

L-Tyrosine

TRADE NAMES

Rxosine (Tyson Nutraceuticals), Free-Form L-Tyrosine (Solaray), Tyrosine Power (Nature's Herbs).

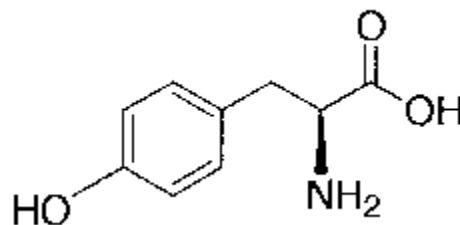
DESCRIPTION

L-tyrosine is a protein amino acid. It is classified as a conditionally essential amino acid.

Under most circumstances, the body can synthesize sufficient L-tyrosine, principally from L-phenylalanine, to meet its physiological demands. However, there are conditions where the body requires a dietary source of the amino acid for its physiological demands. For example, L-tyrosine is an essential amino acid for those with phenylketonuria. L-tyrosine is found in proteins of all life forms. Dietary sources of L-tyrosine are principally derived from animal and vegetable proteins. Vegetables and juices contain small amounts of the free amino acid. The free amino acid is also found in fermented foods such as yogurt and miso.

In addition to being involved in protein synthesis, L-tyrosine is a precursor for the synthesis of the catecholamines epinephrine, norepinephrine and dopamine, the thyroid hormones thyroxine and triiodothyronine, and the pigment melanin.

L-tyrosine is also known as beta- (para-hydroxyphenyl) alanine, alpha-amino-para-hydroxyhydrocinnamic acid and (S)- alpha-amino-4-hydroxybenzenepropanoic acid. It is abbreviated as either Tyr or by its one-letter abbreviation Y. The molecular formula of L-tyrosine is $C_9H_{10}NO_3$, and its molecular weight is 181.19 daltons. L-tyrosine is an aromatic amino acid with the following structural formula:



L-tyrosine

ACTIONS AND PHARMACOLOGY

ACTIONS

L-tyrosine has putative antidepressant activity.

MECHANISM OF ACTION

The mechanism of L-tyrosine's putative antidepressant activity may be accounted for by the precursor role of L-tyrosine in the synthesis of the neurotransmitters norepinephrine and dopamine. Elevated brain norepinephrine and dopamine levels are thought to be associated with antidepressant effects.

PHARMACOKINETICS

Following ingestion, L-tyrosine is absorbed from the small intestine by a sodium-dependent active transport process. L-tyrosine is transported from the small intestine to the liver via the portal circulation. In the liver, L-tyrosine is involved in a number of biochemical reactions, including protein synthesis and oxidative catabolic reactions. L-tyrosine that is not metabolized in the liver is distributed via the systemic circulation to the various tissues of the body.

INDICATIONS AND USAGE

Results are mixed, but largely negative, with respect to claims that tyrosine is an effective antidepressant. Claims that it can alleviate some of the mental and physical symptoms of environmental stress are based on preliminary evidence. Further claims that tyrosine is useful in narcolepsy and attention deficit disorder have been refuted by some studies. Another study found that tyrosine supplementation did not improve neuropsychological performance in subjects with phenylketonuria. Claims that tyrosine is helpful in alleviating symptoms of premenstrual syndrome (PMS) and drug withdrawal are largely anecdotal and unconfirmed. There is no evidence tyrosine has any effect on dementia, Alzheimer's disease or Parkinson's disease.

RESEARCH SUMMARY

Two small, early studies suggested that tyrosine might have useful antidepressant effects. A subsequent follow-up with more subjects and conducted in a randomized, double-blind fashion failed to find any significant antidepressant activity, compared with placebo, in subjects with major depression. The dose used was 100 mg/kg/day of tyrosine for four weeks.

One study has concluded that tyrosine can protect against some forms of environmental stress. Subjects were given a 100 mg/kg dose of tyrosine and then exposed for 4.5 hours to cold and hypoxia in this double-blind, placebo-controlled crossover study. Tyrosine was reported to significantly decrease adverse symptoms, including mood and performance impairment. Follow-up is needed.

In another double-blind, placebo-controlled trial, tyrosine had no significant effect on subjects with narcolepsy and associated cataplexy. Dose used was 9 grams daily for four weeks. Similarly, tyrosine failed to produce lasting, significant improvement in subjects with attention deficit disorder. In this small, open study, tyrosine seemed to improve this condition after two weeks of supplementation, but this improvement was not sustained.

Recently, tyrosine was tested to see if it could improve the neuropsychological test performances of individuals with phenylketonuria. This was a randomized, double-blind, placebo-controlled crossover study. Maximum dosage used was 100 to 150 mg/kg/day. The supplementation increased plasma tyrosine concentrations. Higher tyrosine levels correlated at baseline with improved performance on the neuropsychological tests, yet higher concentrations achieved through supplementation in this trial did not enhance test scores.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTION

CONTRAINDICATIONS

L-tyrosine is contraindicated in those with the inborn errors of metabolism alkaptonuria and tyrosinemia type I and type II. It is also contraindicated in those taking non-selective monoamine oxidase (MAO) inhibitors. L-tyrosine is contraindicated in those hypersensitive to any component of an L-tyrosine-containing supplement.

PRECAUTIONS

Pregnant women and nursing mothers should avoid supplementation with L-tyrosine.

Those with hypertension should exercise caution in the use of L-tyrosine.

Those with melanoma should avoid L-tyrosine supplements.

ADVERSE REACTIONS

L-tyrosine is generally well tolerated. There are some reports of those taking supplemental L-tyrosine experiencing insomnia and nervousness.

INTERACTIONS

DRUGS

Non-selective MAO inhibitors: including phenelzine sulfate, tranylcypromine sulfate and pargyline HC1 — Concomitant use of L-tyrosine and non-selective MAO inhibitors may cause hypertension.

DOSAGE AND ADMINISTRATION

Those who use supplemental L-tyrosine typically take 500 to 1500 mg daily.

HOW SUPPLIED

Capsules — 300 mg, 500 mg

Powder

Tablets — 300 mg, 500 mg, 1000 mg