

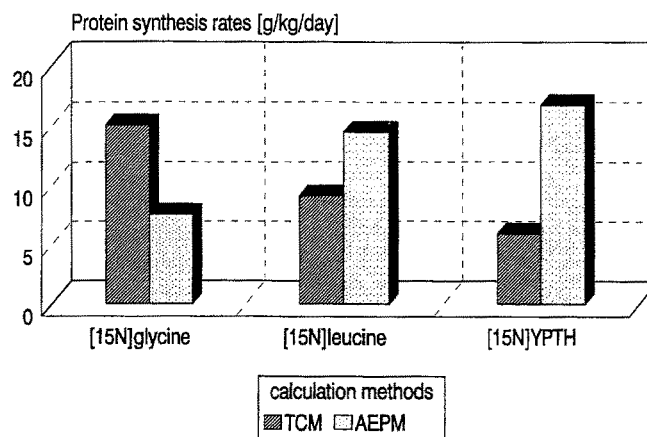
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## Protein turnover and energy expenditure in preterm infants

### Protein- und Energieumsatz bei frühgeborenen Kindern

The protein turnover in preterm infants was considered for a long time to be much higher than in term-born infants. Consequently, preterm infants were claimed to have an extremely high energy consumption due to the energy needs for protein synthesis and breakdown. Energy costs for protein synthesis in preterm infants are reported to be 1 - 3 kcal per g protein. A preterm synthesis rate of about 26.3 g/kg/day as claimed by Pencharz et al. would require glucose of around 5.0 g/kg/day corresponding to 20.2 kcal/kg/day. This calculation does not include the additional requirements for protein degradation and the lower energy production from glucose under anaerobic conditions. Furthermore, such orders of magnitude of energy consumption are not in agreement with the amount of energy which is needed for a positive nitrogen balance and a normal weight gain in preterm infants. Investigations of the protein turnover in preterm infants as conducted by our group have clearly shown that the methods used for establishing the protein turnover rates in preterm infants do not yield reliable results. The methodological errors are related to the disregard of the assumptions for determining the protein turnover. We have recently conducted a comparison of [ $^{15}\text{N}$ ]glycine, [ $^{15}\text{N}$ ]leucine and uniformly  $^{15}\text{N}$ -labeled yeast protein hydrolysate (YPTH) as tracer substances. Flux rates were calculated using a three-compartment model (TCM) and the ammonia end product method (AEPM). If the uniformly  $^{15}\text{N}$ -labeled yeast protein hydrolysate and the end

product total- $^{15}\text{N}$  were used, protein synthesis rates in preterm infants were found to be in the range of newborn infants (Wutzke et al.), Fig. 1.



A protein synthesis rate of 14 g/kg/day as it is generally believed to be the real order of magnitude in preterm infants would still mean, that 26% of the energy required for the basal metabolic rate is wasted for synthesis and breakdown of body protein.

### Conclusion

Protein turnover in preterm infants is not much higher than in term born newborns. Differing results as published formerly are due to methodological errors. Hypercaloric modes of parenteral and enteral nutrition in order to meet the additional requirements for protein synthesis and breakdown are therefore not justified.

**References**

- Pencharz PB, Steffee WP, Cochran W, Scrimshaw NS, Rand WM, Young VR. Protein metabolism in human neonates: nitrogen-balance studies, estimated obligatory losses of nitrogen and whole-body turnover of nitrogen. Clin Sci Mol Med 1977; 52: 485–498.
- Wutzke KD, Heine W, Plath C, Müller M, Uhlemann M. Whole-Body protein parameters in premature infants: a comparison of different  $^{15}\text{N}$  tracer substances and different methods. Pediatr Res 1992; 31:95–101.