Gastric emptying of Caloreen meals in the newborn

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SUMMARY The gastric emptying of 10% solutions of glucose and of Caloreen, a glucose polymer, was compared in 16 newborn infants. Caloreen left the stomach more rapidly than glucose on all but one occasion. This has potential advantages to infant feeding.

In encouraging early feeding for low birthweight infants the paediatrician must take into account the problems that result from immature sucking and swallowing reflexes, an incomplete oesophageal cardiac sphincter, a poor gag reflex, and a small gastric capacity.1–2 Hypoglycaemia and jaundice may be prevented but only at the considerable risk of regurgitation and potentially fatal aspiration.3 Although there has long been agreement that early provision of an adequate caloric intake is desirable,4 the volume and composition of early feeds are still subjects for debate.

For some years it has been the practice in our special care nursery to provide light-for-dates and other infants at risk from hypoglycaemia with a high-energy diet for the first few days of life. Originally this was achieved by the introduction of glucose-fortified feeds,5 but when these were given earlier and in larger volumes it became apparent that they often produced vomiting, abdominal distension, and diarrhoea. Caloreen* was substituted for glucose and it has been our impression that the incidence of these symptoms has decreased. This favourable clinical experience and the dearth of data on the use of Caloreen for newborn infants have prompted us to evaluate the effect of Caloreen on gastric emptying in the newborn period.

Caloreen is a white, slightly sweet powder prepared by the enzyme degradation of corn starch to give a mixture of malto-oligosaccharides containing 3% glucose, 7% maltose, 5% maltotriose, and 85% polysaccharides containing 4 to 15 glucose units (mean 5 units).6 After ingestion in adults Caloreen is readily converted to glucose by enzymatic action.7

Methods

An attempt was made to study gastric emptying in 18 infants in the first 6 weeks of life. All were patients

Results

The percentage of gastric retention after Caloreen and glucose meals is presented in the Table and the Figure. Gastric emptying was faster after Caloreen than after glucose in all but one of the 32 studies. Gastric retention of more than 30% of the test feed at 30 minutes was seen after only 7 (22%) of the Caloreen feeds compared with 25 (78%) of the glucose feeds. Caloreen solution thus clearly left the stomach much more rapidly than the glucose solution.

Table  Gastric emptying in 16 newborn infants after 2 test meals each of 10% Caloreen and 2 test meals each of 10% glucose solutions

<table>
<thead>
<tr>
<th>Gestation at birth (weeks)</th>
<th>Birth weight (g)</th>
<th>Age at first study (days)</th>
<th>Percentage of test meal recovered from stomach after 30 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>29-37</td>
<td>1240-2690</td>
<td>5-69</td>
</tr>
<tr>
<td>Mean</td>
<td>33.8</td>
<td>1842</td>
<td>20</td>
</tr>
<tr>
<td>SEM</td>
<td>0.62</td>
<td>98</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Discussion

In adults the duodenum contains osmoreceptors; a high osmolality in the duodenal contents delays gastric emptying. Husband and Husband concluded that these osmoreceptors were functional within the first few days of life by demonstrating that a 10% glucose solution emptied from the stomach at a slower rate than a 5% glucose solution. It has also been shown that a starch solution emptied from the stomach of the newborn infant more rapidly than a glucose solution of comparable energy content, whereas in the adult Hunt and Pathak found that starch and glucose solutions left the stomach at about the same rates. The postpyloric osmoreceptors apparently respond to starch only after conversion to maltose and glucose by pancreatic amylase and intestinal maltase, and Husband et al. attributed the more rapid gastric emptying in the newborn after starch feeds to the relative deficiency of pancreatic amylase, previously demonstrated during the first few months of life by Andersen. Similar rapid emptying of starch meals has been demonstrated in patients with deficient pancreatic secretion. As Caloreen is also converted to glucose by amylases, this would explain the rapid emptying of Caloreen from the infant's stomach.

Glucose is widely used as a first feed and as an energy supplement in the neonatal period. Experience with Caloreen is limited but it has some theoretical advantages over glucose because of its lower osmotic activity (a 10% solution has an osmolality of 120 mosmol/l compared with 555 mosmol/l for a glucose solution of similar strength and energy content) and our results indicate that it leaves the stomach much more rapidly than glucose. Since the danger of regurgitation with subsequent aspiration into the lungs is a limiting factor in prescribing the volume of enteral feeds for low birthweight infants during the early days of life, there may be some advantage in using Caloreen rather than glucose or other simple sugars. However, if we are correct in our speculation that Caloreen empties rapidly from the stomach not only because of its low osmolality in solution but also because it is not digested in the newborn period, it is possible that it might not be absorbed; if this were so there would be no nutritional benefit in using it. However, tolerance tests comparing Caloreen with glucose show that Caloreen produces a sustained rise in the plasma glucose concentration. It is therefore concluded that Caloreen has significant advantages over glucose as a carbohydrate supplement in infant feeding.

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References


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