

Supplement to
THE JOURNAL OF
Allergy AND Clinical
Immunology

VOLUME 114

NUMBER 5

Introduction: Stuffy is also related to Sleepy and Grumpy—The link between rhinitis and sleep-disordered breathing

Eli O. Meltzer, MD *San Diego, Calif*

Since the 1980s, the general public has slowly awakened to the problem of sleep-disordered breathing. This condition causes a person's slumber to be disrupted repeatedly because the airway constricts or closes. Sleep specialists estimate that up to 20% of adults, or 18 to 20 million persons in the United States, have sleep apnea. However, the majority of these conditions go undiagnosed and untreated.

A steady flow of scientific studies has shown a link between sleep disorders and a myriad of health problems. Impaired sleep is associated with (1) disturbances in biologic rhythms; (2) disturbances in hormonal release and function (eg, decreased excretion of growth hormone at night results in growth impairment in children); (3) higher incidence of heart disease, hypertension, and digestive disorders; (4) increased stress, sexual dysfunction, and mood alterations (irritability and depression); and (5) premature aging.¹⁻⁵ Along with many physiologic abnormalities, sleep disorders also have a dramatic economic effect. They are associated with absenteeism and diminished productivity (presenteeism) at work and in school,

and studies have demonstrated that individuals with sleep disturbances are more prone to accidents.⁶⁻⁸

Nasal obstruction appears to be a particularly important risk factor for the development of sleep-disordered breathing.⁹ The nose is the primary route for breathing both during wakefulness and sleep, and it accounts for approximately half of the total respiratory resistance to airflow. Nasal obstruction leads to pathologic changes in airflow velocity and increases in nasal airway resistance, which affect the pressure differential between the atmosphere and the intrathoracic space. Increased effort in inhalation through a blocked nose causes the inspiratory muscles to generate an increased negative intrathoracic pressure. This subsequently leads to either increased turbulence in the relaxed soft tissues, causing snoring, or retropharyngeal airway collapse, sucking the airway closed. Collapse of the pharyngeal airway leads to hypoxia and hypercarbia, which result in microarousals, sleep fragmentation, and sleep deprivation and, consequently, to daytime somnolence and impairment.

At the 2004 annual meeting of the American Academy of Allergy, Asthma and Immunology, the symposium "Allergic rhinitis after hours: The relevance and consequence of nighttime symptoms," was held to discuss the link between rhinitis and sleep-disordered breathing and possible therapeutic interventions. The articles in this supplement describe our current understanding of these issues as presented in that session.

In his article Dr Gelfand reviews the immunopathology and pathophysiology of allergic rhinitis. He notes that histamine, cysteinyl leukotrienes, neuropeptides, and inflammatory cells consequent to allergen exposure correlate with and contribute to the development and progression of allergic symptoms.

Although allergic rhinitis symptoms are primarily caused by inflammation related to exposure to external

From the Allergy and Asthma Medical Group and Research Center, Department of Pediatrics, University of California, San Diego.

Disclosure of potential conflict of interest—E. O. Meltzer has consultant arrangements with Aventis, Merck, Boehringer Ingelheim, Genentech, and GlaxoSmithKline. He receives grants—research support from AstraZeneca and GlaxoSmithKline. He is a clinical investigator for Bristol-Myers Squibb and Sanofi Winthrop. He receives an honoraria for speaking from Aventis, Genentech, GlaxoSmithKline, Merck, and Boehringer Ingelheim.

Reprint requests: Lauri Sweetman, American Academy of Allergy, Asthma and Immunology, 611 East Wells St, Milwaukee, WI 53202. E-mail: lsweetman@aaaai.org.

J Allergy Clin Immunol 2004;114:S133-4.
0091-6749/\$30.00

© 2004 American Academy of Allergy, Asthma and Immunology
doi:10.1016/j.jaci.2004.09.011

allergens, endogenous circadian biorhythms also influence the allergic disease process and might be partly responsible for sleep disturbances and observed increases in symptom severity in the morning. Exactly how much mediator and inflammatory cell levels vary over a 24-hour period and their role in circadian rhythms requires further study.

Dr Craig and colleagues cite evidence that chronic nighttime nasal obstruction is significantly associated with snoring and daytime drowsiness. Nasal airway resistance is increased in allergic individuals and becomes more exaggerated when they lie down. Frequent sleep-disordered breathing events, such as hypopneas and apneas, can be documented in these patients by means of polysomnography and cardiorespiratory measures.

Several inflammatory mediators that contribute to the allergic cascade are also directly involved in the regulation of sleep. Therefore when their normal levels are altered, this too, can impair sleep quality. Interestingly, some of the factors that affect the inflammatory process appear to have diurnal rhythms.

Dr Storms reviews data correlating the magnitude of nighttime rhinitis symptoms with the frequency of snoring, apnea, and sleepiness. Allergic rhinitis symptoms are typically at their worst during the night and in the early morning because of multiple pathophysiologic mechanisms. The diurnal variation in symptom severity has important implications for management because it is possible to align the pharmacokinetics and pharmacodynamics of medications to maximize their benefits. This concept is called chronotherapy. By using quality-of-life questionnaires, it is possible to assess the value of an intervention on daytime and nighttime rhinitis symptoms, as well as on changes in sleep quality.

Pharmacotherapy for allergic rhinitis includes antihistamines, intranasal corticosteroids, leukotriene receptor antagonists, mast cell stabilizers, and decongestants. Advantages and disadvantages of each drug class as they relate to

changes in nighttime rhinitis symptoms and sleep are reported in the articles by Drs Craig and Storms.

As Ernest Hemingway once said, "I love sleep. My life has the tendency to fall apart when I'm awake." It is incontrovertible that restorative sleep is a necessary part of every person's life. Unfortunately, sleep problems are highly prevalent. A growing body of evidence points to rhinitis symptoms, particularly nasal obstruction, as causative factors for sleep-disordered breathing and associated increases in muscular, ocular, and brain activity; greater respiratory effort; and decreased oxygen saturation during periods of microarousals. The frequent periods of restless sleep are followed by daytime fatigue, compromised mood, and impaired performance. Future research should lead to a better understanding of the links between atopy, nasal disease, circadian rhythms, and quality of sleep. Health-promoting interventions can alleviate the physical, social, emotional, and economic suffering of patients with sleep-disordered breathing.

REFERENCES

1. Spiegel K, Leproult R, Colecchia EF, L'Hermite-Baleriaux M, Nie Z, Copinschi G, et al. Adaptation of the 24 hour growth hormone profile to a state of sleep debt. *Am J Physiol Regul Integr Comp Physiol* 2000;279: R874-83.
2. Lavie P, Herer P, Hoffstein V. Obstructive sleep apnoea syndrome as a risk factor for hypertension: population study. *BMJ* 2000;320:479-82.
3. Roux F, D'Ambrosio C, Mohsenin V. Sleep-related breathing disorders and cardiovascular disease. *Am J Med* 2000;108:396-402.
4. Ing AJ, Ngu MC, Breslin AB. Obstructive sleep apnea and gastroesophageal reflux. *Am J Med* 2000;108(suppl 4a):120S-5S.
5. Thase ME. Treatment issues related to sleep and depression. *J Clin Psychiatry* 2000;61(suppl 11):46-50.
6. Foresman BH. Sleep and breathing disorders: the geneses of obstructive sleep apnea. *J Am Osteopath Assoc* 2000;100(suppl 8):S1-8.
7. Guleria R. Sleep apnoea and road traffic accidents. *Nat Med J India* 2000; 13:22-3.
8. Horstmann S, Hess CW, Bassetti C, Gugger M, Mathis J. Sleepiness-related accidents in sleep apnea. *Sleep* 2000;23:383-9.
9. Proctor DF. The upper airways, nasal physiology and defense of the lungs. *Am Rev Respir Dis* 1977;115:97-129.