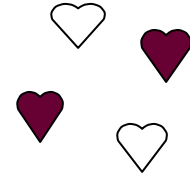


MONTIFF INC  
*Don Tyson's Advanced Nutraceuticals*

## L-CITRULLINE ENDOTHELIAL SUPPORT



Citrulline metabolizes to form Arginine in the endothelial cells of the circulatory system, producing high output sustained Nitric Oxide synthesis. Nitric Oxide is necessary for endothelial support, improving vascular tone, blood pressure and cardiovascular health.

### WHAT IS CITRULLINE?

Citrulline, which is considered a non-essential amino acid synthesized in the intestinal tract from Glutamine, converts to Arginine in the endothelial cells. This biochemical process involves L-Aspartate and the enzymes Argininosuccinate Synthetase and Argininosuccinate Lyase, in the presence of ATP. Arginine is important for Nitric Oxide production for cardiovascular health; however, most Arginine is utilized in the liver and kidneys, and only a fraction is available for this purpose. Since Citrulline is a precursor to Arginine, it allows for increased and sustained Nitric Oxide production in the endothelium for support of circulatory function. Oral Citrulline supplementation provides a readily available source of Citrulline for this purpose, and some recent research further indicates that Citrulline may be the preferred source of cellular Arginine. In addition Citrulline also increases energy, stimulates the immune system, and is essential for Urea Cycle function as well.

### WHAT IS NITRIC OXIDE (NO)?

Nitric Oxide (NO), the endothelial relaxing factor (EDRF), is a small molecule made from Arginine. It plays an essential role in the regulation of vascular homeostasis, tone and blood pressure, modulates cardiac contractility, and helps in preventing vessel injury and Atherosclerosis. It is also an important free radical scavenger, preventing oxidative stress (free radical damage) which creates injury to endothelial cells. Citrulline converts to Arginine in the vascular cells, thus increasing Nitric Oxide production, which can help to restore endothelial cell function, and also helps keep coronary arteries open that supply blood to the heart. The role of Nitric Oxide and Arginine supplementation, as well as the role of Citrulline in endothelial function has been documented in medical studies.

- Increasing NO by oral Arginine supplementation, has been shown to **lower blood pressure, prevent platelet aggregation, increase the exercise capacity in those with stable angina and reduce angina pain in other patients, as well as increase blood flow responses in atherosclerotic subjects.**
- Recent studies also suggest that damage from hypertension, high cholesterol and other coronary heart disease factors, impairs the ability of the endothelium to produce necessary Nitric Oxide.
- When plaque builds up, the blood supply to the endothelial cells gets blocked, also preventing the production of Nitric Oxide. After many years of plaque accumulation, Atherosclerosis occurs. Research from major universities suggest that Arginine supplementation can begin to reverse this process by helping to restore endothelial cells that have been damaged, and increase their ability to make Nitric Oxide. Since most of Arginine is utilized in the liver and kidneys, Citrulline supplementation is beneficial in increasing the amount of Arginine that is available and can be utilized by the endothelial cells for increased Nitric Oxide production.
- Even with those who have had impaired vasodilatation, Citrulline and Arginine supplementation has increased NO and helped to lower high blood pressure and reduce cholesterol and LDL levels. It also improved brachial artery FMV.
- Citrulline and Arginine supplementation can also prevent damage to endothelial cells in the arteries, veins and capillaries to insure a healthy circulatory system. Antioxidants play an important role in preventing free radical damage as well.

### WHAT ARE THE ENDOTHELIAL CELLS?

- The endothelial cells are absolutely critical to healthy arterial/venal function. They surround the smooth muscle rings and expand the artery's diameter, effecting the blood carrying capacity.

\*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.

- They originate on the outside of the artery and weave through the walls
- These cells, like all human cells, require oxygen and nutrients, and Arginine is essential for their proper function.
- Endothelial cells make Nitric Oxide (NO) from Arginine, which is responsible for the endothelial relaxing factor (EDRF), and plays an essential role in the regulation of vascular homeostasis.
- Citrulline is important for increasing the Arginine available for Nitric Oxide production.

## OTHER IMPORTANT CONSIDERATIONS

- A healthy diet, low salt intake, moderate exercise, reduction of weight in cases of obesity, and totally refraining from smoking assists in promoting good cardiovascular health.
- Three Citrulline to 1 Arginine is a suggested ratio; however this is not clearly defined, and the doctor may have to evaluate the patient's needs and progress to assess the best modality for each individual.
- The ASI (Arterial Stiffness Index) is recommended to help evaluate cardiovascular risk. Monitoring blood and pulse pressure, brachial artery index, as well as other clinical observations can help assess the patient and note improvement.

**DIRECTIONS:** Take 3 capsules of Pure L-Citrulline twice daily along with 1 capsule of Montiff Pure L-Arginine HCL twice daily, (or as needed). Citrulline alone at 3 capsules twice daily may be the preferred dosage in some cases. Montiff Vaso-Lene (with Citrulline, Arginine as well as Carnitine and Pine Bark Extract) may be substituted or combined and taken 2 - 4 capsules daily. Take with full glass of water or fruit juice.

**Do not take with milk or dairy products.** Montiff Vita-Minz Plus (1-2 capsules daily) is recommended for normal metabolism.

**\*Special consideration** should be noted with patients who have sepsis, septic or cytokine-induced shock, since they may have excessive Nitric Oxide production. In addition, **excessive NO has been associated with malignant tumors, asthma, and migraines.** Montiff L-Carnosine supplementation is recommended with these individuals (1 capsule per day). See L-Carnosine technical sheet for further information.

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