Revista de Ciencias Médicas de Pinar del Río

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

**REVIEW ARTICLE**

# Scoping review of the effectiveness of melatonin on sleep quality and latency

Scoping review de la efectividad de la melatonina sobre la calidad y latencia del sueño

**Carlos Alberto Valverde-Gonzalez** [1], **Lexter Ivan Mihalache-Bernal** [1], **Edison Sotalin-Nivela**[1]

[1]Universidad Regional Autónoma de los Andes. Ecuador.

**Received:** May 22, 2025
**Accepted:** May 25, 2025
**Published:** June 9, 2025

**Citar como:** Valverde-Gonzalez CA, Mihalache-Bernal LI, Sotalin-Nivela E. Scoping review de la efectividad de la melatonina sobre la calidad y latencia del sueño. Rev Ciencias Médicas [Internet]. 2025 [citado: fecha de acceso]; 29(2025): e6793. Disponible en: http://revcmpinar.sld.cu/index.php/publicaciones/article/view/6793

## ABSTRACT

**Introduction:** the treatment of sleep disorders represents a significant clinical challenge in both adults and children.
**Objective:** to review the current evidence on the use of melatonin in the treatment of insomnia.
**Methods:** document review using the PRISMA methodology. Scientific databases such as PubMed, MEDLINE, and Scopus were consulted, prioritizing recent studies, systematic reviews, and meta-analyses. The search focused on parameters such as sleep latency, duration, and quality, ensuring methodological rigor and scientific validity.
**Development:** melatonin, a key hormone in the regulation of circadian rhythms, has shown promising effects in the treatment of insomnia, particularly in reducing sleep latency and increasing total sleep duration. Recent systematic reviews and meta-analyses reveal that its administration can shorten the time to fall asleep by 5 to 12 minutes and prolong sleep by up to 60 minutes, with improved subjective perception. Its safety profile is favorable, with few adverse effects, making it an attractive alternative to traditional hypnotics. Its efficacy appears to be greatest in insomnia related to circadian rhythm disturbances, in older adults, and in mild cases. However, further research is needed to confirm its usefulness in chronic or secondary insomnia.
**Conclusions:** melatonin may improve sleep in some cases, but the evidence is inconsistent and of low quality. Although safe in the short term, its long-term effects are unknown, and clinical recommendations vary, requiring further research.

**Keywords:** Sleep Quality; Insomnia; Melatonin; Sleep Disorders; Drug Treatment.

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793


## RESUMEN

**Introducción:** el tratamiento de los trastornos del sueño representa un desafío clínico significativo, tanto en adultos como en niños.
**Objetivo:** examinar la evidencia actual sobre el uso de la melatonina en el tratamiento del insomnio.
**Métodos:** se desarrolló una revisión documental utilizando la metodología PRISMA. Se consultaron bases de datos científicas como PubMed, MEDLINE y Scopus, priorizando estudios recientes, revisiones sistemáticas y metaanálisis. La búsqueda se centró en parámetros como latencia del sueño, duración y calidad, asegurando rigurosidad metodológica y validez científica.
**Desarrollo:** la melatonina, hormona clave en la regulación del ritmo circadiano, ha mostrado efectos prometedores en el tratamiento del insomnio, especialmente en la reducción de la latencia del sueño y el aumento de su duración total. Revisiones sistemáticas y metanálisis recientes revelan que su administración puede acortar el tiempo para conciliar el sueño entre cinco y 12 minutos, y prolongar el sueño hasta en 60 minutos, con una percepción subjetiva mejorada. Su perfil de seguridad es favorable, con escasos efectos adversos, lo que la convierte en una alternativa atractiva frente a hipnóticos tradicionales. Su eficacia parece mayor en insomnio relacionado con desajustes circadianos, adultos mayores y casos leves. No obstante, se requiere mayor investigación para confirmar su utilidad en insomnio crónico o secundario.
**Conclusiones:** La melatonina puede mejorar el sueño en algunos casos, pero la evidencia es inconsistente y de baja calidad. Aunque segura a corto plazo, sus efectos a largo plazo son desconocidos y las recomendaciones clínicas varían, requiriéndose más investigación.


**Palabras clave:** Calidad del Sueño; Insomnio; Melatonina; Trastornos del Sueño; Tratamiento Farmacológico.



## INTRODUCTION

Sleep disorders represent one of the main concerns in today's medical field. It is estimated that up to one-third of patients visiting their primary care physician present sleep-related complaints, such as difficulty falling asleep or unsatisfactory sleep quality. This proportion increases considerably among patients seeking psychiatric care, reaching two-thirds. Within these disorders, insomnia, whether primary or secondary, stands out as the most common diagnosis in sleep disorder clinics.[1]

Although hypnotics, including benzodiazepines, are widely prescribed for insomnia, their long-term efficacy and associated risks remain a matter of debate. Prolonged use of these medications can lead to problems such as dependence, withdrawal, and rebound insomnia.[2,3]

In addition to pharmacological treatments, alternative approaches to addressing insomnia are being explored, such as cognitive-behavioral therapy, sleep hygiene, and attention to psychosocial factors that may influence sleep quality.[4]

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

Among the new therapeutic options gaining interest is melatonin, which has been shown to be effective in regulating the sleep-wake cycle naturally and without the risks associated with traditional hypnotics. Melatonin offers a promising alternative for those seeking safer and more effective treatments for insomnia. The objective of this review is to examine the current evidence on the use of melatonin in the treatment of insomnia, in order to provide an updated and comprehensive overview of the therapeutic options available to those struggling with this sleep disorder.

## METHODS

The documentary review on the effect of melatonin on insomnia followed a structured process that began with the definition of clear objectives aimed at analyzing the most recent and relevant scientific evidence. The research question was specifically tailored to the impact of melatonin on parameters such as sleep latency, total sleep duration, and subjective sleep quality.

To gather up-to-date and reliable information, specialized health sciences and medical databases such as PubMed, MEDLINE, Embase, Scopus, and Web of Science were consulted. Specific search terms related to melatonin, insomnia, sleep disorders, and pharmacological treatment were combined using Boolean operators to optimize search precision and breadth. Synonyms and descriptors from controlled sources were also included to ensure comprehensiveness.

The literature selection prioritized systematic reviews, meta-analyses, and randomized controlled clinical trials to synthesize the available evidence and provide a comprehensive and up-to-date overview of the efficacy and safety of melatonin in the treatment of insomnia. Google Scholar was also used to supplement the search, expanding the scope to include scientific articles, theses, and academic books, thus ensuring the quality and validity of the sources consulted.

This process followed strict inclusion criteria, limiting the search to publications in English and Spanish, with full access to full texts. Isolated case reports, conference proceedings, and non-peer-reviewed papers were excluded to maintain scientific rigor. The final selection was conducted independently by several researchers to minimize bias and ensure objectivity in the review.

The PRISMA methodology was used to systematize the results and prepare this report, facilitating transparency in the identification, selection, and analysis of the included studies. This rigorous methodological approach ensures that the documentary review is comprehensive, critical, and based on the best available evidence on the use of melatonin for the management of insomnia.

## DEVELOPMENT

Despite advances in our understanding of insomnia, its diagnosis and treatment continue to represent a clinical challenge. Lack of awareness about sleep disorders and time constraints during medical consultations make it difficult to detect and manage them in a timely manner. Therefore, it is essential to strengthen the training of healthcare professionals in the recognition and management of insomnia to ensure effective care. Insomnia is a complex disorder that affects quality of life and daytime functioning. According to Padilla-Gil,[5] sleep is an active state

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

that involves multiple brain structures and performs essential restorative functions. This definition underscores the need for a rigorous clinical approach to insomnia.

The diagnosis is based on a detailed medical history and sleep records, including data from family members. The evaluation should consider:[6,7,8]

- Medical history: duration (transient, short-term, chronic), type (reconciliation, maintenance, early awakening or global) and severity.
- Heteroanamnesis: especially useful in parasomnias.
- Sleep-wake patterns: schedules, naps, use of stimulants or depressants.
- Physical and psychological evaluation: to rule out organic or psychiatric causes.
- Additional tests:
  - Polysomnography: records physiological parameters during sleep, although its results do not always correlate with the subjective perception of sleep.
  - Multiple Sleep Latency Test (MSLT): assesses daytime sleepiness.
  - Actigraphy: useful in chronic insomnia and circadian disorders.

**Treatment of insomnia**

Non-pharmacological treatment of insomnia offers significant advantages over pharmacological treatment, such as lower cost, fewer side effects, and active patient participation in the recovery process. However, its implementation can be more challenging due to the need to change long-standing habits and the dedication required by both the patient and the physician. In many cases, temporarily combining pharmacological treatment with behavioral measures can be beneficial, and in fact, the best results are often obtained with this combination.[9]

Regardless of the therapeutic approach, sleep hygiene measures are fundamental in the treatment of insomnia. Evidence supports the effectiveness of various non-pharmacological techniques, such as stimulus control, progressive muscle relaxation, and paradoxical intention. Although further research is needed to confirm the efficacy of other techniques such as sleep restriction, biofeedback, and cognitive-behavioral therapy, they are recognized as useful tools in the management of chronic insomnia.[10]

Insomnia treatment is aimed at improving the patient's sleep quality by reducing latency and the number of nocturnal awakenings and providing at least six hours of restorative sleep, which promotes optimal daytime psychomotor performance. Treatment generally varies depending on the cause, type of insomnia, and degree of disruption to daily life. It is important to emphasize that, before resorting to pharmacological measures, non-pharmacological treatment should always be used, identifying triggering factors, treating underlying conditions, and improving sleep hygiene.[4,11]

Therapists use a variety of techniques to promote physical and mental relaxation, along with behavioral modifications, such as establishing regular bedtimes and wake-up times, limiting time in bed, and creating a sleep-friendly environment. Cognitive-behavioral psychotherapy, on the other hand, focuses on improving a patient's quality of life by teaching strategies to manage stress, regulate emotions, and encourage relaxing activities.[12,13]

**Pharmacological treatment**

Pharmacological treatment for insomnia has evolved throughout history, from the use of plant-derived chemicals to modern pharmaceuticals. Barbiturates, once popular, fell into disuse due to their potential for abuse and associated risks. Benzodiazepines emerged as an effective alternative, but prolonged use can lead to tolerance and dependence.[14,15]

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

Non-benzodiazepine hypnotics have gained popularity as first-line treatment for acute insomnia, demonstrating efficacy and a lower risk of side effects. However, their usefulness in severe chronic cases may be limited. Furthermore, some antidepressants are used as adjuvants for severe insomnia, although they may also affect sleep structure.[16,17]

In special situations, such as in elderly patients or those with delicate medical conditions, neuroleptics may be necessary due to their sedative effects. Over-the-counter antihistamines are also used for mild cases of insomnia, although prolonged use may cause residual sedation.[18]

Most systematic reviews show that melatonin can significantly reduce the time taken to fall asleep by an average of 5,05 minutes compared to placebo (95 % CI: -8,51 to -1,59). Furthermore, an increase in total sleep time of between 8,2 and 18,2 minutes was observed, according to the four meta-analyses reviewed.[19,20]

Melatonin acts primarily as a circadian rhythm regulator, signaling the body's arrival at night and promoting sleepiness. Its exogenous administration has been evaluated in several clinical trials to determine its efficacy in improving sleep latency, increasing total sleep duration, and improving subjective sleep quality. Recent systematic reviews and meta-analyses show that melatonin can reduce the time required to fall asleep (sleep latency) and increase total sleep duration, with a favorable tolerability and safety profile.[21,22]

A meta-analysis by Ferracioli-Oda et al., [22] and updated in subsequent studies confirms that melatonin reduces sleep latency on average by about seven to 12 minutes, while prolonging total sleep time by about 20 to 30 minutes in patients with primary insomnia or circadian rhythm disorders. Moreover, recent research suggests that melatonin may be especially useful in specific populations, such as older adults and people with shift work-related sleep disorders or jet lag, where natural melatonin production is often impaired.[23]

In addition to its effects on sleep latency and duration, melatonin has been observed to improve perceived sleep quality, resulting in improved nighttime restoration and reduced impact of daytime fatigue. This is related to its ability to synchronize the internal biological clock with the external environment, promoting more regular and deeper sleep patterns.[21,24]

However, the effectiveness of melatonin may depend on factors such as dose, timing, and formulation used (immediate versus extended-release). Recent studies suggest that administering melatonin at low doses (0,5–3 mg) and close to bedtime offers better clinical outcomes and a lower risk of side effects. Furthermore, extended-release preparations appear to be more effective in improving sleep duration, while immediate-release preparations promote a reduction in sleep latency.[22,25]

Regarding safety, melatonin has a very favorable profile, with minimal and transient adverse effects, primarily mild daytime sleepiness or dizziness in some cases. This makes it an attractive alternative to other hypnotic drugs, which may present risks of dependence and more severe side effects.[21]

However, it is important to note that, although melatonin may be effective for short-term insomnia or insomnia associated with circadian disturbances, its effectiveness in chronic insomnia and insomnia secondary to other medical or psychiatric conditions requires further research and a multidisciplinary approach that includes behavioral and psychological interventions.[25]

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

The results of meta-analyses and systematic reviews suggest that melatonin administration can significantly improve sleep quality. An average increase in total sleep time of approximately 65 minutes has been observed, which is statistically significant and clinically relevant, as it implies more than an additional hour of rest. Furthermore, a notable decrease in sleep latency has been reported, indicating that patients take less time to fall asleep. This reduction in time to fall asleep is consistent in various comparative studies with placebo.[26,27]

Despite these positive conclusions, it is important to highlight that the quality of the research is generally poor, as mentioned in the text. This suggests that further rigorous and well-designed research is needed to confirm the beneficial effects of melatonin in the treatment of sleep disorders. Furthermore, the clinical relevance of some of the reductions in time to fall asleep may be questionable, as it is not always discussed in the reviewed studies.

It is important to note that study results may vary due to differences in melatonin administration protocols, patient populations studied, and other factors. For example, the different studies reviewed may use varying doses of melatonin and have different treatment durations, which could influence the observed results.



## CONCLUSIONS

Melatonin has been widely studied for the treatment of sleep disorders, showing benefits in some cases such as faster sleep onset and longer sleep duration. However, the evidence is inconsistent and of low quality due to the variability of the studies. Systematic reviews and meta-analyses offer mixed results, with some supporting significant improvements and others inconclusive findings. Although its short-term safety profile is acceptable, its long-term effects are unknown. Clinical guidelines present divergent recommendations, reflecting the lack of solid evidence. In conclusion, melatonin may be useful for certain patients, but its efficacy and clinical role require further investigation.

## BIBLIOGRAPHIC REFERENCES

1. Doghramji P. Prevalence of Sleep Disorders in Primary Care Clinics. NeurologyLive [Internet]. 2022 [Citado 20/05/2025]. Disponible en: https://www.neurologylive.com/view/prevalence-of-sleep-disorders-in-primary-care-clinics

2. Soyka M, Wild I, Caulet B, Leontiou C, Lugoboni F, Hajak G. Long-term use of benzodiazepines in chronic insomnia: a European perspective. Front Psychiatry [Internet]. 2023 Aug 2 [Citado 20/05/2025]; 14: 1212028. Disponible en: https://pmc.ncbi.nlm.nih.gov/articles/PMC10433200/

3. Lynch B. Long-Term Effects Of Benzodiazepine Abuse [Internet]. Addiction Center; 2024 [Citado 20/05/2025]. Disponible en: https://www.addictioncenter.com/benzodiazepines/long-term-effects/

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

4. Trauer JM, Qian MY, Doyle JS, Rajaratnam SM, Cunnington D. Cognitive Behavioral Therapy for Chronic Insomnia: A Systematic Review and Meta-analysis. Ann Intern Med [Internet]. 2015 [Citado 20/05/2025]; 163(3): 191–204. Disponible en: https://pubmed.ncbi.nlm.nih.gov/26054060/

5. Padilla-Gil DN. El sueño: fisiología y homeostasis. Rev Colombiana Cienc Anim. Recia [Internet]. 2023 [Citado 20/05/2025]; 15(1): e985. Disponible en: https://www.researchgate.net/publication/379615705_El_sueno_fisiologia_y_homeostasis

6. Peters GL. Migraine overview and summary of current and emerging treatment options. Am J Manag Care [Internet]. 2019 [Citado 20/05/2025]; 25(2Suppl): S23-S34. Disponible en: https://pubmed.ncbi.nlm.nih.gov/30681821/

7. Eigenbrodt AK, Ashina H, Khan S, et al. Diagnosis and management of migraine in ten steps. Nat Rev Neurol [Internet]. 2021 [Citado 20/05/2025]; 17(8): 501-514. Disponible en: https://www.nature.com/articles/s41582-021-00509-5

8. Adams AM, Buse DC, Leroux E, et al. Chronic Migraine Epidemiology and Outcomes - International (CaMEO-I) Study: Methods and multi-country baseline findings for diagnosis rates and care. Cephalalgia [Internet]. 2023 [Citado 20/05/2025]; 43(6): 3331024231180611. Disponible en: https://pubmed.ncbi.nlm.nih.gov/37314231/

9. Morin CM, Benca R. Chronic insomnia. Lancet [Internet]. 2012 Mar 31 [Citado 20/05/2025]; 379(9821): 1129-41. Disponible en: https://pubmed.ncbi.nlm.nih.gov/22265700/

10. Sateia MJ, Buysse DJ, Krystal AD, Neubauer DN, Heald JL. Clinical practice guideline for the pharmacologic treatment of chronic insomnia in adults: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med [Internet]. 2017 Feb 15 [Citado 20/05/2025]; 13(2): 307-349. Disponible en: https://jcsm.aasm.org/doi/10.5664/jcsm.6470

11. Espie CA, Kyle SD, Williams C, Ong JC, Douglas NJ, Hames P, et al. A randomized, placebo-controlled trial of online cognitive behavioral therapy for chronic insomnia disorder delivered via an automated media-rich web application. Sleep [Internet]. 2012 Jun 1 [Citado 20/05/2025]; 35(6):769-81. Disponible en: https://pubmed.ncbi.nlm.nih.gov/22654196/

12. Vargas I, Egeler M, Walker J, Benitez DD. Examining the barriers and recommendations for integrating more equitable insomnia treatment options in primary care. Front Sleep [Internet]. 2023 [Citado 20/05/2025]; 2: 1279903. Disponible en: https://pmc.ncbi.nlm.nih.gov/articles/PMC11361330/

13. Riemann D, Baglioni C, Bassetti C, Bjorvatn B, Dolenc Groselj L, Ellis JG, et al. European guideline for the diagnosis and treatment of insomnia. J Sleep Res [Internet]. 2017 Dec [Citado 20/05/2025]; 26(6): 675-700. Disponible en: https://pubmed.ncbi.nlm.nih.gov/28875581/

14. Riemann D, Baglioni C, Bassetti C, Bjorvatn B, Dolenc Groselj L, Ellis JG, et al. The European Insomnia Guideline: An update on the diagnosis and treatment of insomnia 2023. J Sleep Res [Internet]. 2023 [Citado 20/05/2025]; 32(6): e14035. Disponible en: https://onlinelibrary.wiley.com/doi/full/10.1111/jsr.14035

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

15. Del Rio Verduzco A, Salari A, Haghparast P. Efficacy and safety of pharmacotherapy in chronic insomnia: A review of clinical guidelines and case reports. Ment Health Clin [Internet]. 2023 [Citado 20/05/2025]; 13(5): 244–254. Disponible en: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10732122/

16. Ariza-Salamanca DF, Venegas M, Parejo K, Amado S, Echeverry J, Calderón-Ospina CA. Expert Consensus on the Use of Diphenhydramine for Short-Term Insomnia: Efficacy, Safety, and Clinical Applications. J Clin Med [Internet]. 2025 [Citado 20/05/2025]; 14(10): 3297. Disponible en: https://www.mdpi.com/2077-0383/14/10/3297

17. Trigo FS, Pinto NC, Pato MV. Long-Term Insomnia Treatment with Benzodiazepines and Alzheimer's Disease: A Systematic Review. NeuroSci [Internet]. 2025 [Citado 20/05/2025]; 6(1):11. Disponible en: https://www.mdpi.com/2673-4087/6/1/11

18. Salahub C, Wu PE, Burry LD, Soong C, Sheehan KA, MacMillan TE, et al. Melatonin for Insomnia in Medical Inpatients: A Narrative Review. J Clin Med [Internet]. 2023 [Citado 20/05/2025]; 12(1): 256. Disponible en: https://www.mdpi.com/2077-0383/12/1/256

19. Maruani J, Reynaud E, Chambe J, Palagini L, Bourgin P, Geoffroy PA. Efficacy of melatonin and ramelteon for the acute and long-term management of insomnia disorder in adults: A systematic review and meta-analysis. J Sleep Res [Internet]. 2023 Dec [Citado 20/05/2025]; 32(6): e13939. Disponible en: https://pubmed.ncbi.nlm.nih.gov/37434463/

20. Marupuru S, Arku D, Campbell AM, Slack MK, Lee JK. Use of Melatonin and/or Ramelteon for the Treatment of Insomnia in Older Adults: A Systematic Review and Meta-Analysis. J Clin Med [Internet]. 2022 [Citado 20/05/2025]; 11(17): 5138. Disponible en: https://pubmed.ncbi.nlm.nih.gov/36079069/

21. Yi M, Wang S, Wu T, Zhang X, Jiang L, Fang X. Effects of exogenous melatonin on sleep quality and menopausal symptoms in menopausal women: a systematic review and meta-analysis of randomized controlled trials. Menopause [Internet]. 2021 Mar 26 [Citado 20/05/2025; 28(6): 717-725. Disponible en: https://pubmed.ncbi.nlm.nih.gov/33784263/

22. Ferracioli-Oda E, Qawasmi A, Bloch MH. Meta-analysis: Melatonin for the treatment of primary sleep disorders. PLoS One [Internet]. 2013 [Citado 20/05/2025]; 8(5): e63773. Disponible en: https://pubmed.ncbi.nlm.nih.gov/23691095/

23. Gendy MN, Lagzdins D, Schaman J, *et al.* Melatonin for Treatment-Seeking Alcohol Use Disorder patients with sleeping problems: A randomized clinical pilot trial. Sci Rep [Internet]. 2020 [Citado 20/05/2025]; 10: 8739 Disponible en: https://www.nature.com/articles/s41598-020-65166-y

24. Yuan F, Dong H, Gong J, Wang D, Hu M, Huang W, et al. A Systematic Review and Meta-analysis of Randomized Controlled Trials on the Effects of Turmeric and Curcuminoids on Blood Lipids in Adults with Metabolic Diseases. Adv Nutr [Internet]. 2019 Sep 1 [Citado 20/05/2025]; 10(5): 791-802. Disponible en: https://pubmed.ncbi.nlm.nih.gov/31212316/

25. Wei S, Smits MG, Tang X, Kuang L, Meng H, Ni S, et al. Efficacy and safety of melatonin for sleep onset insomnia in children and adolescents: a meta-analysis of randomized controlled trials. Sleep Med [Internet]. 2020 Apr [Citado 20/05/2025]; 68:1-8. Disponible en: https://pubmed.ncbi.nlm.nih.gov/31982807/

**ISSN:** 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(2025): e6793

26. Fatemeh G, Sajjad M, Niloufar R, Neda S, Leila S, Khadijeh M. Effect of melatonin supplementation on sleep quality: a systematic review and meta-analysis of randomized controlled trials. J Neurol [Internet]. 2022 Jan [Citado 20/05/2025]; 269(1): 205-216. Disponible en: https://pubmed.ncbi.nlm.nih.gov/33417003/

27. Cruz-Sanabria F, Bruno S, Crippa A, Frumento P, Scarselli M, Skene DJ, et al. Optimizing the Time and Dose of Melatonin as a Sleep-Promoting Drug: A Systematic Review of Randomized Controlled Trials and Dose-Response Meta-Analysis. J Pineal Res [Internet]. 2024 Aug [Citado 20/05/2025]; 76(5): e12985.Disponible en: https://pubmed.ncbi.nlm.nih.gov/38888087/