

MEASUREMENT OF TOTAL BODY NITROGEN BY
IN VIVO NEUTRON ACTIVATION ANALYSIS - ACCURACY AND PRECISION

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Protein nutritional status in humans can be assessed indirectly by anthropometry, whole body ^{40}K counting and nitrogen balance studies or directly by in vivo prompt gamma neutron activation analysis of total body nitrogen (TBN). In adults TBN analysis has become the gold standard for assessing total body protein content. With the recent development of a low-dose radiation facility in Sydney (Allen et al. 1987), this technique is now applicable to children but information is required to assess the accuracy and precision of TBN in small subjects.

The aims of this study were to determine the accuracy and precision of TBN estimations in child size box and anthropomorphic phantoms.

Static counts were made of i) a perspex box-phantom containing an aqueous solution of urea (2.6% nitrogen) and saline (0.12% chloride), and ii) samples of wheat (6 - 6.7kg) of varying protein content (9.5% - 14.7%, 5.7g protein per g nitrogen). In addition, three anthropomorphic phantoms (AP) filled with urea/saline solution were counted in a manner identical to that for patients ('dynamic' counts). Results with the mass of nitrogen measured expressed as % of known nitrogen content are as follows:

Phantom Used	Number	% Known Nitrogen	Coefficient of Variation
Single box	15	98.5%	1.4%
Wheat	5	98.1%	5.3%
42kg (AP)	20	100.0%	4.5%
26kg (AP)	15	101.5%	4.3%
8kg (AP)	10	97.1%	5.4%

These results demonstrate the TBN system developed for use in small subjects is accurate and precise in the varying sizes of box and anthropomorphic phantoms studied and are comparable to those from instruments developed for adult use. With the low radiation dose, this technique is now applicable to children.

ALLEN, B.J., BLAGOJEVIC, N., MCGREGOR, B.J., PARSONS, D.E., GASKIN, K.J., SOUTTER, V., WATERS, D., ALLMAN, M., STEWART, P. and TILLER, D. (1987). In 'In Vivo Body Composition Studies', p.77, eds K.J. Ellis, S. Yasumura and W.D. Morgan (I.P.S.M.: London).

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