

Abstract

Tryptophan is an amino acid which has many functions in the body. Besides its participation in the production of proteins, it acts as a substrate for the kynurenine and methoxyindole metabolic pathways. The kynurenine pathway ends with the production of nicotinamide adenine dinucleotide (NAD⁺), which is needed for the production of cellular energy. Thus, with increased energy demand during immune system activation, the activity of the kynurenine pathway is increased. Due to increased activity, it produces more immunoreactive and neuroactive metabolites such as kynurenic acid and quinolinic acid. These metabolites are involved in many processes in the body and affect the pathology of many diseases. Studies show that regulation of these metabolites could be a key innovation in the treatment of cancer, cardiovascular or neurodegenerative diseases. The methoxyindole pathway is another important tryptophan processing pathway. Its best-known metabolites are serotonin, which acts as a neurotransmitter, and melatonin, a hormone with immunomodulatory effects regulated by the circadian clock.

This work deals with the circadian rhythmicity of enzyme expression of these two metabolic pathways. It also describes the effect of systemic administration of lipopolysaccharide endotoxin on the expression of genes of these enzymes. Our experiments used Wistar rats at 30 days of age. The lipopolysaccharide was administered to the experimental group before tissue collection, which was performed at 24-hour intervals for 24 hours. For the purposes of this work, samples of the pineal gland, liver and heart were taken. The expression level of the measured genes was determined by the RT-qPCR method. The results of this work confirmed the presence of a circadian rhythm of some kynurenine pathway genes in the liver and changes in the expression of kynurenine pathway genes and measured transcription factor genes and circadian clock genes.

Key words: kynurenins, melatonin, pineal gland, liver, heart, lipopolysaccharide, circadian system, rat