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Commentary

The Energy Metabolism Role and its Parameters in Predicting Weight Gain

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DESCRIPTION

Metabolism is the process by which the body obtains energy and synthesizes the other molecules; it is obtained from the fats, carbohydrates, and proteins we consume as food, using enzymatic reactions aided by minerals and vitamins.

Energy homeostasis is crucial for species survival

As a result, multiple and complex mechanisms for regulating energy intake and expenditure to maintain body weight have evolved. Not only, energy intake must match energy expenditure for weight maintenance, but macronutrient intake must also balance macronutrient oxidation. This equilibrium, however, appears to be particularly difficult to accomplish in people with lower fat oxidation, low energy expenditure, low sympathetic activity, or low levels of spontaneous physical activity, as all of these factors, in addition to excess energy intake, explain the tendency of some people to gain weight.

Furthermore, when an energy surplus is applied experimentally or spontaneously, there is a high degree of variability in weight change. The data clearly indicate a strong genetic impact on body weight regulation, implying normal physiology in an 'obesogenic' environment.

Longitudinal studies are needed to identify biomarkers or factors associated for weight gain in order to understand the aetiology of human obesity.

The four parameters that are more predictive in weight gain are Low metabolic rate, low spontaneous physical activity, low Sympathetic Nervous System (SNS) activity, and low fat oxidation.

Low metabolic rate

Obesity is characterized by a high eternal metabolic rate, both at rest and over 24 hours and thus cannot be affected by a low average metabolic rate, as is commonly proposed. However, it is essential to recognize that the association among both metabolic rate and body size varies greatly, implying that individual people can have high, normal, or low comparative metabolic rates at any given body size. For example a relatively low metabolic rate (adjusted for differences in fat-free mass, fat mass, age, and sex) was found to be a risk factor for body weight gain in adult non-diabetic individuals.

Low spontaneous activity

The cost of energy of impulsive physical activity is another component of 24-hour energy expenditure, accounting for 8-15 percent of the overall daily expenditure.

Longitudinal studies in many individuals found that spontaneous physical activity is a familial trait that is inversely related to weight and fat mass gain, at least in men, which is consistent with the cross-sectional observation of reduced impulsive physical activity in obese individuals.

Low SNS activity

According to studies, SNS activities are related to each of the major elements of energy expenditure: RMR, thermic effect of food, spontaneous physical activity, and the 24-h respiratory quotient. Importantly, cross-sectional studies show that individuals prone to obesity have lower levels of muscle sympathetic activity than weight-matched individuals. As a result, we explored the influence of dysfunctional SNS activity and/or adrenal medullary function in the future.

Low fat oxidation

The proportion of nutritional intake is an important factor for the development of obesity, and one would expect the proportion of nutrient oxidation to play a role in its aetiology as well.

The no protein Respiratory Quotient (RQ) is an index of the carbohydrate-to-fat oxidation ratio, and fasting values of 0.80 after an extended fast indicate a strong dependence on fat oxidation, whereas values approaching 1.00 after consuming a carbohydrate meal indicate a greater emphasis on carbohydrate as the primary energy substrate.

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