



Review

Pharmacological Treatments of Sleep–Wake Disorders: Update 2023

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Abstract: Biological, environmental, behavioral, and social factors can influence sleep and lead to sleep disorders or diseases. Sleep disorders are common, numerous, and heterogeneous in terms of their etiology, pathogenesis, and symptomatology. The management of sleep–wake circadian disorders (SWCDs) includes education on sleep hygiene, behavioral strategies, psychotherapy (cognitive behavioral therapy (CBT), particularly), instrument-based treatments (i.e., positive airway pressure therapy, hypoglossal nerve stimulation), and pharmacotherapy. Depending on the disease, therapy varies and is executed sequentially or can be a combination of several forms of therapy. Drugs used for SWCDs include traditional sleep- or wake-promoting agents and chronotherapeutic agents. Recently, novel medications, which more precisely act on specific neurochemical systems (i.e., the orexin system) important for sleep and waking, are also increasingly being used. In this review, the pharmacotherapy of common sleep disorders (insomnia, sleep-related breathing disorder, central disorders of hypersomnolence, circadian rhythm sleep–wake disorders, parasomnias, and sleep-related movement disorders) embedded in the overall therapeutic concept of each disorder is presented. There is also an outlook on possible future pharmacotherapies.

Keywords: pharmacotherapy; sleep–wake disorders; hypersomnolence; restless legs; syndrome; parasomnias; sleep-related breathing disorders; insomnia; circadian disorders



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1. Introduction

There is a growing understanding of the neurobiology and functions of sleep and its effects on human health, including brain and mental health [1]. More than 1/3 of the global population reports sleep loss [2,3]. Insufficient or irregular sleep and sleep–wake disorders adversely affect human health in several dimensions, with both immediate effects such as sleepiness, impairment at work, or reduced psychosocial well-being as well as increased risk for (i.e.,) dementia, stroke, cardiovascular disorders, and depression [4–6].

There is also a high economic burden of sleep disorders. In a European study from 2010, the costs of disorders of the brain were calculated. The burden of sleep disorders was high and comparable with mental and neurological disorders [7], i.e., for narcolepsy, the direct and indirect costs reached €10,000 per patient, annually. Recently, several professional societies have aimed at increasing awareness, education, and research on sleep and moving healthcare policy towards healthy sleep [1,6,8].

The neurobiology of sleep and wakefulness is complex and includes not only wake- or sleep-promoting systems but also homeostatic, circadian, and motivational processes [9,10]. The neurobiology of sleep is beyond the scope of this review, and reference is made to the relevant literature.

Biological factors, environmental, behavioral, and social factors all can influence sleep. The individual may influence some of these factors, such as sleep times, sleep duration, or

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Helmut Lechner



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Sleep—Wake Disorders K. Meier-Ewert, M. Okawa, 2013-06-29 Sleep wake disorders frequently give rise to severe ailments and varied distresses in a great number of people in the world disturbing their physical and mental activities and their social function Sleep wake disorders are now classified into a great number of categories according to their clinical features and etiological factors Patients with sleep wake disorders are taken care of not only by specialists for such disorders but also by general physicians and specialists of different physical and mental disorders In the recent years the nature of sleep and sleep wake disorders have been intensively studied by investigators belonging to different fields of science including medicine biology and psychology in many countries It is very important for the progress of research that investigators working in the related fields in different countries meet together and exchange their findings and ideas The Japanese German International Symposium on Sleep Wake Disorders was held on October 9 10th 1996 in the old beautiful city of Erfurt Germany This symposium was organized by Professor Karlheinz Meier Ewert Schwalmstadt Germany and Dr Masako Okawa Ichikawa Japan with support of the German Society of Sleep Research President at that time Professor J H Peter and of the Japanese Society of Sleep Research President at that time Professor Y Hishikawa *Index of Conference Proceedings* British Library. Document Supply Centre, 1998 The British National Bibliography Arthur James Wells, 1998

Chemical Abstracts Service Source Index American Chemical Society. Chemical Abstracts Service, 1907 A key source to journal and conference abbreviations in the sciences Although it focuses on chemistry other scientific and engineering disciplines are also well represented In addition to the abbreviation and full title each entry also contains publishing info title changes language and frequency of publication and libraries owning that title Over 130 000 entries representing more than 70 000 publications dating back to 1907 are included Cumulated Index to the Books, 1999 *American Book Publishing Record*, 1998 **Subject Guide to Books in Print**, 1991 **Sleep-Wake Disorders** K. Meier-Ewert, 1997 Proceedings of a Japanese German International Symposium held in Erfurt Germany October 9 10 1996 *Forthcoming Books* Rose Army, 1998-06 *Books In Print 2004-2005* Ed Bowker Staff, Staff Bowker, Ed, 2004 *Sleep-Wake Disorders* K. Meier-Ewert, M. Okawa, 2014-01-15 Sleep and Sleep Disorders Osamu Hayaishi, Shōjirō Inoue, 1997 Sleep and Sleep Disorders From Molecule to Behavior presents the published papers from the Ninth Takeda Science Foundation Symposium on Bioscience which was held December 4 7 1996 in Kyoto Japan From the molecular to behavioral level the 26 chapters deal with the most important aspects of a wide scope of basic and clinical research on sleep The best authors for each topic have reviewed the up to date achievements in their respective specialty providing both specialists and non specialists alike with cutting edge information on sleep science and sleep medicine **Proceedings of the Fourth International Symposium on Sleep and Respiration** American Sleep Disorders Association, 1996 **Abstracts** World Federation of Sleep Research

Societies. International Congress, Hartmut Schulz, Pier Luigi Parmeggiani, Michael H. Chase, 1999 **Sleep and respiration : proceedings of the First International Symposium on Sleep and Respiration, held in Banff, Alberta, April 1 - 4, 1989** Faig G. Issa, 1990 Sleep-wake Disorders, 1994 *Sleep Disorders and Respiration* B. Duron, P. Levi-Valensi, **Sleep and Sleep Disorders** Helmut Lechner, 1986 **Third International Congress The Function and Functional Significance of Sleep** Hartmut Schulz, 1999 **Sleep and Sleep Disorders** H. Lechner, South East European Society for Neurology and Psychiatry, 1986

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