

Chrono-nutrition for preventing chronic diseases

Richard Béliveau

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Studies are increasingly showing that simply synchronizing our food intake with our circadian rhythms (chrono-nutrition) allows us to optimize our metabolism, preventing excess weight and reducing the risk of many chronic diseases.



CIRCADIAN RHYTHMS AND THE INTAKE OF FOOD

All living creatures, from the simplest bacteria to human beings, have evolved a way of coordinating their activities with the day-night cycle associated with the rotation of the Earth. These circadian rhythms govern not only our periods of waking and sleeping but also the way in which we absorb nutrition: for example during the night, when no food is being consumed, the liver synthesizes glucose and secretes it into the circulation, whereas during the day this system is silenced because sufficient quantities of sugar are provided by the diet.

Thanks to a sophisticated system of regulatory genes which express cyclically, our biological clock allows the body to autonomously control the level of blood sugar. However, when this circadian rhythm is disturbed (in night shift workers or when food intake is spread out over the whole day), the system becomes ineffective and the fluctuations in blood sugar which result can eventually affect the production of insulin and lead to type 2 diabetes.

LESS THAN 12 HOURS

Studies have shown that a simple way of avoiding perturbations in metabolism is to restrict food intake to a period of less than 12 hours. This new concept, called time-restricted feeding, is based on the fact that our species first arose in Africa, close to the equator, and that our metabolism thus evolved in such a way as to optimally function while the periods of day and night are equivalent (12 hours each). Eating all of the daily calories during a shorter period of time, say 8 hours, followed by a fast of 18 hours, thus allows synchronization of the dietary intake with the natural cycle of metabolism. It is a very simple approach, but is very effective.

EATING DURING A RESTRICTED PERIOD

A very large number of studies, performed to date in animal models, show that this type of eating optimizes the effectiveness of metabolism. This then allows maintenance of a healthy body weight and prevents or slows the progression of many diseases, including atherosclerosis, diabetes, some cancers and neurodegenerative diseases¹.

To evaluate whether restricting eating periods can also lead to health benefits for humans, a team of American scientists recruited

obese volunteers (mean BMI of 32) who exhibited metabolic anomalies characteristic of prediabetes (fasting blood glucose and insulin levels elevated, intolerance to glucose, glycated hemoglobin greater than normal).² Throughout the study, the participants ate prepared meals according to the directives they had been given.

In the first stage of the study, which spanned 5 weeks, the volunteers ate their three meals over a period of 12 hours, and a battery of biochemical parameters (blood glucose, insulin, blood lipids) and vital signs (arterial pressure) were measured at regular intervals. After an intervening period of 7 weeks, during which the participants could eat as they chose, they undertook the second stage of the study which consisted of eating exactly the same meals as during the first stage but now within a period of 6 hours.

RESULTS

The results were very interesting. Even though the participants consumed the same number of calories in each of the two stages of the study and thus did not lose any weight, the simple act of restricting food intake to a reduced time period had measurable effects on several metabolic parameters; the levels of insulin fell drastically, particularly in those who had exhibited hyperinsulinemia at the beginning of the study, a decrease linked to a marked improvement in the response of certain organs to this hormone. Arterial pressure was itself also greatly affected, with a decrease in the systolic and diastolic pressures by about 10 mm Hg, a decrease comparable to that due to antihypertensive medications. Because hypertension and hyperinsulinemia are major risk factors for cardiovascular diseases, these results illustrate the extent to which the simple act of eating during a shorter period of time can have a major positive effect on health.

With the ubiquity of food in our environment (and the many advertisements inciting us to eat), it has become common to nibble on a small snack at any time, even quite late at night. The results of this study show however that to remain in good health, we must respect the complexity of our biological clock and avoid eating whatever and whenever.

⁽¹⁾ Melkani GC and Panda S. Time-restricted feeding for prevention and treatment of cardiometabolic disorders. *J. Physiol.* 2017; 595: 3691-3700.

⁽²⁾ Sutton EF et al. Early time-restricted feeding improves insulin sensitivity, blood pressure, and oxidative stress even without weight loss in men with prediabetes. *Cell Metab.* 2018; 27:1212-1221.