Bericht & Report: The Hypothesis becomes Reality

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Malnutrition remains very frequent in hospital and particularly in intensive care settings. The problem of this persistence is partly explained by the absence of immediately visible consequences of acute underfeeding: they are not easily measurable and become obvious only after 7-14 days, i.e. frequently after discharge from the ICU, prolonging the hospital stay. By contrast the consequences of insufficient oxygen delivery are immediate, requiring the ICU team attention. This is an important reason why nutrition support is so frequently forgotten early on, resulting in large energy deficits. Contradictory studies have been published over the last years regarding the respective merits of hypo- and hypercaloric feeding, increasing the confusion for clinicians. The principal problem appears now to be the prescription of a reasonable energy and protein target, and to monitor its achievement.

Mette M Berger

The optimal level of energy target is difficult to predict in critically ill patients due the high variability of resting energy expenditure during illness (alteration by shock, sepsis, fever, etc.). Further a reasonable prediction requires at least knowing the accurate pre-illness body weight (knowing that actual body weight may be unmeasurable). This information is frequently missing in ICU patients: when an actual body weight is available, it is flawed by fluid accumulation during resuscitation. The guidelines recommend that expenditure be measured on an individual basis by indirect calorimetry. This technique is relatively expensive1, and there are several obstacles to its measurement in clinical settings thus affecting the accuracy of any such measurements2, but this tool may prove to be very important in the near future. Coming studies are suggesting that indirect calorimetry might prove essential as well.

PHYSIOLOGICAL AND PRACTICAL CONSIDERATIONS

The mean healthy adult’s resting energy expenditure (REE) is about 40 kcal/m²/hour. A modulated rate of body mass, total body surface, temperature, feeding and activity. Energy metabolism of aerobic organs is based on electron transfer in redox systems, and ATP production. It is accepted that the human body produces daily its own mass of ATP, and the rate of ATP production is proportional to the energy requirements of the body. The rationale for indirect calorimetry, is that the energy requirement can be extrapolated from the metabolic rate of glucose and protein for the maintenance of a living body. The rationale for indirect calorimetry is that the energy requirement can be extrapolated from the metabolic rate of glucose and protein for the maintenance of a living body. The rationale for indirect calorimetry is that the energy requirement can be extrapolated from the metabolic rate of glucose and protein for the maintenance of a living body. The rationale for indirect calorimetry is that the energy requirement can be extrapolated from the metabolic rate of glucose and protein for the maintenance of a living body. The rationale for indirect calorimetry is that the energy requirement can be extrapolated from the metabolic rate of glucose and protein for the maintenance of a living body.
CAUSES OF INSUFFICIENT ENERGY DELIVERY

Our group showed some years back that the promotion of enteral nutrition was associated with insufficient energy delivery and energy deficit. This has been confirmed by several studies since. The energy gap builds up during the first week, i.e. during the period of maximal GI intolerance: the alterations of the gut function are worst in the severest patients. The energy gap increases with time under the time, and is distributed rapidly and homogeneously within the body water pool and more importantly, is compensated by oral feeding.

A further nutritional problem comes from the use of non invasive ventilation (NIV) during mechanical ventilation. A prospective randomized trial? This lack of evidence is also true for the use of a parachute while undergoing gravitational challenge! Possibly the increasing evidence of the necessity of individualizing energy delivery will push us in the future differently about the acquisition of indirect calorimeters.

TOOLS TO SOLVE THE PROBLEM

In the future, strategies that can be used for improving nutritional status may be to

- Requirement and target: Determining the correct energy target is the first step towards optimizing nutrition: the “FAST HUG” strategy (48, 55, 59) following the ESPEN guidelines (20-25 kcal/kg/day) in non-obese patients should be the highest in safety in absence of calorimetry. 
- Early EN: Artinian et al showed that starting EN within 24 hours of ICU admission significantly improved survival despite and increased risk of VAP, and particularly in the sickest patients.
- Prevention of the development of energy deficit during mechanical ventilation: early EN and the use of combined feeding. Supplemen
tal PN, i.e. combined EN and PN feeding is not enough to overcome the digestive problems.
- Protocols: Lack of standardized practice and of protocols has been shown to be a primary cause of insufficient feeding.
- Optimizing the use of the gut with probiotics and possibly acuracic which does probably not mean “force feeding” it is probably the gut is probably the gut that is the causative factor. The gut is probably the gut that is the causative factor. The gut is probably the gut that is the causative factor.

Optimizing the energy delivery, by individualizing and adapting it to the pa
dients daily conditions is a new concept. Recently, a prospective controlled rando

Table 1: Principles of the principal energy expenditure determination methods.

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<th>Method</th>
<th>Principle</th>
<th>Prerequisite</th>
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| Indirect calorimetry | Estimates the metabolic rate from measurements of oxygen consumption (VO2) and carbon dioxide production (VCO2). The essential assumption is that under steady state conditions respiratory exchange ratio is in equilibrium with the metabolic processes, thus measuring indirectly oxygen phosphorylation. Energy requirements are extrapolated from O2 consumption and CO2 production using the modified 
Krogh equation. The standard metabolic rate is determined by multiplying the measured rate by 20. Medium duration (30-40 minutes) measurement determines resting energy expenditure (REE); 24 hours measurement = TEE. | Stable conditions: not change in vasovasor mediators or inspired oxygen fraction < 60 %; stable temperature, absence of movement, no leaks in the system, no use of NO. |