Oral tolerance of Caloreen in babies

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SUMMARY Serial plasma glucose concentrations were compared in 20 infants of low birthweights (<2500 g) after test meals of 10% solutions of Caloreen and glucose. After Caloreen, the rise in plasma glucose concentration occurred more slowly but was better sustained, and hyperglycaemia was seen less often than after glucose. Caloreen may be preferable to glucose as a carbohydrate source in the prophylaxis and treatment of neonatal hypoglycaemia.

In a previous study¹ we showed that solutions of Caloreen*, a glucose polymer, consistently left the stomach of the newborn infant more rapidly than glucose solutions of similar strength. We speculated that this might be due to failure of enzymatic degradation of Caloreen resulting in lack of stimulation of the duodenal osmoreceptors; if this were so, Caloreen might not be absorbed and would therefore offer no advantage over glucose as a carbohydrate source in neonatal nutrition, although this would be out of keeping with our clinical observation that Caloreen is useful in the prophylaxis of neonatal hypoglycaemia. The present study was therefore designed to compare the effects of Caloreen and glucose test meals on plasma glucose concentration.

Methods

Clinical details of the 20 infants studied are presented in Table 1. Each infant received two consecutive test meals, one of 10% Caloreen and one of 10% glucose, the order in which these were given being varied by predetermined random selection. The meals were given at room temperature in a volume of 20 ml/kg on day 2, 24 ml/kg on day 3, and 28 mg/kg on and after day 4. Plasma glucose

concentration was estimated using the Beckman† glucose analyser² on plasma obtained from duplicate samples of arterialised capillary blood³ taken fasting and at 30, 60, 120, 180, and 240 minutes after the test meal; the plasma glucose concentration 240 minutes after the first test meal was used as the fasting plasma glucose concentration for the second test meal. The plasma was separated immediately by centrifugation and if immediate analysis was not possible it was stored at -4°C for up to 4 hours. The paired plasma glucose concentrations were compared using Student's *t* test.

Results

Plasma glucose concentrations after Caloreen and glucose test meals are shown in Table 2; it can be seen that after Caloreen the rise in plasma glucose concentration was less pronounced but better sustained than after glucose. It was also noted that in individual babies hyperglycaemia occurred more often after glucose (Table 3). One infant developed

Table 1 *Clinical details of 20 low birthweight infants on whom plasma glucose estimations were performed*

	Gestation at birth (weeks)	Birthweight (g)	Age at study (days)
Mean	34.3	1879	13.7
SEM	0.63	76	2.5
Range	29-38	1240-2360	2-41

*Roussel Laboratories Ltd, Wembley Park, Middlesex, England.

Table 2 *Plasma glucose concentration after test meals of Caloreen and glucose*

Time after test feed (min)	Plasma glucose concentration (mmol/l)				
	After 10% Caloreen		After 10% glucose		<i>P</i>
	Mean	SEM	Mean	SEM	
0	3.15	0.19	3.56	0.20	0.2 > <i>P</i> > 0.1
30	6.30	0.41	7.57	0.52	0.005 > <i>P</i> > 0.001
60	7.01	0.43	9.41	0.70	0.001 > <i>P</i>
120	5.95	0.49	7.45	0.56	0.05 > <i>P</i> > 0.025
180	4.30	0.22	3.99	0.32	0.5 > <i>P</i> > 0.4
240	3.81	0.19	2.99	0.18	0.005 > <i>P</i> > 0.001

Conversion: SI to traditional units—glucose: 1 mmol/l ≈ 18 mg/100 ml.

†Beckman, Glenrothes, Fife, Scotland.

Table 3 Incidence of hyperglycaemia

Plasma glucose concentration (mmol/l)	Number of infants	
	After Caloreen	After glucose
> 11.0	Nil	9
> 9.5	4	18
> 8.0	12	29
> 7.5	19	35

asymptomatic hypoglycaemia (plasma glucose 1.2 mmol/l; 22 mg/100 ml) 4 hours after a glucose feed.

Discussion

Because of the risks of hyperosmolality and dehydration associated with hyperglycaemia, Lillien *et al.*⁴ recommended that neonatal hypoglycaemia be corrected without inducing hyperglycaemia. The tolerance tests reported above show that Caloreen is effective in producing a sustained rise in plasma glucose concentration without the pronounced fluctuation and hyperglycaemia which follow glucose. This lack of fluctuation is similar to that reported after starch meals,⁵ but whereas the blood glucose concentration scarcely rose above the fasting level after starch (maximum rise 1.8 mmol/l (35 mg/100 ml) 90 minutes after meal), Caloreen had a much more pronounced effect on plasma glucose (maximum rise 3.9 mmol/l (70 mg/100 ml) 60 minutes after meal). Husband *et al.*⁵ concluded that starch was hydrolysed slowly in the newborn infant and that given alone it had no part to play in the oral treatment of hypoglycaemia. Caloreen however, in addition to leaving the stomach rapidly and thereby reducing the risks of vomiting and inhalation which are so common at this age, appears to be well absorbed.

The apparent contradiction in the findings that Caloreen leaves the stomach rapidly (suggesting slow or absent hydrolysis) but is well absorbed (suggesting more rapid hydrolysis) may reflect

intracellular breakdown of the compound by glucosidases.⁶ There would then be little or no intraluminal conversion of Caloreen to glucose to increase osmolality and hence stimulate the duodenal osmoreceptors which are known to be functional in the newborn.⁵

Caloreen appears to offer two advantages over glucose as a carbohydrate source in neonatal nutrition: it does not delay gastric emptying, and it produces a smoothly sustained rise in plasma glucose concentration. It therefore appears to be particularly suitable for use in the treatment and prophylaxis of neonatal hypoglycaemia.

We thank Dr G Hems for statistical help, Professor A G M Campbell for advice, and Miss Gordon, Pharmacy Department, Royal Aberdeen Children's Hospital, for assistance.

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Received 16 October 1979