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Effect of orally administered L-tryptophan on serotonin, melatonin, and the innate immune response in the rat.

Esteban S¹, Nicolaus C, Garmundi A, Rial RV, Rodríguez AB, Ortega E, Ibars CB.

Author information

Abstract

To assess the effects of external administration of L-tryptophan on the synthesis of serotonin and melatonin as well as on the immune function of Wistar rats, 300 mg of the amino acid were administered through an oral cannula either during daylight (08:00) or at night (20:00) for 5 days. Brain, plasma, and peritoneal macrophage samples were collected 4 h after the administration. The accumulation of 5-hydroxytryptophan (5-HTP) after decarboxylase inhibition was used to measure the rate of tryptophan hydroxylation in vivo. Circulating melatonin levels were determined by radioimmunoassay, and the phagocytic activity of macrophages was measured by counting, under oil-immersion phase-contrast microscopy, the number of particles ingested. The results showed a diurnal increase ($p < 0.05$) in the brain 5-HTP, serotonin (5-hydroxytryptamine, 5-HT), and 5-hydroxyindolacetic acid (5-HIAA) of the animals which had received tryptophan at 08:00 and were killed 4 h later. In the animals which received tryptophan during the dark period, the 5-HT declined but the 5-HT/5-HIAA ratio remained unchanged. There was also a significant increase ($p < 0.05$) in nocturnal circulating melatonin levels and in the innate immune response of the peritoneal macrophages in the animals which had received tryptophan at 20:00. The results indicated that the synthesis of serotonin and melatonin, as well as the innate immune response, can be modulated by oral ingestion of tryptophan.

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