

Resting Energy Expenditure PROTOCOL

About Resting Energy Expenditure (REE)

- Humans require energy to support normal metabolic functions, growth and repair of tissues and physical activity. Energy is provided by the oxidation of dietary (and stored) carbohydrate, fat, and protein and is expressed as calories. The resting energy expenditure (REE) represents the amount of energy expended by a person at rest. Basal metabolic rate (BMR) is more precisely defined as the REE measured just after awakening in the morning. In practice, REE and BMR differ by less than 10% so the terms can be used interchangeably.
- REE is measured by indirect calorimetry. A large plastic “bubble” is placed over the participant’s head while a plastic sheet covers the participant’s upper body, preventing external air from entering the bubble. Oxygen flows into the bubble from a valve at the top. The calorimeter measures the amount of O₂ consumed and the amount of CO₂ produced while at rest by comparing the concentrations of O₂ and CO₂ in the air inspired by the participant with the concentration in the air expired by the participant.
- The modified Weir equation is used to convert the volume of oxygen consumed and the volume of CO₂ produced per minute into a value for resting energy expenditure expressed in calories. It differs from the standard Weir equation in that the gas concentration measured by the REE machine used by this study is in liters/minute, not ml/min (Weir JB, J Physiol. 1949: 109, 1-9).

Preparation of the participant

- Instruct the participant NOT to eat or drink anything (other than water) for at least 4 hours before the REE test is performed and NOT to exercise for 48 hours prior to the measurement. Allow the participant to rest for 20 minutes in a chair after their arrival to clinic. *For participants with diabetes, insulin and/or oral agents will need to be adjusted during a prolonged fast. Please see **Protocol for Participants with Diabetes** for these adjustments.*
- **Suggested explanation to the participant:** “The ‘bubble’ machine measures the amount of oxygen you inhale and carbon dioxide you exhale. This information is translated into the amount of energy or calories your body uses while at rest. We have asked you about your usual physical activity which gives us a measure of how much energy (calories) your body uses while performing these activities. With your REE and activity estimates, we will be able to determine how many total calories your body needs every day. The food record you filled out will help us determine if you are eating enough calories to meet your energy needs. You may need to eat more if you are underweight, or less if you are overweight.”

Resting Energy Expenditure Protocol, continued

Procedure

- Have the participant lie comfortably on his/her back on the bed. Instruct the participant to relax but not to sleep during the measurement and inform him/her that we will be looking in from time to time to make sure he/she is awake. Inform the participant that he/she is free to remove the bubble if he/she feels uncomfortable.
- Place the bubble over the participant's head making sure that the plastic skirt is lying flat to prevent air from leaking in under the bubble. Check that the valve at the top of the bubble is not obstructed. (Important: this valve permits room air to enter the bubble and allows the participant to breathe).
- Run the test for 20 minutes. If participant removes the bubble at any time during the 20 minutes, make a note in your data collection forms. This should not effect the reliability of the test as long as the machine collects at least 10 minutes of a "steady state" reading.
- Following each measurement, clean the bubble with hydrogen peroxide and change the sheets on the bed and pillow.

Nutrition for Healthy Living currently uses the Sensor Medics Model #29N. Please refer to the manual that accompanies the REE instrument you are using for operating and calibration procedures.