

Technology Advancement in Dietetics – Metabolic Assessment

Lee, S.P. Peggy, MSc, RDN, CNSC
CSC(AH), DM (Diet) UCH, TKOH and
HHH

Is There an Accurate Method to Measure Metabolic Requirement of Institutionalized Children With Spastic Cerebral Palsy?

Siu Pik Peggy Lee, MSc, RD, CNSD¹; Ka Ming Cheung, MBChB, BMedSc, MRCP (UK), FHKAM(Paed), FHKCPaed²; Chun Hung Ko, MBChB, MMedSc, MRCP(UK), DCH(Ireland), FHKAM(Paed), FHKCPaed²; and Heung Chin Chiu, RN³

Financial disclosure: none declared.



Rationale to Measured Energy Expenditure

- Managing caloric deficit is crucial and valuable to minimize negative clinical complications
- Reduce risk of over- or under-feeding
- Limitation of predicted equations in difficult patient groups(da Rocha, 2006)



Definitions

- *Calorimetry* is to measure heat requirement during a chemical process quantitatively
- *Calorimeter* is an instrument or device to measure heat requirement for the process

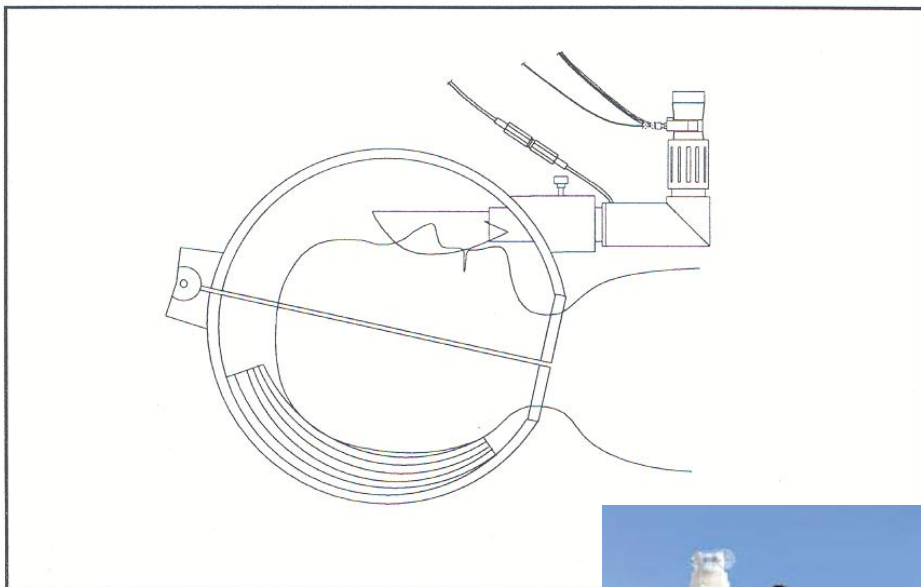
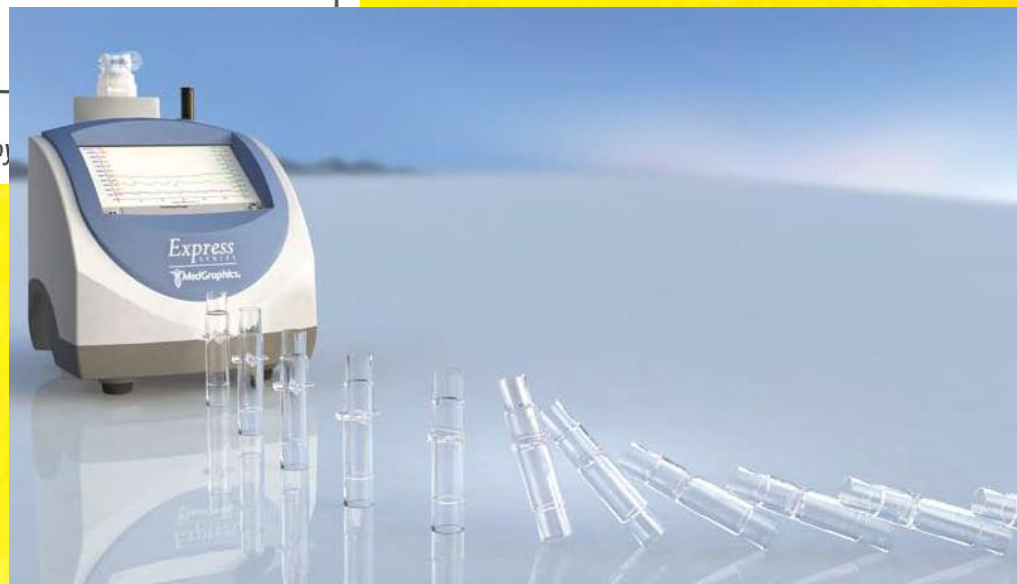


Figure 6-2
MedGraphics Canopy



Indications of Indirect Calorimetry Measurement

- Clinical conditions that impact significantly on resting energy expenditure
 - Infection and inflammation
 - Failure to respond to presumed adequate nutrition support such as improvement in nutrient-related biochemical indicators
 - Individualizing and fine-tuning of existing nutrition regimens

da Rocha et al (2006)

Indications of Indirect Calorimetry Measurement

- At risk of nutritional inadequacy
- Patients with neurologic trauma, paralysis, chronic obstructive pulmonary disease, acute pancreatitis, cancer with residual tumor burden, multiple trauma and amputations
- Without accurate body height and weight
- Failure to respond to regimen designed from estimated equations
- Long-term acute care such as chronic dependency on mechanical ventilation

Clinical Practice Guideline Steering Committee (2004)

6/3/2014

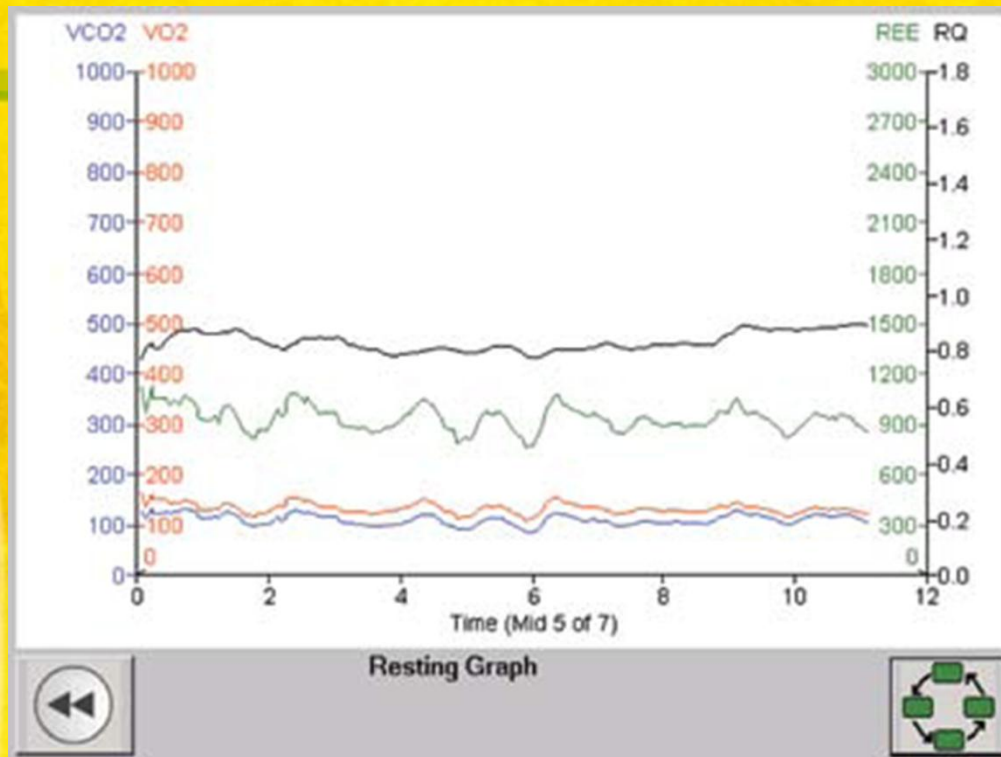
Peggy S.P. Lee, MSc, RDN, CNSC

Operation Conditions

- Steady state
 - 5-10% CV in gas exchange
- Duration of rest
 - 30 minutes in supine
- Duration of measurement
 - Lower CV in steady state, shorter will be measurement
- Body position
 - Usual position in intensive care setting
- Diurnal variation
 - No evidence for different times of day

Operation Conditions

- Thermoneutral environment
 - Difficult to define
 - Avoid uncontrollable shivering
- Thermogenic effect of food
 - Continuous vs. intermittent tube feeding vs. oral diet
- Adjustment factors
 - Procedures
 - Health-related activities
 - Pain
- Advancement in medications
 - Sedation and pain management



INTERPRETATION AND APPLICATION

Gas Exchange Pattern and Measured Energy Expenditure

- Gas collection being converted into measured energy expenditure
- Gas exchange information (VCO_2 and VO_2) can be used to predict successful liberation (Schultz, 2003)
- Information on substrate utilization under controlled operational conditions
 - Steady state, stable ventilator setting and respiration condition

Respiratory Exchange Ratio (RER) or Respiratory Quotient (RQ)

- VCO_2 / VO_2
- Use to guide substrate utilization
 - 0.7 reflected exclusively lipid metabolism
 - 0.8 indicated protein consumption
 - 0.84 suggested mixed fuel
 - 1.0 indicated pure glucose metabolism
- Manipulate by change of ventilator setting or respiratory conditions

McClave (2003)

Respiratory Exchange Ratio (RER) or Respiratory Quotient (RQ)

- RER or RQ should be used to validate indirect calorimetry measurements (McClave et al, 2003)
- Factors that impact on oxygen consumption of patients
 - Inflammation, sepsis, pyrexia, shivering, seizures, agitation/ anxiety/ pain, adrenergic drugs and weaning from ventilation
- Factors that decreased oxygen consumption
 - Sedation or analgesics, muscle paralysis, shock or hypovolemia, hypothermia or cooling, mechanical ventilation, antipyretics and starvation or hyponutrition (Walsh, 2003)

Clinical Outcomes and Economic Implication

- Most studies link higher healthcare cost to malnutrition
- Not directly on the application of indirect calorimetry
- Only accurate way to measure energy expenditure in the very ill
 - Able to provide nutrition support closer to expenditure



Clinical Outcomes and Economic Implication

- Recommended using indirect calorimetry to aid patient nutritional assessment and management, and assessment of the contribution of ventilation to metabolism

CPG Steering Committee (2004)

- Indirect calorimetry is non-invasive and no contraindication in the critically ill population

American Academy of Respiratory Clinician, Clinical Practice Guideline Steering Committee (2004)

Role of Dietitians

- Coordinate setup and operation
- Ensure adequate and appropriate patient preparation
- Communicate results with other healthcare colleagues
- Develop protocol-driven nutrition support for various clinical conditions
- Research to advance nutrition management in the very ill groups



Q & A

Thank You!