Future Directions and Panel Discussion

John A. Milner, PhD, NCI
Energy Balance

- Amount
- Type
- Pattern

Energy in

Energy Balance:

kcal in = kcal out

Energy out

- Physical Activity
- Routine Metabolism
- Thermoregulation
- Growth
- Storage
1. Energy balance is a framework that can be used to understand the interplay between energy intake, energy expenditure and energy storage that determines body weight.

2. A better understanding of energy balance can help develop more effective strategies for reducing obesity rates in individuals and populations.
Methodological Issues in Studying Energy Balance

Dale A. Schoeller, PhD

1. Techniques for measuring energy expenditure and especially energy intake are not sufficiently precise or accurate to measure the small energy imbalances likely to explain the development of obesity on an individual level.

2. On an outpatient basis, the recommended approach is to measure change in body composition and energy expenditure using doubly labeled water to assess energy imbalance.
1. The design of studies of energy balance need to take into account the duration over which compensatory factors may act.

2. The design and analysis of studies of energy balance need to be prepared to accommodate measurement error and modest effect sizes.
Effect of Manipulating Components of Energy Intake and Energy Expenditure
John M. Jakicic, PhD

1. Energy balance is a dynamic rather than a static process, with manipulations of one component of energy balance potentially influencing other components of energy balance.

2. Understanding the interactions of components of energy balance may provide some explanation of the variability observed in body weight among individuals in response to changes in either energy intake or energy expenditure. 30 Years Ago Today
Can Energy Balance Be Altered by Exercise Alone?

Joseph E. Donnelly, EdD

1. Exercise can provide ≥ 5% weight loss with ad libitum diet

2. Gender differences for the response to exercise for weight loss is similar between men and women when the energy expenditure of exercise is equivalent

3. Study design influences our general perception the way we conceptualize the benefits of exercise for weight loss
Imponderables!!
How Much Does Genomics Influence the Response to Diet Change in APOA5 Example

Decrease in body weight results in changes in relative distribution of bacterial phyla toward that of lean individuals.

Changes in relative distribution of bacterial phyla are similar for carbohydrate restriction (CARB-R) and fat restriction (FAT-R).

How Best to Use Animal Models to Provide Insights and Evaluate Overall Implications for Promoting Health?

Fatless Rat Model

Wild Type

A-ZIP/F-1

Eat 2X as much as wild type

2 Stage DMBA Skin Cancer Model

A-ZIP/F-1

A-ZIP/F-1

Wild type

Exposure to a maternal high fat diet results in increased body weight in F3 female, but not male, offspring through the paternal lineage.

What Happens If We Don’t Change?!

Transgenerational (F3) Effects of a High Fat Diet

Dunn and Bale 2011 Endocrinology 152(6):2228-36. 12 vs 45% fat diet

Estradiol increase transgenerational mammary cancer risk (50%) Clarke et al. 2011 High fat diet increase estradiol