Cysteine

Function:

Cysteine is a sulfur-containing, conditionally-essential amino acid. The sulfur group (thiol or sulfhydryl group) in cysteine accounts for most of cysteine’s functions. Cysteine can be oxidized with itself to form cystine. Cysteine has six major functions: 1) incorporation into amino acid sequences of proteins, where cysteine promotes protein structure by sulfhydryl bonding; 2) rate-limiting precursor for glutathione synthesis; 3) precursor for taurine (used in bile formation and nerve function); 4) source of sulfate for connective tissue synthesis; 5) source of pyruvate for energy or glucose production; and 6) neurotransmitter. As a component of glutathione, cysteine functions include being a powerful antioxidant, detoxification agent, component of some prostaglandins, and an amino acid transporter across membranes. Formation of cysteine from homocysteine is one pathway to reduce homocysteine levels.

Deficiency Symptoms:

Cysteine deficiencies identified by inherited metabolic disorders or reduced levels in body fluid have been associated with: 1) impaired antioxidant defenses; 2) decreased ability to metabolize drugs or toxic compounds; 3) depressed immune functions; 4) some psychoses; and 5) homocystinemia. Patients with rheumatoid arthritis, hypertension, and smokers have reduced levels of cysteine in fluids and tissues. Clinical trials of cysteine supplementation have shown benefits for skin disorders, hair loss, asthma, bronchitis, allergies, cystic fibrosis, chronic obstructive pulmonary disease, heavy metal toxicity, iron deficiency, diabetes & diabetic nephropathy, seizure disorders, reducing cytotoxic treatment side effects, HIV infection, and alcoholism.

Repletion Information:

Cysteine is found in all proteins, and thus, is richest in high protein foods such as meats, yogurt, wheat germ, and eggs. However, some cysteine is oxidized to cystine and other compounds during cooking and storage, and is less available to the body. Regardless of dietary protein intake, cysteine supplementation with N-Acetyl-L-Cysteine has been found to be safe at doses up to 2000 mg daily. Supplementation with cysteine is not recommended as it is not well tolerated by many patients. In addition, it may be rapidly oxidized to cystine which is less available for utilization.