

## **Longitudinal changes in the protein concentration of breast milk**

*JL Sherriff<sup>1</sup>, PE Hartmann<sup>2</sup>*

<sup>1</sup>School of Public Health, Curtin University of Technology, Bentley, WA 6102

<sup>2</sup>Department of Biochemistry, The University of Western Australia, WA 6907

Information regarding the protein concentration of breast milk is required for several purposes, including the estimations of infants' protein requirements, the estimation of the energy intake of an infant, and as a yardstick for infant formulae. In contrast to the lipid component, the protein concentration of human milk is far more constant, however there is controversy in the literature as to whether or not the protein concentration changes significantly either during a feed or over the day. Moreover, with the exception of a study conducted by Allen et al (1), any longitudinal studies have been limited by a low number of subjects, not extending beyond 4 months post-partum, or have only considered total nitrogen. An additional problem results from the fact that the absolute values for protein concentration in the literature are often erroneous due to the lack of an acceptable human milk standard.

The protein concentration of fore and hind defatted milk samples from each breast at a morning, afternoon and evening feed was determined for 18 subjects at 1, 3, 5 and 7 mo post-partum (pp). Additional data were available for morning and afternoon feeds at 1 and 3 mo. The Bio-Rad method was used to assay the samples, and human milk of known protein concentration (determined using the Kjeldahl procedure) was used to establish a standard curve for each Bio-Rad assay. The feed mean is defined as the averaged fore and hind values for protein concentration at each feeding session. A 24 h concentration of protein in defatted milk at 1, 3, 5 and 7 mo was calculated for each subject using 10-12 values.

The inter-individual CV for the 24 h concentration of protein (mean CV at 1 mo, 18.4%) was consistently higher than the intra-individual CV. No maternal factors, including the use of the progestogen-only contraceptive, Microlut, anthropometry, macronutrient intake, 24 h milk yield and feeding frequency, were related to the 24 h concentration of protein.

There was a tendency for the protein concentration of defatted hind milk to be greater than that of the fore milk, although each was constant over the day. This variation resulted in the intra-individual CV for the 24 h concentration of protein being 12.9% at 1 mo pp, with slightly lower values at subsequent sampling times. There was no significant change in the feed mean for protein concentration over the day at 1 and 3 mo pp (54 sets of observations).

There was a significant decline in the mean (SD) 24 hour concentration of protein from 9.5 (1.9) to 6.5 (1.0) g/L between 1 and 7 mo pp. The greatest change, a decline of 12.4%, occurred between 1 and 3 mo pp.

These results indicate that sampling protocols need to take into account longitudinal changes in the protein concentration of milk, although for most purposes, a single milk sample for each day per subject is adequate.

1. Allen LH, Keller RP, Archer P, Neville MC. Studies in human lactation: milk composition and daily secretion rates of macronutrients in the first year of lactation. *Am J Clin Nutr* 1991;54:69-80.