Oleuropein aglycone is present in extra-virgin olive oil from about 23.3% to 37.7%.

**LITERATURE**


**Ornithine Alpha-Ketoglutarate**

**DESCRIPTION**

Oroinithine alpha-ketoglutarate, abbreviated OKG, also known as ornithine 2-oxoglutarate or ornithine oxoglutarate (OGO), is a salt formed of two molecules of the non-protein amino acid, L-ornithine, and one molecule of the Krebs cycle...
dicarboxylic acid, alpha-ketoglutarate. OKG has been used both enterally and parenterally in burn, trauma, surgical and chronically malnourished patients. It appears to decrease protein catabolism and/or increase protein synthesis under these conditions. OKG is a popular nutritional supplement for athletes, among others.

**ACTIONS AND PHARMACOLOGY**

**ACTIONS**

OKG, under certain conditions, may have immunomodulatory and anticyclotonic and/or anabolic actions. OKG is a delivery form of L-glutamine and L-arginine precursors.

**MECHANISM OF ACTION**

The actions of OKG can be attributed to the metabolites that the OKG components, L-ornithine and alpha-ketoglutarate, give rise to. These metabolites are L-arginine, L-glutamine, L-proline and polyamines. The metabolism of L-glutamine and L-arginine is altered in trauma, and this alteration is linked to immune dysfunction.

One of the major biochemical events that occurs following a burn injury is a fall in intramuscular L-glutamine. This amino acid is released from muscle tissue to meet the increased needs of other cells, in particular immune cells and intestinal cells. L-glutamine is now known to be essential for sustaining the proliferation and activation of immune cells. In the intestine it is essential for maintaining the integrity of the mucosal barrier and its metabolic and immune function. Immune and gastrointestinal dysfunctions occur when de novo L-glutamine synthesis is insufficient to maintain normal function of immune cells and enterocytes. Under these conditions, for example a burn injury, the normally non-essential (meaning the body can make it) L-glutamine becomes a conditionally essential amino acid (meaning the body can’t make enough of it). OKG is a delivery form of L-glutamine.

L-arginine is also essential for immune cells. It is thought that the role of L-arginine in immunity is mediated by its metabolite nitric oxide. Burn injury and some other traumas affect the status of both L-glutamine and L-arginine in the various tissues of the body, especially muscle, the immune system and the gastrointestinal tract. As in the case of L-glutamine, de novo synthesis of L-arginine during these conditions is probably not sufficient for normal immune and gastrointestinal function, nor for normal protein synthesis. OKG, in addition to being a delivery form of L-glutamine, is also a delivery form of L-arginine or more precisely L-ornithine, which is converted to L-arginine.

It is unclear if OKG has immunomodulatory or anticyclotonic/anabolic actions under normal conditions.

See L-Glutamine and L-Arginine.

**PHARMACOKINETICS**

Following ingestion, OKG is absorbed from the small intestine from whence it is transported to the liver. In the liver, OKG enters various metabolic pathways. L-ornithine is a precursor in the synthesis of L-arginine and polyamines, among others. Alpha-ketoglutarate is metabolized to L-glutamine, among other molecules. OKG not metabolized by the liver is transported via the systemic circulation and distributed to various tissues of the body, including the brain, where it undergoes metabolic reactions similar to those above. Under conditions of trauma or burn injury, OKG may be metabolized in immune cells, enterocytes and muscle tissue to produce L-arginine and L-glutamine.

**INDICATIONS AND USAGE**

OKG has demonstrated significant usefulness in the nutritional support of burn and other trauma patients, as well as in chronically malnourished subjects and post-surgery in the elderly. It has been shown to speed wound healing. It has exhibited some immunomodulating effects. Claims that it enhances athletic performance have not been confirmed.

**RESEARCH SUMMARY**

OKG has shown significant effects related to nutritional support in burn, trauma, surgical, elderly and chronically malnourished subjects. These effects have been achieved with both enteral and parenteral administration. OKG has been shown, in varying conditions, to decrease muscle protein catabolism and/or increase muscle protein synthesis. It has also been shown to enhance wound healing. Its ability to increase synthesis of L-glutamine and L-arginine may account for these positive effects. In a recent double-blind, placebo-controlled study, 60 severely burned subjects were randomized to receive 20 grams of OKG daily or placebo for 21 days beginning mean four days post-injury. Significant improvement was achieved in the OKG-treated group, compared with controls, as measured by both biological and clinical end points. Previous studies of OKG-treated burn patients have reported shorter hospitalizations and fewer fatalities.

No conclusions can be drawn from scant, preliminary evidence that OKG may exert some positive effects on immunity. There is no credible research to support claims that OKG can build muscle in healthy individuals or that it can enhance exercise/athletic performance.

**CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS**

**CONTRAINDICATIONS**

OKG is contraindicated in those with deficiency of ornithine-delta-aminotransferase (OAT). This is a genetic disease resulting in gyrate atrophy of the choroid and retina and progressive blinding chorioretinal degeneration. It is rare.
PRECAUTIONS
Pregnant women and nursing mothers should avoid supplemental OKG. OKG supplementation may potentially cause hypoglycemia in starved individuals. Those with eating disorders or those who are on very-low-calorie diets should exercise caution in using OKG.

ADVERSE REACTIONS
None reported for those using supplemental OKG.

DOSED AND ADMINISTRATION
There are no typical doses for OKG supplementation. Some athletes use about 2.5 grams before and after exercise, as well as before breakfast and at bedtime.

Doses of 20 to 30 grams daily, given enterally, have been used in burn and trauma patients.

LITERATURE


Pantethine

DESCRIPTION
Pantethine is the disulfide dimer of pantetheine, the 4'-phosphate derivative of which is an intermediate in the conversion of the B vitamin pantothenic acid to coenzyme A (see Pantothenic Acid). Pantethine is found naturally in small quantities in most forms of life, and therefore, in food sources. Very large doses of pantethine have been found to have lipid-lowering effects, and pantethine is used in Europe and Japan as a lipid-lowering agent. Pantethine is marketed in the United States as a nutritional supplement.

Pantethine is also known as D-bis(N-pantothenyl-beta-aminoethyl)disulfide and (R)-N,N'-[dithiobis(ethyleneimino-carbonylethylene)]bis(2,4-dihydroxy-3,3-dimethylbutyramide). Its molecular formula is C_{22}H_{42}N_{4}O_{9}S_{2} and its molecular weight is 554.73 daltons. Pantetine is represented by the following chemical structure:

![Pantethine](image)

**ACTIONS AND PHARMACOLOGY**

**ACTIONS**
Pantethine may have lipid-modulating activity. It has putative antiatherogenic, ophthalmoprotective and detoxification activities.

**MECHANISM OF ACTION**
Pantethine has been found to decrease serum levels of total cholesterol, low-density lipoprotein cholesterol (LDL-C), apolipoprotein B and triglycerides. It has also been found to increase high-density lipoprotein cholesterol (HDL-C) and apolipoprotein A1 levels. The mechanism of the possible