplementation enhances cycling time trial performance in healthy trained men: Double-blind randomized placebo-controlled 2-way crossover study. J Int Soc Sports Nutr, 13, 6 (2016).

Kyowa's History of Amino Acid Innovation

Improving lives with health science

1940s
Kyowa Hakko beginnings

- Food & Pharma Divisions Established
- Pharma: To help eradicate tuberculosis
- Food: To address food shortage & nutritional deficiency

1950s
Technology & fermentation innovation

- Partnership with Merck and introduction of production technology to develop Streptomycin to eradicate tuberculosis in Japan
- Invented Amino Acid fermentation process
- First to produce L-Glutamic acid by fermentation
- Pioneered development of Lysine, first essential amino acid, with fermentation

1960s - 1970s
Global initiatives

- Kyowa's L-Glutamic acid contributed to the launch and expansion of instant noodles in Japan
- Collaborated with Japanese schools and United Nations to supply fortified foods with Lysine for children
- Upcycled fermentation broth into fertilizer and received first ever award for sustainability initiatives in Japan

1980s - Now
USA division established

- BioKyowa USA facility opens in Cape Girardeau, MO to produce amino acids
- First to produce dipeptide, L-Alanyl-L-Glutamine, by fermentation
- Celebrated 50 years of technological advancements & amino acid innovation

L-Citrulline's Specifications

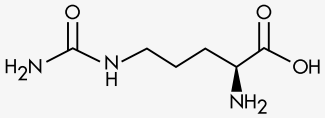
Description
White crystalline powder

INCI Designation
L-Citrulline

CAS No.
372-75-8

Physical & Chemical Properties
Empirical formula: C6H13N3O3
Molecular weight: 175.19

Chemical Structure



Specifications

Appearance	White crystalline powder
Identification	Pass test
State of Solution	Colorless and Clear
pH	5.7 ~ 6.7
Specific rotation (at 20° C)	+24.5 ~ +26.5°
Ammonium (NH4)	Not more than 0.02%
Chloride (Cl)	Not more than 0.017%
Sulfate (SO4)	Not more than 0.02%
Iron (Fe)	Not more than 10ppm
Arsenic	Not more than 1.4ppm
Cadmium	Not more than 0.5ppm
Lead	Not more than 0.5ppm
Mercury	Not more than 0.2ppm
Foreign Amino Acids	Not more than 0.5%
Loss on Drying	Not more than 0.2%
Residue on Ignition	Not more than 0.1%
Insoluble Foreign Matter	Pass test
Assay (dry basis)	99.0 ~ 101.0%
Total Count (CFU)	Not more than 1,000/g
Yeast and Molds (CFU)	Not more than 100/g
Coliform	Negative/g

Manufacturing Process
L-Citrulline is made in the USA using a proprietary fermentation process with no raw materials of animal origin. The process eliminates any risk of Transmissible Spongiform Encephalopathy (TSE) or Bovine spongiform encephalopathy (BSE) contamination. L-Citrulline is Prop 65 compliant and doesn't contain any WADA prohibited substances.

Solubility
Freely soluble in water

Stability
Stable under normal handling conditions

Allergen-Free
No preservatives, corn, celery, wheat, grains, nuts, yeast, soy, starch, lupin, preservatives, glutens, animal derivatives, fish and shellfish, egg, mustard, seeds, dairy, sulfite, artificial flavors or colors, mollusk

Safety Studies
- Acute oral toxicity: LD50>5,000 mg/kg (rats)
- Kyowa USA L-Citrulline is self-affirmed GRAS

Storage
Keep in containers tightly closed in a dry, well-ventilated place at room temperature

Packaging
Standard packing: 25kg

Certifications
Kosher/HALAL
HACCP accredited facility
ISO 9001: 2015

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.