Amino acids and central fatigue.

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There is an increasing interest in the mechanisms behind central fatigue, particularly in relation to changes in brain monoamine metabolism and the influence of specific amino acids on fatigue. Several studies in experimental animals have shown that physical exercise increases the synthesis and metabolism of brain 5-hydroxytryptamine (5-HT). Support for the involvement of 5-HT in fatigue can be found in studies where the brain concentration of 5-HT has been altered by means of pharmacological agents. When the 5-HT level was elevated in this way the performance was impaired in both rats and human subjects, and in accordance with this a decrease in the 5-HT level caused an improvement in running performance in rats. The precursor of 5-HT is the amino acid tryptophan and the synthesis of 5-HT in the brain is thought to be regulated by the blood supply of free tryptophan in relation to other large neutral amino acids (including the branched-chain amino acids, BCAA) since these compete with tryptophan for transport into the brain. Studies in human subjects have shown that the plasma ratio of free tryptophan/BCAA increases during and, particularly, after sustained exercise. This would favour the transport of tryptophan into the brain and also the synthesis and release of 5-HT which may lead to central fatigue. Attempts have been made to influence the 5-HT level by giving BCAA to human subjects during different types of sustained heavy exercise. The results indicate that ingestion of BCAA reduces the perceived exertion and mental fatigue during exercise and improves cognitive performance after the exercise. In addition, in some situations ingestion of BCAA might also improve physical performance; during exercise in the heat or in a competitive race when the central component of fatigue is assumed to be more pronounced than in a laboratory experiment. However, more experiments are needed to further clarify the effect of BCAA and also of tryptophan ingestion on physical performance and mental fatigue.

Related articles

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