

NAMS Regional Symposium on Sleep Medicine

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SLEEP AND ENDOCRINOLOGY: *HYPOTHALAMIC-PITUITARY-ADRENAL AXIS AND GROWTH HORMONE*

SYNOPSIS

The suprachiasmatic nucleus (SCN) is the biological clock of the body determining the circadian rhythm. The neurons of the nucleus have inherent rhythm and set in biological day and night for humans. These periods usually correspond to day and night and indirectly to the cycle of sleep-wakefulness in most individuals. Retino-hypothalamic tract carrying photic stimuli from the retina provides the most important input to maintain the inherent rhythm of SCN. The rhythmic discharges from the SCN to various neurons of the central nervous system including pineal gland and hypothalamus translate into characteristic circadian rhythm for several hormones and metabolites such as glucose. As a result there is a pattern of hormonal changes occurring during cycle of sleep-wakefulness. Most characteristic of these changes are surge of melatonin with biological night, surge of GHRH at onset of sleep and surge of CRH during later part of the sleep. The cause and effect relationship of the hypothalamic releasing hormones and their target hormones on various phases of sleep including initial non-REM phase at onset of sleep and REM phase near awakening is an upcoming research area. Sleep EEG determining the onset of non-REM and REM sleep is an important tool complimenting the studies assessing relationship between various hormones and phases of sleep. The slow wave activity corresponds to the intensity of sleep at its onset during the biological night of an individual.

Besides, GHRH and CRH, several other peptide and steroid hormones including growth hormone, ghrelin, neuropeptide Y, estrogen and DHEAS are associated with, or have the potential to change phases of sleep including initial slow wave-non-REM sleep.

The sleep disturbances described with aging and depression are common. These are reflected as impaired slow wave activity in the EEG and early morning awakening. Recognition of sleep associated endocrine changes has resulted in a number of studies assessing sleep promoting effect of compounds such as melatonin and other compounds antagonizing CRH action at the

receptor. These studies have potential therapeutic implications for patients with sleep disturbances associated with depression, aging and those having frequent night shifts.

The impact of misalignment between normal circadian rhythm of an individual and the sleep wake-cycle as observed during night shift has recently been recognized to result in important adverse consequences. These include difficulty in maintaining sleep during day time and cardio-metabolic derangement such as obesity, impaired insulin secretion and associated glucose intolerance. An understanding of *Sleep-Endocrine* physiology is clinically relevant for dealing with these adverse consequences.

SUGGESTED READING

1. Morris CJ, Aeschbach D, Scheer FA (2012). Circadian system, sleep and endocrinology. *Mol Cell Endocrinol* **349**:91-104.
2. Steiger A (2003). Sleep and endocrinology. *J Intern Med* **254**:13-22.