Introduction
Controversy remains concerning the most efficacious caloric additive for oral rehydration solutions (ORS) to promote ion absorption in severe diarrhoea. Small intestinal epithelial cells are mainly fuelled by glutamine, which strongly promotes jejunal absorption of sodium. The colonic mucosa is mainly fuelled by short-chain fatty acids (SCFA) derived by fermentation of fibre and these stimulate sodium absorption in the colon.2

As glucose does not strongly promote mucosal ion absorption, alternative metabolic substrates have been sought. The addition of rice water, rice water and glycine or amylase-resistant starch usefully promotes ion absorption in diarrhoeal conditions.2,4 A single foodstuff that provides both glutamine and dietary fibre for fermentation to fuel small and large intestinal mucosa, has not been used in ORS.

Aim and purpose
The case for the combined use of glutamine and a suitable source of fibre for SCFA is strengthened by observations that the diarrhoeal effect of cholera toxin is dampened by glutamine in the small intestine and by SCFA in the large intestine.4,8 Preferably, glutamine and dietary fibre should be supplied in a single foodstuff. A suitable food item which provides both glutamine, as well as dietary fibre for fermentation to fuel small and large intestinal mucosa, has not been used in ORS.

Method and results
Groundnuts and rice were obtained from commercial sources and ground with a pestle and mortar. Aliquots of ground foods were subjected to protein extraction with perchloric acid (20%), neutralised and hydrolysed by the enzymatic action of glutaminase to yield glutamate. Glutamate was measured enzymatically and the glutamine content was the difference between before and after glutaminase action.9

Total dietary fibre of each food was determined by the method of Prosky et al. with the exception of rice water because the fibre content was too low to measure. Results are given in Table 1. Groundnuts have 50 times more glutamine than rice water and contain, depending on processing, 4–25 times more dietary fibre than whole rice. The glutamine and fibre content of groundnuts is vastly superior to the levels found in rice water.

Discussion
The advantage of a natural food source over commercially derived substrates for ORS is that they are readily available

Table 1. Total dietary fibre (TDF) and glutamine content of groundnuts, rice and rice water

<table>
<thead>
<tr>
<th>Foodstuffs</th>
<th>TDF* (g/100 g)</th>
<th>Glutamine† (µm/gm)</th>
</tr>
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<tbody>
<tr>
<td>Groundnuts, no skin, roasted</td>
<td>9.8</td>
<td>1.78 ± 0.05</td>
</tr>
<tr>
<td>Groundnuts with skin, raw</td>
<td>11.0</td>
<td>1.4 ± 2.3</td>
</tr>
<tr>
<td>Rice, white</td>
<td>0.4</td>
<td>0.17 ± 0.02</td>
</tr>
<tr>
<td>Rice, brown</td>
<td>2.7</td>
<td>0.21 ± 0.03</td>
</tr>
<tr>
<td>Rice, water</td>
<td>–</td>
<td>0.03 ± 0.02</td>
</tr>
</tbody>
</table>

* Average of duplicate determinations from one batch, † mean ± SE of four estimations, ‡ fibre content was too low to measure.

Correspondence address: Associate Professor WEW Roediger, Department of Surgery, The Queen Elizabeth Hospital, Woodville Road, Woodville, South Australia 5011, Australia. Tel: 61 8 8222 6752; Fax: 61 8 8222 6028 Email: bill.roediger@adelaide.edu.au Accepted 14 July 2000
in local communities at little extra cost. Amylase-resistant starch and glutamine are only commercially available. Adding glutamine as a pure substance can result in the problem of storability, as the release of ammonia may occur at room temperature\(^4\) thus necessitating refrigeration which is not often available. Groundnuts, apart from glutamine and fibre, also contain unsaturated fats necessary for nutritional repletion. The use of fermentable fibre in the colon improves absorption in diarrhoeal conditions.\(^7\) On the basis of current results, the use of groundnuts in a macerated form in ORS appears an ideal form of nutrient therapy in diarrhoeal conditions and is worthy of a randomly controlled trial.

References