

## Stool water in preterm neonates

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**SUMMARY** Data are presented on faecal water losses in 93 preterm infants being fed breast milk (72 infant days) or formula (280 days). Losses per kg increased to 4 weeks, when they amounted to 11% of water requirement in infants fed breast milk and 8% in infants fed formula.

There are no generally available data of faecal water loss in preterm infants. Losses in full term infants are said to be about 10 ml/kg daily,<sup>1</sup> or approximately 13% of total daily water requirement.<sup>2</sup> Values for small numbers of preterm infants have been published by Friis Hansen<sup>3</sup> and Senterre<sup>4</sup> and suggest a smaller loss of the order of 5–10 ml/kg daily, remaining fairly constant during the early weeks of life. This paper examines faecal water losses in a larger series of preterm infants at different weights and postnatal ages, and provides up to date information, previously unavailable, on stool water content in infants of very low weight.

### Patients and methods

Faeces were collected during the course of energy and nitrogen balances at various postnatal ages in 93 preterm infants (24–35 weeks' gestation), weighing between 770 and 2085 g. Complete 24 hour collections were made on 352 days, of which 72 were during breast milk feedings and 280 during formula feedings. No infants were receiving intravenous feeding during the collections. At least two days of collection were made in each infant, and in some cases as many as 10. Faeces were collected between carmine markers, using rayon napkin liners (Boots). These liners are effective at preventing the transfer of water into or out of the stool, provided the stool is formed or semi-formed.<sup>6</sup> We have not presented data on completely unformed stools. Stools were frozen at –24°C in sealed plastic bags together with their liners, which were of known weight. Twenty four hour aggregates were weighed wet and were then reweighed after freeze drying. The difference in weight represented the water content.

Oral feed intake in most infants was between 180 and 200 ml/kg/day after the end of the first week.

Table *Stool water loss (ml/kg/day) at various postnatal ages\* in breast milk and formula fed preterm infants of 24–35 weeks' gestation (mean (SD))*

Postnatal age (weeks)	Preterm infants grouped according to feed			
	Breast milk		Formula	
	Stool water loss	n=	Stool water loss	n=
1	15.7 (8.6)	15	8.6 (3.1)	18
2	16.3 (13.8)	15	11.2 (3.8)	25
3	19.6 (11.8)	14	11.1 (3.0)†	24
4	14.8 (12.6)	10	9.6 (2.6)	18
5 and 6	11.5 (9.0)	11	7.8 (4.9)†	21

\*During each postnatal week the values for each individual infant were represented by the mean of at least two 24 hour stool collections.

†For formula fed infants at postnatal ages of 3 and 5 and 6 weeks,  $t=2.72$  and  $p<0.05$  for mean (SD) stool water loss.

### Results

The Table shows the faecal water loss (ml/kg/day) at various postnatal ages in breast milk fed and formula fed infants. Losses were greater on breast milk feeds, but the difference was only significant during the first 14 days; thereafter the variability of stool water content in the breast fed infants was too large for significance to be achieved. Losses increased with postnatal age until the fourth week and then declined. There was no further change after the sixth week, though the variance continued to diminish. No significant correlation was found between stool water losses (ml/kg/day) and body weight ( $r=0.23$ ,  $p>0.05$ ) or gestation ( $r=0.18$ ,  $p>0.05$ ), but there was a highly significant correlation between total wet stool weight and daily stool water losses (Figure).

At an intake of 180 ml/kg/day, faecal water losses amounted to about 11% of the water requirement during the fourth week in breast milk fed infants and to about 8% in formula fed infants. In individual infants, however, as much as 24% of the intake could occur in the stool on occasions.

### Discussion

Water balance is important for preterm infants because of high insensible losses and imperfect renal concentrating ability. Stool water losses, though rarely measured, may be an important factor in

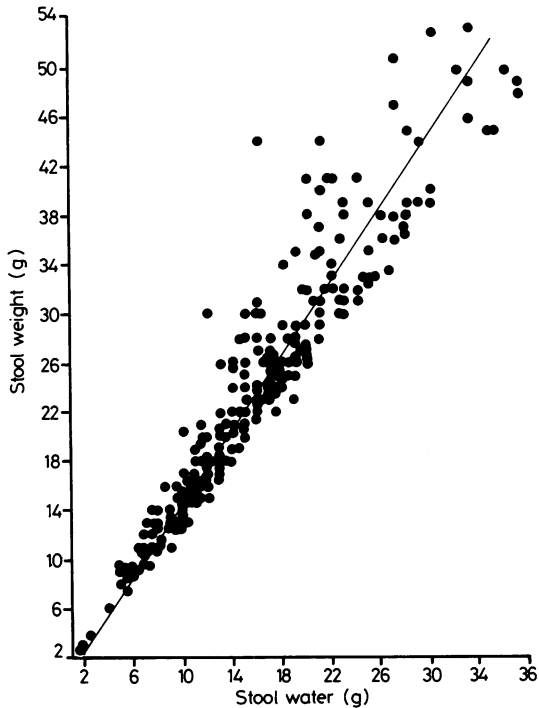


Figure Relation between total wet stool weight and stool water loss.

overall water economy and need to be taken into account in calculations of water balance. Our data provide information on stool water content from a large number of preterm infants and show that body weight and gestation are not important variables in determining stool water losses, but the type of feeding and the postnatal age do need to be taken into account. Water losses were 45% greater on

breast milk than on formula and seem to increase during the first two weeks (presumably due to the increase in feed intake that occurs during this period), declining again to a stable level after the fourth week. Senterre found similar differences between breast fed and formula fed preterm infants (10 v 7 ml/kg/day) to those in our infants after the fifth week, but he did not examine postnatal age relations. Our results show that considerably greater allowances need to be made for younger infants fed breast milk.

It is not difficult to weigh stools at the bedside using preweighed liners and modern electronic balances. Stool water can be calculated from stool weight using the Figure, from which it can be seen that 10 g stool contains approximately 7 g water. The increasing scatter at high stool weights certainly reflects the greater fat content of such stools.

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#### References

- <sup>1</sup> Pratt EL, Bienvenu B, Whyte MM. Concentration of urine solutes by young infants. *Pediatrics* 1948;1:181-7.
- <sup>2</sup> Bergamann KE, Ziegler EE, Fomon SJ. Water and renal solute load. In: Fomon SJ. *Infant nutrition*. 2nd ed. Philadelphia: WB Saunders, 1974:247.
- <sup>3</sup> Friiss Hansen B. Water distribution in the fetus and newborn infant. *Acta Paediatr Scand (Suppl)* 1983;305:7-11.
- <sup>4</sup> Senterre J, Lambrechts A. Nitrogen, fat and minerals' balances in premature infants fed acidified or non-acidified half-skimmed cow milk. *Biol Neonate* 1972;20:107-19.
- <sup>5</sup> Senterre J. Contribution à l'étude de l'alimentation optimale du prématuré. Liège: Vaillant-Carmanne, 1976. pp 119-25. (Thesis.)
- <sup>6</sup> Lemoh N, Brooke OG. Frequency and weight of normal stools in infancy. *Arch Dis Child* 1979;54:719-20.

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