Mini Review

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2022.41.006654

How to Optimize Glucose Dynamics Via Chrono-Eating?

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ARTICLE INFO

Received: January 27, 2022

Published: February 09, 2022

Citation: Akbar Nikkhah. How to Optimize Glucose Dynamics Via Chrono-Eating?. Biomed J Sci & Tech Res 41(5)-2022. BJSTR. MS.ID.006654.

ABSTRACT

The objective of this article was to present and discuss how eating timing (chrono-eating) affects dynamics of glucose metabolism and fate. In the changing modern environment; social contributions, exercise, work schedule and eating properties (timing and frequency) have tremendously changed. People desire to eat during suboptimal times mismatched with natural glucose and insulin circadian rhythms. Evidence indicates that disturbed biological rhythms of glucose metabolism and dynamics may cause health issues. Diabetes mellitus (T2D) could occur because of suboptimal eating times. Eating less overnight should help optimize chronophysiology of glucose dynamics. Chrono-eating is, thus, a new science that deserves timely attention for incorporation into modern lifestyles. This innovation should help prevent diabetes in today's stressful life.

Keywords: Chrono-Eating; Glucose Dynamics; Biological Rhythm; Diabetes; New Science

Philosophy and Innovation

The anterior part of the hypothalamus hosts a bilateral structure known as suprachiasmatic nucleus (SCN). This is a central pacemaker of the circadian system that regulates circadian rhythms, and thus, is central clock alongside peripheral clocks in liver. These clocks are involved in the regulation of circadian rhythms of glucose metabolic dynamics [1,2]. Glucose tolerance decreases in the evening and overnight simply and logically because less nutrients are needed nocturnally [3]. As such, eating large meals and over-eating sugary and starchy meals during evening and overnight must be avoided to reduce diabetes and obesity risks. Circadian rhythms of glucose dynamics and metabolism require reduced insulin sensitivity and pancreatic β-cells function in the evening vs. morning. This suggests that glucose dynamics possess internal biological rhythms [2]. Whole body insulin resistance may be an initial step in type 2 diabetes (T2D) development. Nonetheless, hyperglycemia and associated diabetes are dependent on rather hepatic than muscle insulin resistance [4]. Furthermore, muscle insulin resistance and energy over-intake may lead to hepatic lipogenesis, further increasing hepatic insulin resistance and reduced insulin effects on hepatic glucose dynamics [4]. As such, nocturnal glucose over-supply by extensive night eating increases insulin resistance and could ultimately lead to increased risk of diabetes and obesity [5].

As stated before, glucose dynamics are strictly orchestrated by the circadian physiology. Hence, shifting eating time from the morning to evening may elevate blood glucose and cause related metabolic issues. In accordance with 'choronotype' concept, people are either morning or evening eaters. The evening eaters have the undesirable habit of eating more extensively overnight. Chronotype, thus, impacts on and interferes with chrono-eating.

It has been reported that night-eaters and shift-workers exhibit reduced glucose tolerance, and are thus, at greater risks of diabetes. This is basically due to altered eating time and disturbed circadian rhythms of glucose dynamics [6]. Moreover, greater blood melatonin has been demonstrated in night eaters, also suggesting damaged glucose dynamics by the disturbed circadian biology [2]. Apparently, melatonin possesses a role in circadian rhythms regulation of glucose dynamics based on the sleep-wake cycle. As such, the discovery of MTNRIB, melatonin receptor 1b gene, has fueled interests in researching possible melatonin effects on circadian glucose dynamics.

Elevated melatonin levels following eating might harm glucose dynamics by decreasing glucose tolerance. Melatonin is at maximum overnight which accords with reduced glucose tolerance circadian-wise [7]. Thus, the greater risk of diabetes in shift-working night eaters may be caused by a disturbance in the circadian rhythmicity of glucose dynamics. An accepted hypothesis about melatonin action is its inhibitory effect on insulin secretion [7]. Chrono-eating entails that energy-dense foods should be eaten preferably in the morning when physical and brain works are being initiated and increased [5]. Breakfast-eating is highly encouraged whereas night-eating is greatly discouraged [8]. To support, greater postprandial glucose levels have been demonstrated in breakfast skippers who instead consumed large later meals [9]. In addition to eating time, for optimized nutrient/waste metabolism, eating and exercise ought to be coordinated for optimal cell function. This will require more research to be well clarified. Chrono-eating as a growing science/practice offers a simple workable strategy to help optimize glucose dynamics and to likely prevent diabetes [10]. Consequently, chrono-eating is postulated to have influential roles in improving glucose dynamics and life quality in today's stressful times.

Conclusion

Glucose dynamics are orchestrated by the circadian physiological rhythms. Glucose tolerance decreases in the evening and overnight. As such, nocturnal eaters display hyperglycemia overnight and possibly during day as well. The elevated blood glucose along with the augmented insulin resistance may most probably lead to obesity and T2D. Chrono-eating, hence, is a rising science/practice that must receive deserving public awareness and attention towards improving glucose dynamics and preventing metabolic complexities such as diabetes in today's stressful life.

Acknowledgement

Nature as a resourceful entity in inspiring for innovative ideas deserves the brightest acknowledgments.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2022.41.006654

Akbar Nikkhah. Biomed J Sci & Tech Res