

Preface

Sleep has recently been recognized as a critical determinant of energy balance, regulating restoration and repair of many of the physiological and psychological processes involved in modulating energy intake and utilization. Emerging data indicate that sleep can now be added to caloric intake and physical activity as major determinants of energy balance with quantitative and qualitative imbalances leading to under- or overnutrition and associated comorbidities. Considerable research is now focused on disorders of sleep and circadian rhythm and their contribution to the worldwide obesity pandemic and the associated comorbidities of diabetes, cardiovascular disease, and cancer. In addition to having an impact on obesity, sleep and circadian rhythm abnormalities have been shown to have significant effects on obesity-associated comorbidities, including metabolic syndrome, premalignant lesions, and cancer. In addition to the observation that sleep disturbances are associated with increased risk for developing cancer, it has now become apparent that sleep disturbances may be associated with worse cancer prognosis and increased mortality. Sleep problems and fatigue also constitute a significant challenge for the ever-expanding group of cancer survivors and their caregivers as well. Moreover, circadian misalignment, such as that experienced by “shift workers,” has been shown to be associated with an increased incidence of several malignancies, including breast, colorectal, and prostate cancer, consistent with the increasing recognition of the role of clock genes in metabolic processes. Of increasing concern are the high prevalence of sleep disorders in childhood, their association with childhood obesity, and associated abnormalities of circulating cytokines, adipokines, and metabolic factors, many of which are implicated as etiologic mediators of the connection between obesity and cancer. In fact, sleep disturbances in childhood, through their contribution to obesity and associated adult malignancies, may pose a significant public health problem, possibly parallel to tobacco use in childhood and its association with the later development of multiple tobacco-related adult malignancies. Extensive studies have now been initiated to investigate the mechanisms by which disturbances in sleep duration, sleep continuity, sleep-related breathing, and circadian rhythm affect central and peripheral tissue oxygenation and metabolism,

quality and quantity of dietary intake, and circulating inflammatory cytokines and regulatory hormones. This volume of Energy Balance and Cancer will review current state-of-the-art studies on sleep, obesity, and cancer, with chapters focusing on molecular and physiologic mechanisms by which sleep disruption contributes to normal and abnormal physiology, related clinical consequences, and future research needs for laboratory, clinical, and translational investigation.

This volume, number 8 in the series on Energy Balance and Cancer, *Impact of Sleep and Sleep Disturbances on Obesity and Cancer*, was developed to alert cancer researchers and clinicians of the significant increase in scientific research focused on this relation and to provide new insights into the underlying mechanisms as well as the need to consider sleep disturbances in clinical cases. While the sleep research community has been highly interactive with neuro- and cardiovascular physiologists, they only recently have been interacting with basic and clinical cancer researchers. We anticipate that this volume will increase the interaction among these communities, leading to new and productive transdisciplinary approaches to research.

As with previous volumes in the series, we have been fortunate to engage the pioneers and world leaders studying the interface of sleep disturbance and cancer to provide chapters for this volume. In Chap. 1, Carolyn D'Ambrosio (Tufts University School of Medicine, Boston, MA) and Susan Redline (Harvard Medical School, Boston, MA) outline changes in sleep and sleep disorders across the life span. Chapter 2, written by Orfeu Buxton (Harvard Medical School, Boston, MA), Josiane Broussard (Cedars-Sinai Medical Center, Los Angeles, CA), Alexa Zahl (Harvard Medical School, Boston, MA), and Martica Hall (University of Pittsburgh School of Medicine, Pittsburgh, PA), examines the effects of insufficient sleep on metabolic processes and regulatory pathways. In Chap. 3, Katherine Dudley and Sanjay Patel (Harvard Medical School) discuss melatonin metabolism, its normal role in regulating sleep, how it may be altered by disturbances in sleep patterns, and some of its attendant consequences. In Chap. 4, Keith C. Summer and Fred W. Turek (Northwestern University, Chicago, IL) identify many of the molecular components of the circadian clock and how their disruption affects cancer and other disease states. Chapter 5, written by Jayashri Nanduri and Nanduri Prabhakar (University of Chicago, Chicago, IL), provides an expert examination of the molecular and physiologic consequences of intermittent hypoxia and their possible role in cancer. In Chap. 6, F. Javier Nieto (University of Wisconsin, Madison, WI) and Ramon Farré (University of Barcelona, Barcelona, Spain) have teamed up to report the effects of sleep apnea and hypoxia on cancer epidemiology and the important development of an animal model to study these effects. Returning to clinical epidemiology, in Chap. 7, Elizabeth Devore and Eva S. Schernhammer (Harvard Medical School) discuss the important pioneering and continuously evolving insights on the relation of shift work to obesity and cancer. In Chap. 8, Cheryl Thompson and Li Li (Case Western Reserve University, Cleveland, OH) discuss recent studies linking sleep disorders to cancer risk and prognosis. Chapter 9, coauthored by Christine Miaskowski and Bradley Aouizerat (University of California San Francisco, School of Nursing, San Francisco, CA), reviews the important clinical problems associated with sleep disturbances and fatigue in cancer patients, possible interventions, and

corrective interventions, and in Chap. 10, Lavinia Fiorentino and Sonia Ancoli-Israel (University of California San Diego, San Diego, CA) discuss sleep disturbances in cancer survivors, an ever-increasing challenge because of the increase in this population. Chapter 11 completes this volume with a discussion of interventions for sleep disorders by Marie-Pierre St-Onge and Ari Shechter (Columbia University College of Physicians and Surgeons, New York, NY).

The great diversity and transdisciplinary nature of these chapters clearly illustrate the depth and breadth of this relatively recent surge on sleep and cancer. This volume, *Impact of Sleep and Sleep Disturbances on Obesity and Cancer*, summarizes recent developments in this rapidly evolving field and provides important directions for much needed research. As with other aspects of the evolving energy balance and cancer story, this volume shows how progress is made when investigators link epidemiology, molecular biology, neurophysiology, biobehavioral, and clinical studies in a transdisciplinary fashion to enhance understanding and promote progress in these complex challenges.

This book should be of interest to students, researchers, and clinicians across a broad range of disciplines, especially those involved in energy balance and cancer research, as well as to clinicians who deal with sleep disturbances in patients undergoing therapy as well as those who are cancer survivors.

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Impact of Sleep and Sleep Disturbances on Obesity and
Cancer

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2014, XIII, 239 p. 30 illus., 19 illus. in color., Hardcover

ISBN: 978-1-4614-9526-0