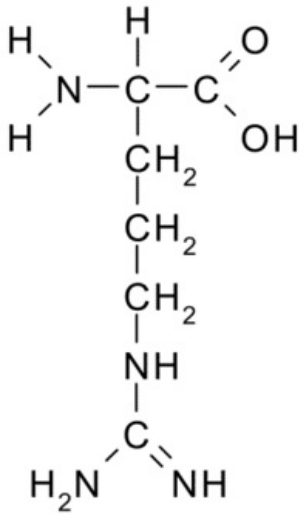
Arginine

Arginine, together with histidine, belongs to the **semi-essential** amino acid. This means that the synthesis is insufficient during child development and the body must take them in protein through the diet.

Arginine metabolism



Arginine

Arginine, along with other amino acids, belongs to the amino acid group of 2-oxoglutarate. It is synthesized in the urea cycle, which takes place in the liver. It is also synthesized in the kidney due to the lack of arginase activity, which catalyzes the conversion of arginine to ornithine. During the urea cycle, arginine is transferred by a specific transporter from the cytoplasm to the mitochondria, where the action of arginase produces citrulline, which is again transferred from the mitochondria to the cytoplasm by a specific transporter.

Arginine is also involved in the synthesis of **creatine**, nitric oxide and agmatine, a substance important for its antihypertensive effects. Arginine phosphate is also important, occurring in intervertebral muscles and having a similar function to **creatine phosphate** formed from creatine.

Creatine' is formed by transamination, when a guanidine group is transferred to glycine by the enzyme transaminidase in the kidneys. This reaction produces ornithine and guanidine acetate, which is methylated by S-adenosylmethionine, a product of methionine, to creatine in the liver. The amount of creatine is proportional to the size of the body's muscle mass and this amount is replaced every day. Approximately 1-2% of creatine is non-enzymatically converted (cyclised) to creatinine, which is further excreted in the urine. Creatine phosphate is a source of energy for skeletal and cardiac muscles.

Nitric oxide is an important regulatory molecule and belongs to the local mediators. It is formed in many tissues by the action of **NO synthase (NOS)**, or rather by its three isoenzymes, whose cofactors are FAD, FMN and heme group. The first treatment with NO was recorded in 1867, when Sir T. Lauder Bruton administered nitroglycerin and amyl nitrate to a patient. The NO molecule itself was not described until the 1980s. This molecule causes vasodilation, has a modulatory effect on the immune system - it alters macrophage activity and is also important for its radical scavenging functions and as a neurotransmitter. It also inhibits platelet aggregation, causes erection as part of vasodilation and also nitrosylates proteins. The substrate of the reaction is arginine, from which citrulline and NO are formed via an intermediate product. NO decomposes to NO^{2-} and NO^{3-}.

Sources

- MATOUŠ, Bohuslav. *Základy lékařské chemie a biochemie.* 2010. edition. Galen, 2010. pp. 0. ISBN 978-80-7262-702-8.