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You Are What and WHEN You Eat

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Announcements:

- The 2019 International Conference on Quality of Life will be held at Kyoto Pharmaceutical University from Sept 28-29 or October 5-6 or 26-27, 2019 (TBA). Further information can be found at <http://as4qol.org/icqol/2019/>
- The 2018 International Meeting on Quality of Life was held recently. Proceedings as well as photos and other information can be found at <http://as4qol.org/icqol/2018/>

More information at <http://as4qol.org/>



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The next time you walk in a hamburger eatery or a ramen shop at late-night or wee hours (hr) in the morning and order your favorite juicy burgers or spicy noodle, you might want to think twice after a recent research finding on the relationship between energy use (and subsequent long-term outcomes) and the circadian system of our body.

According to a recent study published in the journal *Current Biology*, 'resting energy expenditure' (REE) – the use of calories for basic physiological functions (i.e. respiration, brain activity, blood/lymph circulation, heat production, etc.) – follows an event-time cycle regulated by the body's clock system, where the clock ticks with the progress of the day. It has been extensively known that the circadian rhythms of human body dictate not only the urge to sleep, eat and other essential physiological activities to sustain life, but also to regulate mechanisms of a series of metabolic activities throughout a 24-hr period.

The findings of the study published in the aforementioned journal may explain eating-related tendencies and disorders such as higher rates of obesity and diet-induced metabolic abnormalities such as type-2 diabetes and gastrointestinal disorders when the event-time cycle is disrupted.

The study observes that at the lowest REE – ca. 04:00-05:00 hr – the human core temperature decreases to its lowest point, and our basic metabolic energy use descends to its trough level (Fig. 1). From this lowest point of time, REE increases rapidly – in the initial phase – and then gradually with time until the late afternoon (ca. 17:00 hr) where it peaks (Fig. 1). Subsequently, REE plunges steadily for ca. 12 hr. Basically the intrinsic dynamics of our human energetics has evolved in such a way that our REE follows a specific event-time pattern precisely: viz., humans moved around in search of food and ate while the sun was high, and slept when darkness fell. In the modern day, although our appetites and all-night availability of food may prompt us to eat even at late hours after

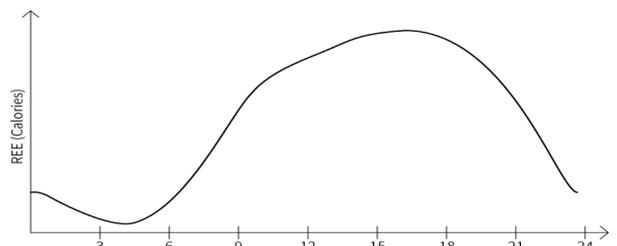


Fig. 1: Variations of the resting energy expenditure (ERR) at 3-hr intervals in a 24-hr clock cycle.

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sundown, and our jobs may demand us that we sleep during daytime and work during nighttime: e.g. those who care for patients, or drive trucks through the night, our body circadian system still ‘stubborn’ adheres to the underlying clock system. In other words, when we disregard the biological rhythms that regulate activities of our body system, we do so at our own risk.

REE may be defined as the minimum calories required to sustain our basic physiological activities (i.e. respiration, brain activity, blood/lymph circulation, heat production, etc.) which may account for 60-70% of total daily energy usage. Therefore, calorie intake at an inappropriate time: e.g. eating in the late-night and wee hours of the day may induce the body to save the unused calories as fat, which may in turn induce unhealthy tendencies such as fat deposition in visceral tissues, organs, and blood vessels. Furthermore, said study suggests that a faithful 12-hr fasting period during darkness accompanied by normal nocturnal responses of the human body may prevent or reverse obesity.

Based on the salutary effect of dietary obedience to circadian rhythm, and the negative outcomes of disruptions in diet on the cycle of event-time metabolic activities in our body system, it is most health-beneficial for us to maintain a regular daily event-time cycle: viz., getting up and going to bed as well as eating our meals at the same event-vs-time of the day on a daily basis is optimally friendly to the body system over time.

The daily calorie output – or store of excessive calories as fat – is probably influenced not just by our body size; what, when and how much we eat, and the amount of exercise we do with reference to time of day are important factors that cannot be overlooked as factors of proper calorie use. Therefore, appropriate attention and habituation of the event-vs-time cycle in a day is critical to allowing our body systems to adjust to the dynamics of calorie intake/output.

All in all, when we repeat activities such as sleeping late on weekends, hopping across time-zones, or working alternatively on periodical night- and day-shifts, patterns of the circadian clock is disrupted, resulting in disorderly synchronization of the event-time metabolism cycle with the energetics of our body system which will lead to disease induction over time. There is one way on the safe, healthy, and wise side: just adhere a consistent event-time schedule on a daily basis. This is probably the best way to prevent metabolism-related diseases.

Anthelme Brillat-Savarin once wrote in *Physiologie du Gout, ou Meditations de Gastronomie Transcendante* (1826): “Dis-moi ce que tu manges, je te dirai ce que tu es.” Or “Tell me what you eat and I will tell you what you are.” Or in its modern abbreviated form: “You are what you eat.” With the clinical evidence of recent investigations, I would like to complement the saying to instead: “You are what and *when* you eat.”