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DETERMINING THE PRIORITY OF THE STUDY OF BIOCHEMICAL REACTIONS OF TRYPTOPHAN AND THE USE IN ORGANIC SYNTHESES

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Annotation: The importance of amino acids in the human body and in chemical reactions has been studied a lot. Taking tryptophan and its derivatives is important for the importance of tryptophan in the human body and the changes in metabolic processes in the human body. it is impossible to process preparations.

Key words: Tryptophan, Niacin, cerebellar ataxia, 5-HTP, glutaric acid, glutaryl-CoA, 3-hydroxyglutaric acid, glutaconic acid, macrocephaly, EMS,.IDO1 and IDO2, pituitary, prolactin

Amino acids are organic compounds with a simple structure consisting of -COOH and -NH_2 groups, they are important in many biological processes and syntheses. L-tryptophan is one of the 20 proteinogenic amino acids, that is, it participates in the biosynthesis of proteins. Tryptophan is present in all organisms, from bacteria to plants to animals. It is a non-polar, uncharged (at physiological pH) aromatic amino acid . Tryptophan is an essential amino acid, which means that the body cannot synthesize it, and the daily diet should contain tryptophan-preserving substances. The need for tryptophan decreases with age. The minimum daily requirement for adults is 3 mg/kg/day or about 200 mg/day. 400 mg in one cup of wheat germ , One cup of low-fat cottage cheese can contain up to 300 mg of tryptophan , and chicken and turkey can contain up to 600 mg . Tryptophan is especially found in chocolate, oats, dried dates, milk, yogurt, cottage cheese, red meat, eggs, fish, poultry, sesame, peas, almonds, sunflower seeds, pumpkin seeds, buckwheat. , spirulina and peanuts are abundant. Tryptophan is important in the synthesis of serotonin and melotanin.

Melatonin is a hormone produced by the pineal gland of animals that regulates sleep and wakefulness. Serotonin is a brain neurotransmitter, platelet clotting factor, and neurohormone found in organs throughout the body. Nutrients such as vitamin B6, niacin, and glutathione are needed for the conversion of tryptophan into serotonin. Niacin (also known as vitamin B3) is an important metabolite of tryptophan. It is synthesized through kynurenine and quinolinic acids, which are the breakdown products of tryptophan. There are a number of conditions or diseases characterized by tryptophan deficiency. For example, fructose malabsorption leads to improper absorption of tryptophan in the intestine, which lowers tryptophan levels in the blood

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and leads to depression. Tryptophan deficiency can cause pellagra, a niacin-tryptophan deficiency disease with symptoms of dermatitis, diarrhea, and dementia.

Hartnup's disease is a disorder in which tryptophan and other amino acids are not absorbed properly. Symptoms of Hartnup disease include skin rash, difficulty coordinating movements (cerebellar ataxia), and psychiatric symptoms such as depression or psychosis. Tryptophan supplements may be helpful for treating Hartnup's disease. Assessment of tryptophan deficiency is carried out by studying the excretion of tryptophan metabolites in urine or blood. Blood can be the most sensitive test . Increased urination of tryptophan breakdown products (eg, kynurenine) is associated with increased tryptophan degradation, which occurs in cases of oral contraception, depression, mental retardation, hypertension, and anxiety. The resulting serotonin is metabolized by the pineal gland into melatonin, which promotes sleep. It has been suggested that consumption of tryptophan , or 5-HTP, may improve symptoms of depression by increasing serotonin levels in the brain. It is sold as a dietary supplement for use as a substance. In some European countries, it is sold as a prescription drug for the treatment of severe depression. There is evidence that tryptophan levels in the blood are not altered by dietary changes, but consuming purified tryptophan increases serotonin levels in the brain, while eating tryptophan-containing foods does not. This is because the transport system that transports tryptophan across the blood-brain barrier also transports other amino acids found in protein food sources. In certain cases, tryptophan can be a neurotoxin and a metabotoxin. A neurotoxin is a compound that damages the brain and nerve tissue. Metabotoxin is an endogenously produced metabolite that causes adverse health effects at chronically high levels. Glutaric aciduria type I can be considered as a result of tryptophan not being absorbed by the body . GA1 is a genetic disease in which the body cannot fully break down the amino acids lysine, hydroxylysine and tryptophan due to a deficiency of mitochondrial glutaryl-CoA dehydrogenase. Their intermediate breakdown products (eg, glutaric acid, glutaryl-CoA, 3-hydroxyglutaric acid, glutaconic acid) can accumulate in excessive amounts and damage the brain (as well as other organs), especially the basal ganglia. Babies with glutaric acidemia type I are usually born with unusually large heads (macrocephaly). Other symptoms are spasticity (increased muscle tension) and dystonia (an involuntary muscle contraction resulting in abnormal movement or posture), but many affected individuals are asymptomatic. Eosinophilia-myalgia syndrome, an incurable and sometimes fatal flu-like neurological condition associated with high levels of tryptophan as well as high L-tryptophan intake (EMS) related. The risk of developing EMS increases with large doses of tryptophan and increasing age. The presence of eosinophilia is a key feature of EMS, with unusually severe myalgia (muscle pain). Tryptophan and some unknown tryptophan contaminants may contribute to EMS. In addition, it has been hypothesized that excess tryptophan or

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elevation of its metabolites may play a role in enhancing some pathological features of EMS. This pathological damage is exacerbated by metabolites of the kynurenine pathway (tryptophan breakdown pathway). Low levels of tryptophan in the blood are commonly seen in people with chronic infections, traumatic injuries (burns or wounds), or sepsis (PMID). Tryptophan is mainly catabolized by the enzymatic activity of two enzymes: indoleamine-2,3-dioxygenase (IDO) 1 and IDO2, both of which are widely distributed in human tissues and both are induced by interferon gamma (IFN-gamma or IDO1 and IDO2). forms tryptophan catabolites such as kynurenine and kynurenic acid. These tryptophan catabolites activate the aryl hydrocarbon receptor (AhR), which plays an important role in immune regulation.IDO1 and IDO2 is to effectively deplete tryptophan levels to starve organisms (bacteria and parasites), thereby killing them or slowing their growth. On the other hand, the activation of AhR leads to a state of immunosuppression and is designed to inhibit the immune response to infectious organisms (overgrowth of IFNG and IL-1B). Tryptophan is metabolized in the liver by tryptophan pyrrolase and tryptophan hydroxylase. The biological half-life of tryptophan is 15.8 organized the hour

A number of important side reactions occur during the catabolism of tryptophan in the acetoacetate pathway. The first enzyme of the catabolic pathway is iron porphyrin oxygenase, which opens the indole ring . The latter enzyme is highly inducible, its concentration increasing almost 10-fold in a tryptophan- rich diet. Kynurenine is the first major network intermediate in this pathway. Kynurenine undergoes deamniation in a standard transamination reaction to form kynurenic acid . Kynurenic acid and its metabolites have been shown to act as excitotoxic and anticonvulsants. The second side branch reaction produces anthranilic acid and alanine . Another equivalent of alanine is produced along the main catabolic pathway, and it is the production of these alanine residues that allows tryptophan to be classified between glucogenic and ketogenic amino acids. The second important branching point converts kynurenine into 2-amino-3-carboxymuconic semialdehyde, which has two fates . The main stream of carbon elements from this intermediate is glutarate . An important side effect in the liver is transamination and several rearrangements to produce limited amounts of nicotinic acid , which results in the production of small amounts of NAD + and NADP + .

The findings indicate that (L)-tryptophan-induced increased serotonin metabolism and physical restraint are associated with stimulation of prolactin release from the anterior pituitary by thyroid-stimulating hormone (TSH) in rats.

Biochemical reactions of tryptophan :

1. H + NADPH + trp + O_2 ⟶ CO_2 + indole-3-acetaldoxime + NADP + H_2O
2. pyruvate + trp ⟶ indole-3-pyruvate + ala
3. H + trp ⟶ tryptamine + CO_2

4. H + trp ⟶ tryptamine + CO_2

5. H + trp + O_2 ⟶ N -formylkynurenine

6. ATP + trp ⟶ diphosphate + AMP

7. H + trp + O_2 ⟶ N -formylkynurenine breakdown of tryptophan to 2-amino-3-carboxymuconate hemialdehyde

8. 2-oxoglutarate + trp ⟶ glt + indole-3-pyruvate Activated by BSAT breakdown of tryptophan

9. H + + trp + O_2 ⟶ N -formylkynurenine tryptophan degradation I (via anthranilate)

10. H + + trp + O_2 ⟶ N -formylkynurenine NAD biosynthesis II (from tryptophan)

11. L-serine + indole-3-glycerol-phosphate ⟶ D-glyceraldehyde-3-phosphate + L-tryptophan + H_2O activated by tryptophan synthase

12. L-tryptophan + phenylpyruvate ⟶ indolepyruvate + L-phenylalanine Breakdown of tryptophan

Corn and whole grains contain adequate amounts of niacin , but the vitamin is bound and unavailable. They are also low in tryptophan. The combination of low tryptophan and absent niacin leads to niacin deficiency. Current feeding practices under intensive agricultural conditions require the addition of niacin or tryptophan to highly concentrated diets of poultry and pigs.

In conclusion, it can be said that biological syntheses and the use of tryptophan and its derivatives of high medical value as chemical syntheses and biological supplements provide promising results.

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