Editorial

How useful are formulas to calculate the basal metabolic rate?

Abbreviations: IC, indirect calorimetry; BME, basal metabolicexpense

Editorial

Indirect calorimetry (IC) is a method that determines the nutritional needs and the utilization of energy substrates from the oxygen consumption and carbondioxide production. The resting energy expenditure is the energy expended by an individual maintains edatrest, in a thermally neutral environment in the morning, after 12 hours of fasting. The basal metabolicexpense (BME) can be considered as the energy used to maintain the electrochemical gradient of cell membranes, energy necessary for the functioning of the cardiovascular and respiratory systems, the energy used in the synthesis of body componentes and also energy expended to maintain body temperature.

The energy expenditure at rest can be measured by Icorestimated by predictive equations. For instance, it is said that the Harris-Benedict equation, which is the most used, estimates the resting energy expenditure with an accuracy of ± 10% in 80% to 90% of normal individuals. When used in critically ill patients, however, this equation correctly predicts the expenditure in less than 50% of subjects. This variability is related to the severity of the disease, changes in body composition, altered metabolic activity and multiple thermogenic clinical interventions.[1]

Recognizing the need to estimate energy expenditure in institutions that do not have IC, several researchers have proposed specific equations developed from calorimetry studies in groups of patients with similar clinical characteristics.

A study in healthy Brazilians living in the southwestern region of the United States, in order to estimate the accuracy of some predictive equations to estimate the BME, showed that the Schofield equation over estimated the expenditure measured by calorimetry at about 8.5 to 17, 5% and Harris - Benedict over estimated calorimetry data at 15 to 16.8%. They conclude that these equations, recommended for international use, were not suitable for use in the studied Brazilians.[2]

A Dutch group also studied adult patients comparing the BME data obtained by indirect calorimetry with different predictive equations based on weight, height, gender and age. Eighteen equations were studied, including 48 outpatients and 45 inpatients. The percentage of patients with acceptable predictions was only 25-52%, depending on the equation used. The best equation was recommended by the FAO / WHO / UNU both in hospitalized patients and out patients, and that is the equation recommended by the group when you do not have calorimetry.[3]

In another scenario (obese adults hospitalized with body mass index greater than 30 kg/m^2), researchers compared the BME data obtained by calorimetry with several predictive equations, including the Harris-Benedict, Mifflin, Ireton Jones and others. Only the Harris - Benedict equationes timated BME within 10% error compared to the indirect calorimetry, in only 50% of patients.[4]

Volume 2 Issue 1 - 2015

Wilson R Catapani
Department of Gastroenterology, Faculty of Medicine, Brazil

Correspondence: Wilson R Catapani, Department of Gastroenterology, Faculty of Medicine, Brazil. Av. Principe de Gales 821 Santo Andre, SP, Brazil, Tel 55 11 4993 5416, Email Wilson.catapani@fmabc.br

Received: January 30, 2015 | **Published:** February 05, 2015

However a trial involving 337 individuals of a community in the US, studied by indirect calorimetry and comparisons with the Miffl in StJeor, Harris Benedict, Livingston, Muller and other equations, suggested that the Mifflin StJeor and Livingston equations are useful to predict the BME in obese and non-obese adults, while the other equations over estimated BEM.[5]

A Brazilian study attempted to standardize an equation to be used specifically for Brazilian women. Seven hundred and sixty women between 18 and 65 years were assessed by indirect calorimetry and the data correlated by regression logistics to age, weight and height. Two formulas were obtained, one for women with BMI above 35 kg / m^2, and one for women below this score. The calculation of BME by the formula over estimated the measure obtained by IC in about 7%.[6]

Thus, although calorimetry is the gold standard for BME measurements, it is expensive and not readily available in many centers. When considering the use of a formula to estimate the BME, one must think about the various factors that make a formula applicable in a given scenario, but not applicable in a different situation. A good formula applicable universally to different populations still seems to be missing.

Funding

None.

Acknowledgements

None.

Conflicts of interest

The author declares that there is no conflict of interest.

References

1. Diener JR. Indirect calorimetry. *Rev Assoc Med Bras*. 1997;43(3):245–253.
2. Wahrlich V, Anjos LA, Going SB, et al. Basal metabolic rate of Brazilians living in the Southwestern United States. *Eur J Clin Nutr*. 2007;61(2):289–293.
3. Weijs PJ, Kruizenga HM, van Dijk AE, et al. Validation of predictive equations for resting energy expenditure in adult outpatients and inpatients. *Clin Nutr*. 2008;27(1):150–157.

4. Anderegg BA, Worral C, Barbour E, et al. Comparison of resting energy expenditure prediction methods with measured resting energy expenditure in obese, hospitalized adults. *JPENJ Parenter Enteral Nutr*. 2009;33(2):168–175.

5. Frankenfield DC. Bias and accuracy of resting metabolic equations in non obeses and obese adults. *Clin Nutr*. 2013;32(6):976–982.

6. Rodrigues AE, Mancini MC, Dalcanale L, et al. Characterization of metabolic resting rate and proposal of a new equation for a female Brazilian population. *Arq Bras Endocrinol Metabol*. 2010;54(5):470–476.

Citation: Catapani WR. How useful are formulas to calculate the basal metabolic rate? *Gastroenterol Hepatol Open Access.* 2015;2(1):14–15.
DOI: 10.15406/ghoa.2015.02.00027