EDITORIAL: CHRONOBIOLOGY AND HEALTH

> "Melatonin, secreted by the pineal gland plays a role in the transformation of photoperiodic information into an endocrine message… [The pineal gland] adapts the body, essentially to what is luminous…in order to live well, in harmony with light…light, be it internal or external (plays this role), first an external light and then (an internal one, e.g., biophotonic)."—Christian Duraffourd, *Neurologie 176*

Introduction

Change, the great constant of the universe, is managed by adaptation. Adaptability ensures optimal function through the balance of its fundamental dialectics: rigidity vs. fluidity, order vs. chaos, and engrammatic/programmatic vs. creative response. Adaptation allows for departure from order, structure and programed responses for a period of time to be flexible, engaged in creative chaos. The end of adaptation returns the living system to its prior state. Thus, adaptation allows the organism to progress from the false binary "stability *or* adaptation" to "stability *through* adaptation."

Dr. Hans Selye, discoverer of the adaptation syndrome, recognized the importance of rhythmicity for life. In 1950 he stated, "A certain degree of cyclicity is nearly as characteristic of life as adaptability itself, and the lack of periodicity, or rigidity, is almost equivalent to death."[1] Light drives the clock of internal rhythms and the body's response to these external changes. The late Dr. Duraffourd, developer of endobiogeny, explicitly discussed this in his teachings in both a general way (noted in the opening quote), and the specific mechanisms of adaptation:

> "…in the case of the change of seasons, it is also necessary for the general adaptation syndrome to intervene, but this is programmed in a particular manner according to the location in which the individual lives…and when light diminishes (in autumn and winter) the body uses serotonin and oxytocin, via vasopressin, to relaunch ACTH…"LF April 1995.

Long before I came to endobiogeny, the topic of chronobiology had fascinated. I spent innumerable hours during pediatric residency reading original articles as an extra-curricular interest. From a hospital-based medicine point of view, it was clear that infectious diseases had seasonality and times of day in which symptoms were aggravated. Later, as a pediatric intensivist, iatrogenic dysrhythmia from the constant glare of fluorescent lights of the intensive care unit, and, prolonged chemical coma became an issue of great concern. Later, we began to also recognize endogenous disruptions of endocrine rhythmicity from the critical illness itself. As an endobiogenist, I was inspired by Dr. Duraffourd's pronouncements on the subject to model pineal activity in adaptation syndromes: cosmobiologic, meteorologic, electromagnetic and endocrine. I developed a series of indexes to model these various actions, as well as those of vasopressin and oxytocin.

But why devote an entire issue of *Living Systems* to chronobiology for outpatient practitioners? In short, it's highly practical, creating a strong foundation for clinical Endobiogeny. Chronobiology is more pertinent for outpatient practitioners than for hospitalists. For example, two of the most common

complaints in consultation—insomnia and fatigue—are chronobiologic disruptions of neuroendocrine activity, not to mention the disruptions of longer cycles, such as PMS and seasonal affective disorder.

It would seem that disorders of rhythmicity are relatively new to human history, arising with the advent of artificial light. One could argue that for the majority of human history, there was no choice but to live life rhythmically. Humans woke with the sun and slept shortly after sunset. Even when awake in the dark, the glow of the camp side fire was orange, which did not interrupt the release of melatonin. However, there have always been professions with irregular hours, be it the physician or midwife making house calls at all hours, the prostitute, or the night watchman.

In addition, humans have used stimulants from time immemorial—be it coca leaf, maté, cacao, tea or coffee—to hunt faster, work harder or party longer.[2] Humans have also used euphoric hallucinogenic products for at least 10,000 years (cannabis)[3] to disrupt ordinary perceptions of time despite the inevitable "march of time" for our biological aspects.[4] Of course, the consumption of these products may have played a role in adaptability at the social level through cooperative engagement and greater productivity.[5]

Physicians of yore recognized the problems arising from dysrhythmic living. In 240 BC the author of the Chinese classic text of internal medicine, *Neijing Suwen* lamented:

> "These days, people have changed their way of life. They drink wine as though it were water, indulge excessively in destructive activities, and drain [themselves]. They do not know the secret of conserving their energy and vitality. Seeking emotional excitement and momentary pleasures, people disregard the natural rhythm of the universe. They fail to regulate their lifestyle and diet, and sleep improperly. So, it is not surprising that they look old at fifty and die soon after."[6]

When the author wrote those words, perhaps less than 10% of the world population lived in urban areas. In other words, 90% of people likely lived rhythmic lives along with their livestock and were in tune with the cycles of day and night and seasonal changes—their agrarian livelihood depended on it. Now, our urban livelihood and social lives depend on *not* following rhythmic cues. And that is, once again, why this theme is so pertinent to the medicine we must practice today. What is unprecedented is the total dependence of the global economy on disrupted schedules and the multitudes of people affected, from toddlers to the elderly, eyes affixed to glowing blue screens, constantly being stimulated at all times of the day and night, worker efficiency timed to seconds, busy lifestyles, commuting and widescale disrupted sleep schedules.

In some sense, then, there is "no new tale to tell." What is new is the scope and the scale. What is also new are the scientific and medical understanding of *why* adaptation occurs, *how* it adapts physiology and *what* the negative outcomes of dysrhythmia are. But knowledge is *not* power without the will for application of solutions. And, that is where the endobiogenist, keenly aware of the science of rhythmicity and the art of clinical conveyance of this information is so vital. I hope that through your study of this

issue, you will gain a new-found appreciation for inquiring into and advising your patients on a rhythmic life.

There are many levels of physiologic regulation of time-based adaptations. In this issue, we traverse them all in holographic exploration. We begin with a brief overview of circadian and seasonal adaptation. In our section on innovative thinkers, we present a discussion I had with Professor Hogenesch regarding the molecular mechanisms of adaptation. Dr. Adam Johnson discusses the endocrine factors of adaptation with a review of the current science while Dr. Manel Zghidi discusses the use of medicinal plants to regulate these endocrine factors. Finally, Lizzie Johnson discusses ways of using food to augment production of the factors of periodic adaptability. Managing editor Vasiliki Delengos contributes her first article on the joys of clear starry skies. Finally, we close with an outside contribution by the Dark Sky Foundation regarding the importance of dark skies for environmental health.

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About the Editor

Kamyar M. Hedayat is co-founder of Systems Biology Research Group, a private research company dedicated to promoting research, education, publication, product formulation and development of commercial clinical tools based on the theory of Endobiogeny. He was trained by the co-developer of the Endobiogenic teachings, Dr. Jean Claude Lapraz, and is a leading international proponent of integrative physiology and Endobiogeny. He is the author of the definitive four-volume series *The Theory of Endobiogeny.*

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