

## ABSTRACT

### Dietary protein, Growth and Urea kinetics in severely malnourished children and during recovery

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The effect of differences in protein intake on growth, urea kinetics and glycine status was explored in malnourished infants and children, and during different stages of rehabilitation. In addition, the utilization of salvaged urea- nitrogen for amino acids synthesis was investigated.

The subjects were studied as two groups depending on rehabilitation with either a high protein dietary regimen (HP, n = 7) or a lower protein regimen (LP, n = 13), with similar dietary energy. Each child was studied shortly after admission (MAL), during rapid weight gain (RWG) and on recovery (REC). The HP group received different amounts of an unmodified infant formula. The LP diet was the standard hospital treatment diet, prepared using the same milk powder as for the HP diet, but with oil and sugar added. Urea kinetics was measured using  $^{15}\text{N}^{15}\text{N}$ -urea. Urinary 5-l-oxoproline was used to indicate glycine status.

Intakes were:

|                 | LP          |             |             | HP          |             |             |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                 | MAL         | RWG         | REC         | MAL         | RWG         | REC         |
| Energy, kJ/kg/d | 412 ± 24    | 695 ± 38    | 385 ± 73    | 415 ± 3     | 650 ± 76    | 428 ± 38    |
| protein, g/kg/d | 0.61 ± 0.09 | 3.06 ± 0.16 | 0.56 ± 0.13 | 2.97 ± 0.02 | 4.49 ± 0.54 | 3.04 ± 0.29 |

All the children achieved rapid catch-up growth in weight for height (LP:  $100.2 \pm 7.9\%$ ; HP:  $96 \pm 4.3\%$ ) in similar time periods (LP:  $1.9 \pm 0.5$  m; HP ( $2.0 \pm 1.3$  m)). The children gained weight during MAL ( $7.1 \pm 3.4$  g/kg/d) and REC ( $1.7 \pm 3.7$  g/kg/d) in the HP, but not in the LP group. There was no significant group difference in the rate of weight gain group during RWG. However, the energy cost of tissue deposition during rapid catch-up growth indicated that the proportion of lean tissue deposited in the HP (65%) was higher than in the LP group (26%). Urea hydrolysis was  $47 \pm 4$  to  $64 \pm 12$  % of production in all stages. Absolute urea salvage was always higher in the HP group associated with the demand for growth during MAL and REC and for lean tissue synthesis during RWG.

Generally, 84 to 92% of the nitrogen from ureolysis was utilized in other pathways than for urea resynthesis, contributing to the nitrogen economy. Significant transfer of labelled nitrogen from urea into alanine, glycine, histidine and lysine confirms that dispensable and non-indispensable amino acids can be synthesized from urea- nitrogen. Glycine insufficiency was marked during MAL in both groups, and was greater in the HP diet during RWG.

The HP diet that is relatively easy to prepare was associated with more optimum tissue restoration. As the rate of weight gain during HP-MAL was as much as  $7.1 \pm 3.4$  g/kg/d, the HP diet might impose metabolic stress if taken when acutely ill.

**Keywords:** marasmus, kwashiorkor, dietary protein, catch-up growth, urea salvage, 5-L-oxoproline.