This patient illustrates that neurological problems can occasionally be the presenting feature of acute lymphoblastic leukaemia. The diagnosis of central nervous system leukaemia should be considered in cases of unexplained raised intracranial pressure or cranial nerve palsies, even in the absence of a cerebrospinal fluid infiltrate. In these cases a thorough and if necessary repeated examination of the cerebrospinal fluid is required, which should include membrane marker studies, as it was only if the cerebrospinal fluid is required, which should make a precise diagnosis in this case.

We thank Dr M Greaves, Imperial Cancer Research Fund Laboratories, London for help in performing the cell marker studies.

References

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Investigation of the ‘satisfying’ quality of infant formula milks

O G BROOKE AND C WOOD

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SUMMARY The ‘satisfying’ quality of a typical, current formula milk was compared with that of an earlier type with higher protein and mineral content in a double blind, cross over trial in 10 infants. There were no significant differences in the amount of crying or volume consumed which meant that there was a higher sodium and protein intake but no associated improvement in ‘satisfaction’.

Feeding problems in infancy are among the most common encountered in baby clinics and paediatric departments. Many infants seem dissatisfied with their feeding and cause distress by their frequent crying. Although this kind of behaviour often results from a variety of different disturbances of mothering, it is usually perceived by the mother to be a problem of inadequate or unsuitable feeds. She therefore changes the type of feed, often several times, often encouraged in this by professional health workers. There is also a ground swell of opinion, un referenced but recognised by all who work in the field, that the older infant formula milks were more satisfying than the current highly modified low solute formulas, perhaps because of their higher protein content, or because their protein was predominantly casein. With this in mind we designed a study to investigate infant feeding behaviour on two different formulas, one an example of current manufacturing practice and one from the previous generation—safely low in solute content but still containing notably more protein (mainly casein) and electrolytes than is the current fashion.

Patients and methods

Infants. Ten infants were studied in a double blind, cross over experiment. The infants were term and of normal birthweight. They were recruited on the postnatal ward on the basis that their mothers wanted to bottle feed them and were willing to take part in the study. Their mothers gave fully informed consent and the study had ethical approval. The infants were started on one or other of the trial formulas before discharge home.

Formulas. Details of the two formulas are given in Table 1. They were supplied as ready to feed liquid preparations in containers marked only with a week number (from 1 to 8). Unconsumed feed was retained for measurement so that daily intakes could be calculated.
Table 1  Composition of the two formulas (per litre)

<table>
<thead>
<tr>
<th></th>
<th>Formula 1 (highly adapted)</th>
<th>Formula 2 (less highly adapted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>650</td>
<td>680</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>15 (whey predominant)</td>
<td>18.5 (casein predominant)</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>36</td>
<td>31</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>72</td>
<td>84</td>
</tr>
<tr>
<td>Calcium (g)</td>
<td>72</td>
<td>69</td>
</tr>
<tr>
<td>Maltodextrin</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Lactose (g)</td>
<td>570</td>
<td>710</td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>180</td>
<td>270</td>
</tr>
<tr>
<td>Total minerals (g)</td>
<td>2.55</td>
<td>2.91</td>
</tr>
</tbody>
</table>

Procedures. The infants were allocated one or other of the trial formulas at random in the first week of postnatal life. Crossover rank is given in Table 2. The formula was fed ad libitum. During the fifth or sixth week the other formula was substituted. The mother and the reassemblers knew that the change would be made at this time but did not know in which week the change would occur, and this varied with each infant. The milks looked identical and were only identified with the infant’s name and the week number. Enough milk was supplied each week to ensure a surplus. The randomisation and supply was organised by the manufacturing company.

During the fifth and sixth week, daily intakes were measured over seven days by subtracting the volume of unconsumed feed from the total offered, and measurements of the total amount of crying over a 48 hour period were made. This was done with a ‘cry monitor’, consisting of a miniature microphone clipped to the baby’s clothing, an amplifier with high and low pass filters, a small computer, and a digital clock. The device was battery driven. When the baby cried the amplifier switched on automatically and this could be checked visually with a display light. Sensitivity could be adjusted with a gain control so that the device was not triggered by ambient noise. The computer memory stored the total crying time in minutes and seconds and the cumulative crying time could be displayed digitally at will. The device was tested on many infants in the postnatal ward and gave reliable results.

The differences in feed intake on the two feeds were analysed by Student’s paired t-test. The distribution of the crying time data was not normal, so they were compared using the Wilcoxon non-parametric test.

Results

Table 2 shows the milk intake and crying times on the two formulas in each infant. Intakes were the same on either formula and there was little difference in the mean crying times. Infant 4 cried much less on the lower protein formula and infants 6 and 8 cried more, but overall there was no significant difference (P > 0.05) using the paired t-test and Wilcoxon’s test, either in intake or crying time. When change in intake was compared with the change in log crying time, there was a significant negative correlation (r = -0.84, P = 0.002). Protein intake was 2.61 g/kg per day on formula 1 v 3.32 g/kg per day on formula 2 (P < 0.001). Energy intake was 113 kcal/kg per day on formula 1 v 122 kcal/kg per day on formula 2 (P < 0.002). Sodium intake was 31.3 mg/kg per day on formula 1 v 48.6 mg/kg per day on formula 2 (P < 0.001).

Discussion

This study showed that very young infants did not distinguish between formulas with modest differences in protein, energy, and mineral content, either in terms of the volume consumed or in the amount

Table 2  Comparison of intake and crying time in 10 infants fed formula 1 and formula 2 during 5th and 6th week of life

<table>
<thead>
<tr>
<th>Infant</th>
<th>Formula 1 (highly adapted)</th>
<th>Formula 2 (less highly adapted)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily intake (7d) (ml/kg)</td>
<td>Mean crying time (48 h) (min)</td>
</tr>
<tr>
<td>1</td>
<td>166</td>
<td>22.8</td>
</tr>
<tr>
<td>2</td>
<td>165</td>
<td>37.3</td>
</tr>
<tr>
<td>3</td>
<td>195</td>
<td>16.8</td>
</tr>
<tr>
<td>4</td>
<td>202</td>
<td>7.5</td>
</tr>
<tr>
<td>5</td>
<td>178</td>
<td>17.2</td>
</tr>
<tr>
<td>6</td>
<td>195</td>
<td>37.3</td>
</tr>
<tr>
<td>7</td>
<td>170</td>
<td>30.1</td>
</tr>
<tr>
<td>8</td>
<td>172</td>
<td>53.5</td>
</tr>
<tr>
<td>9</td>
<td>162</td>
<td>1.1</td>
</tr>
<tr>
<td>10</td>
<td>136</td>
<td>10.8</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>174 (19.5)</td>
<td>23.4 (16.1)</td>
</tr>
</tbody>
</table>

Cross over rank
of crying during measured time periods. Since crying time was quite variable, many more infants would have been required for us to have established with certainty that there was no difference between the feeds. The similarity, however, in spontaneous feed intake on the two formulas serves as a cross check on the cry times, and it is highly unlikely that the older formula was perceived as more satisfying than the newer, more highly adapted one, in spite of its greater concentration of energy, protein, and sodium and its starch content. Since change in feed intake was found to be negatively correlated with change in crying time it is possible that infants preferred the taste of one formula to the other (though there was no consistent favourite). The only property of feeds which has definitely been shown to influence the intake of young infants remains their sweetness.2

Since the infants consumed virtually identical volumes of the two formulas, their intake of energy, protein, and sodium was greater on the richer formula. Although there is no evidence that harm will occur at this volume of intake, there is an authoritative view that the young formula fed infants should receive a feed as near as possible in composition to human milk,3 particularly in respect of protein,4 since it is difficult to exclude the possibility of an occasional case of hypernatraemic dehydration on formulas with higher protein and salt content. The temptation to change to a richer formula in infants with ‘feeding problems’ should therefore be resisted since these formulas are no more satisfying, and attempts should be made to try to identify other causes of distress in the infant. It is possible, however, that the older infant of 4 to 6 months may find a richer formula more to his taste, though evidence for this is lacking.

Milupa Ltd provided the formulas and the funding for C W, as well as logistical assistance with running the study.

References

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Acid base balance in blood and cerebrospinal fluid

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SUMMARY Thirty four infants were studied; 21 with acute gastroenteritis, dehydration, and metabolic acidosis and 13 who served as controls. All infants with metabolic acidosis and without neurological signs had a normal to near normal cerebrospinal fluid acid base balance, but five with metabolic acidosis and severe neurological signs had cerebrospinal fluid acid base disequilibrium. Acute metabolic acidosis in infants may lead to cerebrospinal fluid acid base imbalance causing cerebral dysfunction.

Acute gastroenteritis in infancy is often accompanied by metabolic acidosis. Some acidotic infants may manifest neurological disturbances without concomitant electrolyte pathology. We suggest that only when the cerebrospinal fluid balance is disturbed will neurological signs occur.

Patients and methods

Thirty four infants, divided into two groups (A and B), whose ages were between 1 month and 16 months were included in this study. Group A consisted of 21 infants admitted to hospital with acute gastroenteritis. All were mildly to severely dehydrated (5% to 7% weight loss), with normal serum electrolyte values. We excluded from the study those with diseases other than acute gastroenteritis, those with known neurological conditions, infants with a history of convulsions, and all infants with a history of birth trauma or low birthweight, or both.
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