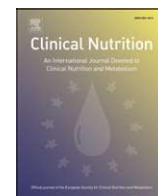




Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: <http://www.elsevier.com/locate/clnu>

Correspondence

The perception that beer improves sleep onset might be a motivation for some to drink heavily. Is it only melatonin that matters? Reply to Dr. Molfino

Dear Editor

I am writing in response to Dr. Molfino's letter to you, regarding my paper which was published in *Clinical Nutrition* 2009, 28:188–191.¹

In first place, I would like to thank to the team of Dr. Molfino his vigilance and interest in our work.

(1) With regard to his comments,² I report that we have not done measurements on beer, melatonin and sleep. Neither in the literature, have we found works that study specifically the role of melatonin in beer on the sleep. For this reason, we can not maintain the scientific explanation, in a similar manner to its antioxidant properties studied in our work. But basing on our experience about functions and melatonin action mechanisms, we can theorize and to speculate on his question: *Sleep-inducing effect of beer: a melatonin - or alcohol-mediated effect?*

Sleep is a necessary activity to maintain the internal homeostasis and for the overall health of organism. Short sleep duration, poor sleep continuity, and poor sleep quality can disturb the psychological state and the susceptibility of an individual to illness or modify the course of the illness and its prognosis.^{3,4} The sleep loss can be due to multiple causes including: diseases, takes of drugs, stress, noisy context, loss of the circadian rhythms of melatonin liberation, old age etc.

Studies in humans have shown that melatonin treatment (3–5 mg) not only improves the total sleep time but also decreases the companions symptoms (anxiety, irritability and fatigue), documenting, the close association between sleep and mood disorders.^{5–8} Melatonin is a molecule, which is synthesized in the pineal gland during the dark phase in all species, including humans and plants.⁹ It is also produced in many other organs and tissues, particularly by the retina, bone marrow cells, bile, lymphoid cells, thymus, etc.,¹⁰ and externally we can find it in the tomato, cherries, nuts, vegetables and in its seeds.¹¹ Melatonin has been shown to possess anti-inflammatory effects,¹² antioxidant,¹³ immunomodulatory,¹⁴ lipids metabolism¹⁵ and hypnotic¹⁶ effects among the others. It has a strong impact on the sleep–wake cycle and is considered a general modulator of the human circadian rhythm.¹⁷ Melatonin acts on MT1 and MT2 receptors located in the hypothalamic supra-chiasmatic nuclei, the site of the body's master circadian clock.^{18,19} All these works and others existing in literature, authorize us to say that melatonin resets disturbed circadian rhythms and promotes sleep.

The effects of the alcohol on sleep are subject to numerous factors. Thus, healthy individuals initially experience an improvement in sleep, although a greater quantity of alcohol can lead to problems of sleep maintenance during the second half of the night.

Pre-existing sleep deprivation or sleep restriction reinforces the effects of alcohol. Alcohol-dependent patients are found to be more prone to sleep problems than healthy individuals, which can facilitate the development of alcoholism.^{20,21}

Beer contains melatonin and alcohol.¹ We think that in healthy adults that for free-choice drink one cup of beer a day, they can perceive an improvement in the sleep quality, and a decrease in the latency to sleep by the action of both alcohol and melatonin at least initially (4 first hours after drinking alcohol).

(2) We are not agreeing with the assertion of Dr. Molfino et al.² when they say that: *beer consumption is frequently justified by the need to facilitate sleep induction, independently from the specific alcohol content.* A questionnaire sent by e-mail to a sample of 145 people among students, colleagues and family, ranging from 18 to 60 years of age, which they answered 103 (42 women and 61 men), in our geographical area (Seville) one of the warmest places of Spain. The questionnaire asked: If you drink beer, which are the motives by which drink it? The 951% responded "I drink beer because I like"; the 825% answered "I drink beer because is refreshing, moisturizing and stops the thirst"; the 339% indicated: "I drink beer because is one of the beverages with lower alcoholic graduation and permits me to drive without legal problems"; the 223% answered that drank beer "because is cheaper than other beverages"; the 194% explained: "I drink beer by its nutritious components"; the 97% emphasized that drank beer "by its social interest" and the 29% aimed that drank beer "by its diuretic power". At least in our geographical area, beer consumption is not justified by the need to facilitate sleep induction. Possibly, many of the people that drink beer do not know that this can induce sleep, although they should have felt, attributing it to a copious food, at the moment of the day in which is taken, to the mixture with other alcoholic beverages etc.

Since a psychological or psychiatric point of view the American Psychiatric Association (DSM-IV)²² recognizes the existence of alimentary disorders in people with mental or emotional problems. The people with insomnia feel anxiety, irritability and depression due to that rest little; If the beer induces them sleep, rest and relaxation (the more sleep, the greater was its degree of alcohol). They will be very motivated to drink beer, even of compulsive form, they will be treating themselves without knowing it and long-term they are being reinforced in negative being able to arrive at the chronic alcoholism.²³

Really, it would be very interesting to measure the effects of beer on sleep induction and correlated these effects on melatonin and alcoholic content of each beer; although in our modest opinion, to drink beer as a pill to induce sleep, seems us that is more near

the mental and personality disorders that of the psychological basis of beer preference. Further research on the link between melatonin in beer and sleep-effects are necessary.

Acknowledgements

MD Maldonado y Aibar acknowledge the support from: beer and health Foundation, Seville University (Spain) and research group CTS-160 (Conserjería de Innovación, Ciencia y Empresa).

Disclosure statement

The authors have declared that no conflict of interest exists.

References

- Maldonado MD, Moreno H, Calvo JR. Melatonin present in beer contribuyes to increase the levels of melatonin and antioxidant capacity of the human serum. *Clin Nutr* 2009;**28**:188–91.
- Molfino A, Laviano A, Fanelli FR. Sleep-inducing effect of beer: a melatonin-or alcohol-mediated effect?. YCLNU-D-09-00344.
- Ancoli-Israel S, Martin JL. Insomnia and daytime napping in older adults. *J Clin Sleep Med* 2006;**2**:333–42.
- Leonard BE, Song C. Stress and the immune system in the etiology of anxiety and depression. *Pharmacol Biochem Behav* 1996;**54**:299–303.
- Kayumov L, Brown G, Jindal R, et al. A randomized double-blind, placebo-controlled crossover study of the effect of exogenous melatonin on delayed sleep. *Psychosom Med* 2001;**63**:40–8.
- Wyatt JK, Dijk DJ, Ritz-de Cecco A, et al. Sleep-facilitating effect of exogenous melatonin in healthy young men and women is circadian-phase dependent. *Sleep* 2006;**29**:609–18.
- Srinivasan V, Pandi-Perumal SR, Trakht I, et al. Pathophysiology of depresión: role of sleep and the melatonergic system. *Psychiat Res* 2009;**165**:201–14.
- Garzón C, Guerrero JM, Aramburu O, Guzmán T. Effect of melatonin administration on sleep, behavioral disorders and hypnotic drug discontinuation in the elderly: a randomized, double-blind, placebo-controlled study. *Aging Clin Exp Res* 2009;**21**:38–42.
- Reiter RJ. Melatonin: clinical relevance. *Best Practice Res Clin Endocrinol Metab* 2003;**17**:273–85.
- Naranjo MC, Guerrero JM, Rubio A, et al. Melatonin biosynthesis in the thymus of humans and rats. *Cell Mol Life Sci* 2007;**64**:781–90.
- Reiter RJ, Tan DX, Manchester LC, et al. Melatonin in edible plants (phytomelatonin): identification, concentrations, bioavailability and proposed functions. *World Rev Nutr Diet* 2007;**97**:211–30.
- Maldonado MD, Murillo-Cabezas F, Terron MP, et al. The potencial of melatonin in reducing morbidity-mortality after craniocerebral trauma. *J Pineal Res* 2007;**42**:1–11.
- Reiter RJ, Tan DX, Maldonado MD. Melatonin as an antioxidant: physiology versus pharmacology. *J Pineal Res* 2005;**39**:215–6.
- Maldonado MD, Murillo-Cabezas F, Calvo JR, et al. Melatonin as pharmacologic support in burn patients: a proposed solution to thermal injury-related lymphocytopenia and oxidative damage. *Crit Care Med* 2007;**35**:1177–85.
- Maldonado MD, Siu AW, Sanchez-Hidalgo M, et al. Melatonin and lipid uptake by murine fibroblasts: clinical implications. *Neuro Endocrinol Lett* 2006;**27**:601–8.
- Escames G, Acuña-Castroviejo D. Melatonin, synthetic analogs, and the sleep/wake rhythm. *Rev Neurol* 2009;**48**:245–54.
- Srinivasa V, Smits G, Kayumov L, et al. *Melatonin in circadian rhythm sleep disorders. neuroendocrine correlates of sleep-wakefulness*. New York: Springer; 2006. p. 269–294.
- Agez L, Laurent V, Guerrero HY, et al. Endogenous melatonin provides an effective circadian message to both the suprachiasmatic nuclei and the pars tuberalis of the rat. *J Pineal Res* 2009;**46**:95–105.
- Bjorvath B, Pallesen S. A practical approach to circadian rhythm sleep disorders. *Sleep Med Rev* 2009;**13**:47–60.
- Gann H, van Calker D, Feige B, Rieman D. The importance of sleep for healthy alcohol consumers and alcohol dependent patients. *Nervenarzt* 2004;**75**:431–41.
- Seggio JA, Fixaris MC, Reed JD, et al. Chronic ethanol intake alters circadian phase shifting and free-running period in mice. *J Biol Rhythms* 2009;**24**:304–12.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (DSM-IV)*. 4th ed. Washington, DC: American Psychiatric Press; 1994.
- Rohsenow DJ, Howland J, Minsky SJ, Arnedt JT. Effects of heavy drinking by maritime academy cadets on hangover, perceived sleep, and next-day ship power plant operation. *J Stud Alcohol* 2006;**67**:406–15.

Maria D. Maldonado*, J.R. Calvo
 Department Medical Biochemistry and Molecular Biology,
 University of Seville Medical School, Avda. Sánchez Pizjuán
 4, 41009. Seville, Spain

* Corresponding author. Tel.: +34 954 559852; fax: +34 954 907048.

E-mail address: aibar@us.es

9 September 2009