THE PHYSIOLOGY OF GLUTAMIC ACID

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Abstract

Glutamic acid (abbreviated as Glu or E) is a non-essential amino acid, whose salt is known as glutamate (also known as sodium glutamate, monosodium glutamate, Natrium Glutaminat, E 621). Human excessive consumption of nutrients having a high glutamate level (beer yeast (*Saccharomyces cerevisiae Meyen*,), certain mushrooms, tomatoes (*Lycopersicon esculentum Mill*.), soy (*Glycine max.(L).Merr*.)), may rise the blood level of the substance, as glutamate is adsorbed very quickly in the alimentary duct (unlike the glutamic acid).
The glutamic acid obtained through crystallization from kelps belonging to the orders of *Laminariales* and *Fucales of class Phaeophyta (brown algae)* more specific the specie Saccharina japonica (*Laminaria japonica*), is accountable for the human perception of the fifth basic sense of taste – umami (delicious in Japanese). Through the industrial production of glutamate there is made a product that potentiates the taste of food. Glutamate is part of a class of chemical substances known as excitotoxins, where a high level of substance in the human blood stimulates excessively the specific cellular receptors, leading to a higher cellular permeability to Ca^{+2}. This mutation can cause damage (cytotoxicity and cell death) at the level of brain areas that are unprotected by the blood-brain barrier.
On the top of the neurotoxicity hypothesis in case of human consumption of large amounts, glutamate and aspartate interfere with the visceralgia transmission.

Key words: glutamic acid, glutamate

Current researches in agriculture debate upon the role of glutamic acid (associated with Gamma-Aminobutyric acid or GABA) in the decrease of the biological stress of the plants (due to deficient nutrients, infestants or environment agents).

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Other sources of glutamate are the natural gum, malted barley (*Hordeum vulgare L*.), soy proteins, soy protein isolate, fermented bean mass, grapes. The glutamic acid obtained through crystallization from kelps belonging to the orders of *Laminariales* and *Fucales of class Phaeophyta (brown algae)* ***more specific*** the specie Saccharina japonica (*Laminaria japonica*), is accountable for the human perception of the fifth basic sense of taste – umami (*delicious* in Japanese). Through the industrial production of glutamate there is made a product that potentiates the taste of food.

Aspartic acid abbreviated as Asp or D; Asx or B) is a non-essential amino acid, whose salt is known as aspartate.

The vegetal sources of aspartate are the germinated seeds, shredded oats, avocado, asparagus, young sugar cane and molasses.

Amino Acids have a chelating effect on micronutrients. When applied together with micronutrients, the absorption and transportation of micronutrients inside the plant is easier. This effect is due to the chelating action and to the effect of cell membrane permiability.

L - Glycine and L - Glutamic Acid are known to be very effective chelating agents. L-glutamic acid acts as a cytoplasm osmotic agent of the "guard cells". Thus favouring the opening of the stomas. Glycine and glutamic acid are fundamental metabolites in the process of formation of vegetable tissue and chlorophyll synthesis.

These amino acids help to increase chlorophyll concentration in the plant leading to higher degree of photosynthesis. This makes crops lush Green.

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L - Glutamic Acid are essential amino acid for pollination. These amino acid increase the pollen germination and the length of the pollinic tube.

L - Glutamic Acid and L - Aspartic Acid, by transamination give rise to the rest of the amino acids.

High temperature, low humidity, frost, pest attack, hailstorm, and floods have negative effects on plant metabolism with a corresponding reduction in crop quality and quantity. The application of amino acids before, during and after the stress conditions supplies the plants with amino acids which are directly related to stress phy siology and thus has a preventing and recovering effect(agrowchem*)*.

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This mutation can cause damage (cytotoxicity and cell death) at the level of brain areas that are unprotected by the blood-brain barrier. On the top of the neurotoxicity hypothesis in case of human consumption of large amounts, glutamate and aspartate interfere with the visceralgia transmission.

Neurotransmitters and neuromodelers involved in the transmission of pain to the posterior medullary velum level are freed as a response to the stimulation of the respective fibers, of the neurons from the inferior velum or of the descending fibers originating in the supraspinal level (Corneliu Neamţu, 2001**).** The main spinal are that receives, modulates and transmits the information on pain is the marrow.

The above mentioned substances are divided into **stimulants** (P substance, CGRP - Calcitonin gene related peptide, glutamate, nitrous oxide, aspartate) or **inhibitors** (enkephalins, somatostatin, serotonin, noradrenaline, glycine, GABA) of pain transmission (Corneliu Neamţu, Andrei Neamţu, 2001**)**.

Glutamate, glycine and aspartate are three **excitatory amino acids (EAA)** that interfere within the chronic and acute pain transmission. (Ganong WF, 1997).

Glutamate is the main neurotransmitter; glutamate and the other excitatory amino acids act upon four types of receptors (glutamate receptors):

- **NMDA (N-methyl-D-aspartate)** – has as specific agonist the aspartate, yet glutamate has the main action upon it (this being a non-specific natural agonist). It is an ionotropic receptor located at the postsynaptic neuron level and it is bound with an ionic channel that allow, under certain conditions, the Calcium and Sodium ions to get in the cell and the Potassium ions to get out of the cell (C. Mungiu, 2002).
- **AMPA Receptor (α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid)** – ionotropic receptor bound to the Na ionic channel.
- **Metabotropic Receptor** - (linked with G-protein and inositol-phosphates - second messengers system).
- **Kainate receptor** – inotropic receptor, linked to the Na ion channel (The McGraw-Hill, 2004).

At spinal level, there has been observed a double mediation (peptide (P substance) – amino acid (glutamate) or peptide (P substance) – nitric oxide (NO)) that has as effect the transmission of the algesic information. (Dan Stefan Antihe, Horatiu Varlam,2002).

Glutamate and P substance are stored in different bladders. Very short term stimuli and persistent ones cause the release of glutamate and aspartate while long term stimuli (minutes) cause the release of P substance.

Under normal conditions, the link of glutamate on the NMDA receptor does not cause the transmission of the pain sensation due to the fact that the ion channel linked to the receptor is blocked against physiological concentrations by Mg ions (Fernando Cervero, 2000).

Under normal conditions, mechanical and thermal stimuli cause the link of the glutamate on the AMPA receptor and the occurrence of short term excitations.

In the inflammation pain, the persistent stimuli or the increasing intensity ones cause repeated depolarization of the membrane and the link of the glutamate and of P substance to the NMDA receptor.

As a consequence of this action, the magnesium is discharged from the channel and a very large amount of Ca^{+2} gets in the neuron, causing hyperexcitability central hypalgesia.

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