

Why Do Most Heart Attack Victims Have Normal Cholesterol Levels?

Elevated Homocysteine... More Deadly than High Cholesterol

Elevated blood homocysteine levels, a newly recognized and highly significant risk factor for coronary artery and other vascular diseases has been established during the past decade. In a comparison with traditional risk factors, elevation of blood homocysteine was found to be a greater risk factor (20-40 fold) than elevated blood cholesterol (1.2-3.1 fold), high blood pressure (8-18 fold) or cigarette smoking (3.5 fold) in a selected group of patients with early-onset arteriosclerosis.⁽¹⁾

Homocysteine is formed in the body as a naturally synthesized byproduct of methionine metabolism. Like cholesterol, homocysteine performs a necessary function in the body. If the right cofactors are present it eventually converts to cysteine and other beneficial compounds such as adenosine triphosphate (ATP) and S-adenosylmethionine (SAME). If it cannot be converted, it enters the bloodstream where it promotes oxidation of lipids, causes platelets to stick together, enhances the binding of Lp(a) to fibrin and promotes free radical damage to the artery walls.

Nutrient Combination Reduces Homocysteine in Virtually All Cases

Many enzymes or catalysts are involved in the complete metabolism of homocysteine. If any of these is defective or functions inefficiently, the body is less able to successfully process homocysteine. This inefficient enzyme function may be due to a defective gene, nutritional deficiencies or, of course, aging. No matter what the cause, elevated homocysteine levels can be easily normalized in virtually all cases.

There are three biochemical pathways for homocysteine conversion.

- Homocysteine is converted by transulfuration to cystathione and then to cysteine. This reaction requires the presence of pyridoxyl-5'-phosphate, a coenzyme of vitamin B-6.
- Homocysteine converts back to methionine in a remethylation reaction involving vitamin B-12 and folic acid.
- Trimethylglycine (TMG) donates a methyl group which detoxifies homocysteine. The TMG is then reduced to DMG (dimethylglycine) which is known for its energizing effects.

Some people may not be able to utilize one or another of these pathways. For that reason, the most effective method for lowering homocysteine is a

TMG PLUS™

Trimethylglycine - Anhydrous Betaine

Product No. 821

Fill Size: 60 Tablets

Each tablet contains:	% Daily Value
Trimethylglycine (anhydrous betaine)-	500 mg. *
Vitamin B-6 (pyridoxine HCl) - - - -	37.5 mg. 1875%
Vitamin B-6 (pyridoxal-5'-phosphate) - -	7.5 mg. 375%
Folate (folic acid)- - - - - - - - - -	450 mcg. 112%
Vitamin B-12 - - - - - - - - - - - - -	375 mcg. 6250%
Selenium (from seleno-L-methionine) -	7.5 mcg. 10%

Other ingredients: gelatin, rice flour.

*Daily Value not established.

Recommended Use: Two tablets daily.

Elevated homocysteine levels have been identified in 21% of patients with coronary artery disease, in 24% of patients with cerebrovascular disease and in 32% of patients with peripheral vascular disease.⁽²⁻³⁾

In an autopsy study of almost 200 veterans, the group with the most severe heart disease had a mean cholesterol of 186. Two-thirds had no evidence of diabetes, high blood pressure or high cholesterol.⁽¹⁾

combination of all of these nutrients...vitamin B-6, vitamin B-12, folic acid and TMG. The remarkable effects of this super nutrient combination can be seen even in people with genetic defects in enzyme production that lead to elevated homocysteine levels.

TMG or Anhydrous Betaine

TMG stands for trimethylglycine, which is the chemical term for betaine. Good quality anhydrous betaine (betaine without water) is derived from sugar beets through a complex extraction method that does not introduce any harmful solvents.⁽³⁾

Anhydrous betaine should not be confused with the digestive aid betaine HCl (betaine with hydrochloric acid) which is usually synthesized. Betaine has a neutral pH, is more than twice as soluble in water as betaine HCl, and has a lower molecular weight. There are no published studies on whether betaine HCl can lower homocysteine and its extreme acidity makes it an unlikely candidate for chronic use.⁽³⁾

TMG functions as a methyl donor to lower homocysteine and increase beneficial SAM levels. Methyl groups are thought to protect cellular DNA from

(over)

mutation. As people age they often do not have enough available methyl groups to safeguard DNA. Abnormal methylation patterns are found in many people with cancer. Eating foods that contain methyl groups such as beets, green leafy vegetables and legumes is helpful, but these must be eaten in relatively large quantities several times a week. Therefore, dietary supplements such as TMG may be required.

B Vitamins: B-6, B-12 and Folic Acid

Research in the Framingham Heart Study linked elevated homocysteine levels to low levels of the B vitamins, folic acid, vitamin B-6 and vitamin B-12. More recent research comparing the extent of artery narrowing with homocysteine and vitamin status, found that men with the most severe arterial blockage had the highest homocysteine levels and lowest B vitamin levels.⁽²⁾

FOLIC ACID protects against high plasma homocysteine concentrations by assisting in the conversion of homocysteine back to methionine. Evidence from scientific studies strongly supports folic acid's ability to lower homocysteine levels and low folic acid levels can be related to the risk of stroke, even after taking other stroke risk factors into account...including age, gender, history of heart disease, blood pressure and smoking.⁽²⁾

VITAMIN B-6, in its coenzyme form, pyridoxal-5'-phosphate converts homocysteine by transsulfuration to cystathione and then to cysteine. In one study, when B-6 supplements given to patients with mildly elevated levels of homocysteine who were diagnosed with cardiovascular disease, homocysteine levels were significantly reduced in 56% of the patients.⁽²⁾ Since some people do not efficiently convert B-6 to its active coenzyme form, supplementing with pyridoxal-5'-phosphate is advised.⁽⁴⁾

VITAMIN B-12 and folic acid work together in a remethylation reaction that converts homocysteine back to methionine. Men with moderately high homocysteine levels generally have significantly lower vitamin B-12 levels and taking B-12 supplements effectively reduces their homocysteine concentrations. Testing homocysteine levels has even been suggested as the most precise way to identify B-12 deficiencies.⁽²⁾

S-Adenosyl Methionine (SAM)

The same nutrients that have been found to reduce homocysteine levels, also raise levels of beneficial S-adenosyl methionine (SAM). SAM, a bioactive form of methionine that is made naturally in the body, is a "methyl donor". It contributes a methyl group (CH₃) to other molecules to change their activity. Increasing SAM levels has proven to be a valuable therapy for several conditions including liver cirrhosis, depression, osteoarthritis and fibromyalgia.⁽³⁾

Homocysteine and Other Risk Factors

Homocysteine's relationship to heart disease may explain some things that the cholesterol theory never could. There is a classic inverse relationship between this super nutrient combination and homocysteine... when one goes up, the other goes down.⁽²⁾

This could explain the increase in heart disease in women over the past twenty years which coincides with the use of oral contraceptives. Birth control pills deplete vitamin B-6 and raise homocysteine levels.

Smoking, a known risk factor for heart disease, also depletes vitamin B-6 and smokers generally have low levels of folic acid and vitamin B-12...all needed for homocysteine metabolism. Statistics linking smoking to heart disease are similar to those linking high homocysteine levels to heart disease.⁽³⁾

Since age is also a risk factor, and homocysteine levels increase with age, any anti-aging program should include homocysteine-lowering supplements. Reducing homocysteine has benefits beyond heart protection. When the blood supply to the heart is blocked, a heart attack results. When blood to the brain is blocked, a stroke results. If the penile artery is occluded, impotence results. Blockages in the extremities result in intermittent claudication or pain in the affected extremity.⁽³⁾

Normalizing Homocysteine Naturally

Since homocysteine is a product of methionine metabolism, avoiding dietary methionine could reduce homocysteine levels. However; methionine is an important sulfur-containing amino acid that is involved in the synthesis of protein, necessary for the maintenance of cartilage and needed for formation of other important amino acids such as taurine and carnitine. Methionine need not be eliminated or drastically reduced if the nutrients necessary for homocysteine conversion are supplied.

TMG Plus™ contains the super combination of nutrients that have been found, in clinical studies, to lower homocysteine concentrations...in the recommended amounts, based on the latest available research. Each nutrient contributes something along the biochemical pathways which break down homocysteine.

WARNING: This information is provided for health care professionals only. **This publication and the product contained herein have not been approved or evaluated by the Food and Drug Administration. This publication, and the product contained herein are not intended to diagnose, treat, cure or prevent any disease.** The product relates to nutritional support only.

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