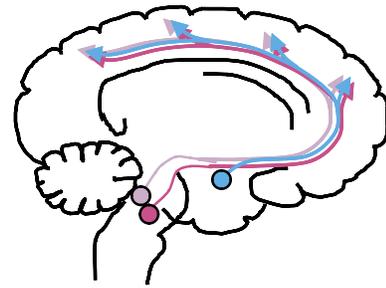


- Second Messenger -

# Thomas Edison's Legacy

## Dealing with sleep problems in shift workers



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**Issue** A growing number of workers experience sleep problems as a result of night and rotating shift-work schedules.

**Actions** Understanding the mechanisms that contribute to sleep problems that shift workers experience, and their treatment options, allows physicians to better assess the risk/benefit ratio of treatment.

**Benefits** Through appropriate treatment for sleep problems, patients with shift-work sleep disorder can experience greater productivity and fewer health risks and accidents.

The advent of new lifestyles also creates new dilemmas in the field of medicine. Before Thomas Edison invented the light bulb in 1879, few people worked after dark, and the average person slept roughly nine and a half hours per night. Today, sleep is considered a luxury for the lazy, as Americans average less than 7 hours of sleep per night, and over 25 million people work night or rotating shifts. Sleep problems are rampant in the new 24/7 society, and shift workers are particularly vulnerable. In recognition of this fact, the DSM-IV classifies shift-work sleep disorder (SWSD) as a specific diagnosis under Circadian Rhythm Sleep Disorders. SWSD results from an inability of the body's endogenous circadian rhythm to adjust to an altered sleep/wake schedule imposed by a person's work times.

### Cosmetic psychopharmacology?

The pharmaceutical industry has responded to society's demand to sleep and wake on command rather than as nature intended. Drugs are now available to help people sleep and wake when they choose. In 1993, Dr. Peter Kramer coined the term "cosmetic psychopharmacology" to describe the use of drugs in people without a true psychiatric disorder.<sup>1</sup> The

current dilemma medicine faces is deciding who should have access to these drugs. Some people argue that lifestyle is not a disorder and therefore should not be treated with psychopharmacology. Others argue that certain lifestyles (night work, long shifts, rotating shifts) are part of society today and that safety should come first.

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### Risk/benefit assessment

In this age of psychopharmacology, physicians must be able to assess the risk/benefit ratio of treating patients with drugs. Pharmacology should not be used as an excuse for ignoring a healthy lifestyle. Just as there is no replacement for regular exercise, there is no substitute for a good night's sleep. But if the Chernobyl nuclear disaster could have been prevented with a pill, the benefit to the world would seem to outweigh the risk of using drugs inappropriately. Since shift work and other sleep-adverse lifestyles are a way of life, physicians need to be sensitive to the dangers of untreated sleep problems.

### Consequences of sleep problems

Although the exact function of sleep is unknown, the importance of sleep is clear. Animals will die within weeks if

## Treatment Options for Shift-Work Sleep Disorder

| Reduce worktime sleepiness  | Improve sleep quality/ quantity  | Shift circadian sleep phase  |
|---|--|--|
| <ul style="list-style-type: none"> <li>•Stimulants</li> <li>•Modafinil</li> </ul> | <ul style="list-style-type: none"> <li>•Hypnotics</li> <li>•Sleep hygiene</li> </ul> | <ul style="list-style-type: none"> <li>•Melatonin</li> <li>•Light therapy</li> </ul> |
| Target arousal circuits (histamine, norepinephrine, dopamine)                     | Target sleep promotor (GABA)   | Target internal clock (suprachiasmatic nucleus)                                      |
|   |  |  |

they are completely sleep-deprived—they appear to lose control of temperature regulation and immune function, and most die of infection. In humans, chronic sleep loss leads to mood changes, compromised immune function, and impaired cognition.<sup>2</sup> Attention, problem solving, logical thinking, and memory—all tasks of executive function—decline rapidly when a person is deprived of sleep. One study published in *Nature*, compared the effects of prolonged wakefulness (up to 24 hours) with alcohol intoxication in the same group of people. The study found that participants' performance decreased rapidly after 13 hours without sleep, and within 16 hours they performed as poorly as they did with a blood alcohol level of 0.05%.<sup>3</sup> This finding is significant since many shift workers are driving home from work after 16 or more hours without sleep.

**Since shift work and other sleep-adverse lifestyles are a way of life, physicians need to be sensitive to the dangers of untreated sleep problems.**

### Circadian sleep mechanisms

In humans, circadian rhythms influence many physiological processes, including the sleep/wake cycle. Subjective alertness increases in the morning and early evening, experiences a small dip in the afternoon, and drops significantly at night. The circadian rhythm biases humans to sleep during the night and be active during the day. Shift workers try to force their body to sleep at times that are out of sync with their endogenous circadian rhythm. The quality and quantity of sleep a shift worker gets depends on how readily their circadian rhythm adapts to the new environment.

The suprachiasmatic nucleus (SCN) is a small group of cells in the hypothalamus that drives circadian rhythms. Inputs to the SCN allow external cues such as light, activity, hormones, and temperature to entrain, or shift, the circadian rhythm. Shift workers who have a hard time adjusting to an altered sleep/wake schedule are likely to experience difficulties sleeping and maintaining wakefulness; if these sleep problems become disruptive to their work and social lives, the person may be diagnosed with SWSD.

### References

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### Treating sleep problems in shift workers

Currently, the only pharmacotherapy specifically approved for SWSD is modafinil, a wake-specific agent that promotes alertness through the histaminergic system. Modafinil is effective at improving attention and performance in night-shift workers,<sup>4</sup> and it has a very low risk of side effects or dependence. Limited studies in animals suggest that modafinil has little effect on subsequent sleep quality after use. Amphetamines or other stimulants have also proven to be effective for improving alertness during simulated night-shift work,<sup>5</sup> but they carry a high risk of abuse and can significantly disrupt sleep. Other pharmacological approaches to treating SWSD include hypnotics to improve daytime sleep. New hypnotic agents such as zolpidem, zaleplon, and eszopiclone are approved to treat insomnia and also carry a good safety record. Recently, eszopiclone was proven effective for nightly use for up to six months with virtually no tolerance or dependence. Hypnotics and wake-promoting agents can help people sleep or maintain alertness, but they do not reset the circadian circuits. Melatonin acts directly on the SCN and is used to shift circadian rhythms,<sup>5,6</sup> although its efficacy is questionable, and its safety has not been adequately demonstrated. Non-pharmacological tactics to aid shift workers include bright light and exercise during work, which also influence the SCN to help shift circadian rhythm to an altered sleep/wake schedule.

**The bottom line**—Evolution cannot outpace technology. Thomas Edison's legacy is a round-the-clock society that demands that many people work when their brains want to sleep, and sleep when their brains want to be awake. Until humans evolve a better circadian coping mechanism, we occasionally need some help. Appropriate drug treatment of sleep problems in shift workers is not cosmetic psychopharmacology. Rather, it improves the lives of and reduces risks for people who must function counter to Mother Nature's intent. ❏

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