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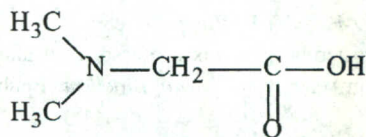
## Dimethylglycine (DMG)

### DESCRIPTION

Dimethylglycine or DMG is a non-protein amino acid found naturally in animal and plant cells. DMG is produced in cells as an intermediate in the metabolism of choline to glycine.

There has been much confusion surrounding the history of DMG as a nutritional supplement. DMG appeared as a supplement in the 1960s under the names vitamin B15, pangamic acid and calcium pangamate. Calcium pangamate was originally a mixture of calcium gluconate and DMG. Calcium pangamate was intended as a delivery form of DMG. However, several products entered the supplement marketplace called pangamic acid or calcium pangamate, and these did not contain DMG. Some of these products contained, instead of DMG, a substance called diisopropylammonium dichloroacetate. At present, DMG supplements are available that do contain dimethylglycine.

DMG-containing calcium pangamate was popular with Russian athletes and cosmonauts because it was reputed to enhance oxygenation at the cellular level, reduce fatigue and enhance physical stamina. None of those claims, however, was ever substantiated. DMG is neither a vitamin nor an essential nutrient. DMG is also known as N, N-dimethylglycine, (dimethylamino)acetic acid and N-methylsarcosine. Its chemical structure is:



Dimethylglycine (N,N-Dimethylglycine)

DMG is a solid, water-soluble substance. DMG should not be confused with TMG (trimethylglycine or betaine). TMG is involved in the methylation of homocysteine to form methionine (see Trimethylglycine).

### ACTIONS AND PHARMACOLOGY

#### ACTIONS

There are no known actions of supplemental DMG.

#### PHARMACOKINETICS

DMG is absorbed from the small intestine and from there transported by the portal circulation to the liver. DMG is metabolized in the liver to monomethylglycine or sarcosine which, in turn, is converted to glycine. Dimethylglycine dehydrogenase, a flavoprotein, is the enzyme that catalyzes the oxidative demethylation of DMG to sarcosine. The methyl group produced in this reaction returns to the one carbon pool at the level of N<sup>10</sup>-hydroxymethyl-tetrahydrofolic acid. DMG itself is formed from trimethylglycine or betaine. DMG that is not metabolized in the liver is transported by the circulatory system to various tissues in the body.

#### INDICATIONS AND USAGE

It is too early to say whether DMG might eventually be indicated as an immune enhancer or in the management of autism. It is not indicated as an anticonvulsant, in epilepsy or for any condition characterized by seizures. Nor is it indicated as an energy booster or athletic-performance enhancer.

#### RESEARCH SUMMARY

Based on claims that DMG is a highly potent "oxygenator" of body/brain tissues, this supplement has been touted as a panacea for years.

Several studies show that DMG has no anticonvulsant value and is thus of no help in epilepsy or other conditions characterized by seizures. Persistent claims that DMG is useful in autism are thus far anecdotal.

Claims that DMG can boost energy and athletic performance have been refuted by human and animal studies. Tests on exercising thoroughbred horses found "no beneficial effects on cardiorespiratory function or lactate production." And male track athletes supplemented with DMG exhibited no significant changes in short-term maximal treadmill performance.

On the other hand, an early finding that DMG can enhance both humoral and cell-mediated immune responses has been fortified by some subsequent research. This animal research needs to be extended to humans.

Early fears that DMG might be mutagenic now appear to be unfounded.

#### CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

##### CONTRAINDICATIONS

Those with hypersensitivity to any component of the preparation should not use DMG.



**PRECAUTIONS**

DMG is not advised for pregnant women or nursing mothers and should only be used in children under medical supervision.

**ADVERSE REACTIONS**

Those with the rare disorder of dimethylglycine dehydrogenase deficiency may complain of a fish odor when taking DMG supplements. No other significant adverse reactions have been reported with DMG.

**INTERACTIONS**

There are no known drug, nutritional supplement, food or herb interactions. There is no known interaction with alcohol.

**OVERDOSAGE**

There are no known reports of overdose with DMG.

**DOSAGE AND ADMINISTRATION**

Use of DMG should be restricted to items specifically labeled DMG or dimethylglycine. Items labeled pangamic acid, calcium pangamate and vitamin B15 should be avoided. DMG comes in tablets, capsules and sublingual preparations, typically at a dose of 125 milligrams. The usual dose is 125 milligrams daily with meals.

**LITERATURE**

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## Dimethyl Sulfoxide (DMSO)

**DESCRIPTION**

Dimethyl sulfoxide or DMSO is a very hygroscopic, sulfur-containing organic compound. It is a colorless liquid with a faint scent of sulfur and mixes readily with a wide range of water-insoluble and water-soluble substances, including water itself. DMSO is rapidly absorbed into the body if ingested or even if touched by the hands, very quickly producing a garlic-like taste. It occurs naturally in small amounts in vegetables, grains, fruits and animal products. DMSO is formed as a byproduct of wood pulp processing and is used as an industrial solvent.

Up until the 1970s DMSO was sold in vitamin stores and used both externally and internally, primarily for various aches and pains. DMSO is approved by the FDA for the palliative treatment of interstitial cystitis and for limited veterinary use. It is not allowed for use as a dietary supplement. A second-generation DMSO, methylsulfonylmethane or MSM (see Methylsulfonylmethane), which is a metabolite of DMSO, is marketed as a dietary supplement.

DMSO is also known as sulfinylbismethane and methyl sulfoxide. The inclusion of DMSO, which is not a nutritional supplement in this PDR, is for historical and informational purposes, and because one of its metabolites, methylsulfonylmethane or MSM, is marketed as a nutritional supplement. The claims for MSM are related to claims made for DMSO.

**ACTIONS AND PHARMACOLOGY****ACTIONS**

DMSO may have anti-inflammatory, antioxidant and analgesic activities. DMSO also readily penetrates cellular membranes.

**MECHANISM OF ACTION**

The mechanism of DMSO's actions is not well understood. DMSO has demonstrated antioxidant activity in certain biological settings. For example, the cardiovascular protective effect of DMSO in copper-deficient rats is thought to occur by an antioxidant mechanism. It is also thought that DMSO's possible anti-inflammatory activity is due to antioxidant action. The membrane-penetrating ability of DMSO may enhance diffusion of other substances through the skin. For this reason, mixtures of idoxuridine and DMSO have been used for topical treatment of herpes zoster in the United Kingdom.

**PHARMACOKINETICS**

DMSO is readily and rapidly absorbed following administration by all routes and distributed throughout the body. It is