Development of a parsimonious dose-to-mother deuterium technique to assess exclusivity of breastfeeding practice in low-income countries
Zheng Liu¹, Aly Diana¹², Christine Slater⁴, Thomas Preston⁵, Rosalind S. Gibson², Lisa Houghton², Stephen B. Duffull¹

¹School of Pharmacy, University of Otago, Dunedin, New Zealand; ²Departement of Human Nutrition, University of Otago, Dunedin, New Zealand; ³Division of Medical Nutrition, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia; ⁴Independent Consultant, UK; ⁵Scottish Universities Environmental Research Centre, University of Glasgow, UK

Background: The World Health Organization recommends exclusive breastfeeding (EBF) for the first 6 months after birth. A deuterium oxide dose-to-mother technique can be used to determine if an infant is EBF or not [1]. However, the method is intensive with 7 paired samples over a 14-day study period.

Objectives: To develop a field friendly DTM technique protocol for use in future national nutrition surveys.

Methods: A dose of deuterium oxide was given to the mother. Saliva samples were collected from both mothers and infants. Data were available from 9 countries including 790 mother-infant pairs. The data was split into, (1) model building (565 pairs, including 113 EBF-controlled pairs as calibration data); (2) evaluation (225 pairs). The model analysis used MCMC in a fully Bayesian framework implemented in Stan. A four-stage method used: (i) determination of EBF criterion using the calibration data, (ii) assignment of subjects in dataset 1 to EBF or non-EBF categories, (iii) optimising a field friendly study, (iv) evaluation of the optimised design involving dataset 2.

Results: The EBF criterion was determined as the amount of water ingested from sources other than breastmilk. Two post-dose windows (days 7-9 and 13-14) yielded optimal categorisation in dataset 1 with similar performance in dataset 2.

Conclusions: A two post-dose-sample design provided 95% sensitivity and specificity compared to the full design. This design can be used in future field studies.


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