

Sleep gremlins: heterocyclic amines and insomnia

Abstract

Objective: This paper explores the current data that shows that heterocyclic amines (HCAs) have a harmful effect on the serotonin system. Because of this, they might contribute to insomnia.

Methods: We searched the literature in Ovid, the Cochrane Database of Systematic Reviews, and PubMed.

Results: The main sources of human exposure to HCAs come from cooking beef, poultry, fish, and pork at >200° C. Cooking methods that create HCAs include frying, grilling, and broiling. Cigarette smoke is the other main source of HCAs. The main HCAs are harmane, norharmane, 2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (PhIP)], and various tetra-beta-carbolines.

Discussion: Beta-carbolines can impair sleep systems by binding to receptors for serotonin, imidazoline, or GABA. Doing so promotes wakefulness. The HCA found in cigarette smoke is beta-carboline 3-carboxylic acid methylamide (FG 7142). Its properties stimulate anxiety. Beta-carbolines can also increase the creation of catecholamines, like dopamine and norepinephrine. Both are stimulating neurotransmitters. Finally, some HCAs hinder the conversion of 5HT to serotonin and melatonin. They do this by inhibiting tryptophan hydroxylase and N-acetyltransferase respectively.

Conclusion: The evidence in literature suggests that HCAs might be major causes of sleep disorders and warrants more study.