# Preface

Obesity levels worldwide have almost doubled since 1980. Currently, it is estimated that 1.46 billion adults are overweight (body mass index greater than 25 kg/m$^2$) and 502 million are clinically obese (BMI > 30 kg/m$^2$) [1]. These estimates include children where the percentage of children who are overweight or obese has more than doubled since 1974 [2]. If these trends continue then it is estimated that by 2020 three of four Americans and seven of ten people in the UK will be overweight or obese [3]. Obesity is a problem in both high-income countries as well as in many low income countries. Obesity has serious adverse consequences as it is an established risk factor for diseases such as type-2 diabetes, cardiovascular diseases, acid reflux, sleep apnea, kidney failure and many cancers [3]. In America one out of every eight deaths is caused by an illness directly related to being overweight or obese [4]. In the USA alone where current estimates show that two out of three people are overweight or obese [5], total healthcare costs attributable to obesity and overweight are projected to account for 16–18% of total US health-care expenditure by 2030 [3].

The increase in obesity is viewed to be primarily driven by changes in the global food system that makes it easy for individuals to consume energy rich foods and beverages [2]. However, emerging evidence over the last 10 years from neurobiological and clinical studies is pointing to a hitherto unknown variable—inadequate sleep, as a powerful driver of energy balance. It may appear odd to consider a good night's sleep as a weight control method, but the evidence is very strong that energy metabolism, sleep and the cellular processes that control them are inextricably intertwined. Disrupt any one of these and a vicious cycle may be triggered that ultimately leads to positive energy balance, and possible weight gain.

We have invited experts in the field to review and discuss the implication of this new evidence. The collection of reviews in this book makes the argument that poor or inadequate sleep is a trigger for increased energy metabolism. This is supported by well controlled, experimentally rigorous clinical studies in otherwise healthy normal weight subjects that have found changes in glucose regulation and appetite after just a few days of partial sleep restriction (reviewed in Chap. 10). In children and adolescents poor or inadequate sleep increases the risk for obesity (reviewed in Chap. 7). Epidemiological data also link insufficient sleep to hypertension and to direct measures of clinical cardiovascular disease and cardiovascular mortality (Chap. 12).

Disruption of the normal cycle of sleep, such as in night-shift work, contributes to weight gain and obesity (reviewed in Chap. 8).

The clinical evidence is supported by data from neurobiological studies that some of the brain neurons regulating feeding and energy metabolism also regulate sleep and waking (Chap. 3). In turn, these neurons interact with the biological clock that controls the timing of sleep and feeding (Chaps. 1 and 2). These interacting physiological mechanisms provide a biological basis for the observations that disruption of feeding or sleep schedules adversely impacts weight gain. Overweight and obese individuals are likely to have obstructive sleep apnea, which might be undiagnosed (Chap. 9) and clinical guidelines for evaluating and treating obstructive sleep apnea are provided in Chap. 13. In obstructive sleep apnea fat accumulation in the upper airway obstructs normal breathing during sleep, resulting in frequent arousals. Repeated arousals are likely to increase energy metabolism and may alter eating behaviors, thereby perpetuating a dangerous cycle. Obesity risk is also high in other sleep disorders such as insomnia and restless legs syndrome (Chap. 11). Once a person gains weight it may be difficult to lose it not only because consuming palatable food activates reward pathways in the brain (Chap. 4), but also because of the intriguing possibility that our brains are wired to overeat (Chap. 5). Furthermore, eating a high-fat diet can produce structural changes in neurons related to energy metabolism which can then also make it difficult to lose weight (Chaps. 2 and 5).

Given the close relationship between obesity and sleep, the genetic basis for obesity is reviewed (Chap. 6). In the section on treatment strategies Kabra et al. (Chap. 14) review pharmacological approaches to manage weight and Perna et al. (Chap. 15) detail current surgical choices for treating obesity.

Considering that lack of sleep has an insidious effect on weight control and health, we emphasize that it is important to include adequate sleep along with well-balanced nutritious foods and plenty of exercise as part of a healthy life style. And, yes, turn off the smart phone before going to sleep.

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