

A Scientific Meeting was held at the West Park Conference Centre, Dundee, Scotland, on 27 and 28 March 2008

Feeding behaviour and energy balance in 4- to 6-month-old infants: adaptive changes during exclusive breast-feeding

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The WHO recommends exclusive breast-feeding (EBF) until 6 months of age⁽¹⁾. EBF indisputably has many advantages for mother and infant, but a systematic review of cross-sectional studies has found only sparse data on energy transfer from mother to baby after age 5 months⁽²⁾, and has suggested uncertainty as to whether sufficient adaptive changes take place during EBF to accommodate increasing infant energy needs during EBF to 6 months⁽³⁾. Longitudinal studies have failed to find significant changes in breast milk volume or energy content after 4 months of lactation⁽²⁾. Most studies have used test weighing combined with milk sampling, which may interfere with breast-feeding routines, and provide unrepresentative estimates of the energy content of breast milk, so there is a need for more evidence using isotopic techniques. In the present investigation isotopic techniques have been used in cross-sectional and longitudinal studies in order to identify the adaptive changes that occur to make EBF possible for 6 months. Data from the cross-sectional study are presented here.

The metabolisable energy content of breast milk was examined in 21 infants at 12.3 (SD 0.6) weeks of age⁽⁴⁾. A dose-to-infant of doubly-labelled water was administered through a feeding tube, and disappearance rates of Deuterium and Oxygen-18 was measured from daily urine samples for the subsequent 7 days, as described previously⁽⁴⁾.

Mean breast milk intake was 879 (SD 121) ml/d and the metabolisable energy density content was 2.59 kJ (0.62 kcal)/ml breast milk (Table).

	Mean	SD
Infant characteristics		
Weight of infants (kg)	6.03	0.65
Doubly-labelled-water-derived data (n 21)		
Milk volume intake (ml/d)	879	121
Metabolisable energy density: kJ/ml	2.59	0.48
kcal/ml	0.62	0.11

This cross-sectional study suggests that the metabolisable energy density of breast milk may be lower than literature values, which are commonly found to be 2.9–3.0 kJ/ml (ranging from 2.6–3.3 kJ/ml)⁽²⁾. Increasing infant energy needs during EBF could be met by increased breast milk energy density and/or milk volume. Alternatively, infant growth rate may decrease, delaying the point at which breast milk energy supply becomes insufficient. To investigate this it is necessary to conduct a longitudinal observational study on the energetics, growth and body composition of healthy EBF infants from 4 to 6 months of age, using the doubly-labelled water method, and such a study is underway.

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4. Wells JCK & Davies PSW (1995) *Am J Hum Biol* **7**, 85–92.