

## CONFERENCE

**Treatment of malnutrition in refugee camps**

For severe childhood malnutrition treatment ought to start with a low-protein diet because of hepatic insufficiency. In the recovery phase, the diet ought to be higher in protein and more energy-dense, to produce rapid weight gain. Such a protocol, though, is not practical enough for use in refugee camps, where protocols have to be simple yet embody all the essential principles of the more complex regimens developed in metabolic wards of research units. This issue and others, such as the use of WHO oral rehydration solution (ORS) for treating dehydration in severely malnourished children when close clinical supervision is not possible, were discussed at a meeting hosted by Médecins sans Frontière, Epicentre, and INSERM in Paris in May. General agreement was reached on features of a formula suitable for all stages of treatment.

A formula of 80 g dried skimmed milk, 50 g sugar, 60 g oil, minerals, and vitamins per litre of feed<sup>1</sup> (energy density; 1 kcal/mL) is sufficient for catch-up growth<sup>2</sup> when fed to appetite. The same formula may also be given orally or by nasogastric tube, in the early stages of treatment, if diluted 3:1 with water. About 100 mL/kg per day of the formula (total 133 mL with water) should be given in the first few days, when the children are anorexic and then very much more of the undiluted feed (about 200 mL/kg per day) once appetite has returned.

The diet must contain adequate potassium, magnesium, zinc, copper, selenium, iodine, and each of the vitamins. In the case of diets not specifically pre-formulated for treatment of malnutrition, addition of minerals and vitamins is feasible only from ready-made sachets (or stock solutions). For stability, the minerals and vitamins have to be packaged separately. Mineral and vitamin concentrations, calculated to provide the amounts needed for repletion and rapid recovery of malnourished children taking 100–200 mL/kg per day of the feed, are given in the table.

Where no refrigeration exists, lactobacillus fermentation of the formula (which lowers pH and produces antibacterial products) is a practical way of preventing contamination with pathogens. In addition it reduces the risk of

lactose intolerance. Such yoghurt has been successfully used in Senegal to treat malnutrition for 10 years.<sup>2</sup>

The presence of dehydration makes the management of malnourished children especially difficult. Malnourished children already have a greatly increased total-body-sodium and decreased total-body-potassium, which contribute significantly to their illness. The potassium concentration of WHO-ORS (20 mmol/L) is too low to match stool output or make good the deficit, and the sodium concentration (90 mmol/L) is sufficiently high to induce heart failure,<sup>3</sup> particularly in kwashiorkor and marasmic-kwashiorkor. The deficiency of minerals such as magnesium, zinc, and copper in malnourished children can contribute to the diarrhoea, and these minerals are not present in WHO-ORS. Magnesium, in particular, is essential for the retention of potassium and is usually lacking in refugees' rations.<sup>4</sup> If one WHO-ORS packet is diluted in 2 L of water (instead of 1 L), and the same mineral sachets used to supplement the diet (1 sachet/L) and 50 g sugar (25 g/L) are added, then an isotonic (290 mosmol/L) rehydration solution with sodium (45 mmol/L), potassium (40 mmol/L), magnesium

(3 mmol/L), zinc, copper, and carbohydrate in concentrations more appropriate for children with malnutrition is obtained. A preliminary field trial of mineral-mix sachets for use with the diet and the new rehydration solution, by Médecins Sans Frontière in Ethiopia, shows this approach to be both practical and well received by the children and staff of refugee camps (B Le Lin, personal communication). WHO-ORS is best suited for treating dehydration in the absence of malnutrition and in patients with copious watery diarrhoea.

Nearly all malnourished children have infections and bacterial overgrowth of mucosal surfaces. In view of the usual lack of signs of infection, the absence of laboratory facilities, and the working conditions and training of most staff, blind, unselective, broad-spectrum antibiotic treatment should be given to all patients.

Persistent diarrhoea usually responds to intensive feeding alone. Failure to grow despite adequate intake of nutrients is often due to tuberculosis. Parenteral vitamin A and measles vaccine should be given to all children. In certain countries, up to 50% of malnourished children have HIV infection, which in future is bound to alter the epidemiology and outcome of severe malnutrition. HIV-infected children should not be treated differently from other malnourished children. If HIV testing is done, it is best delayed until discharge.

*Michael H N Golden, André Briend*

Nutrient	Concentration (per litre of made-up feed)
<b>Minerals*</b>	
Potassium	30 mmol/L
Magnesium	3 mmol/L
Zinc	300 µmol/L
Copper	45 µmol/L
Selenium	0·6 µmol/L
Iodine	0·6 µmol/L
<b>Water soluble vitamins</b>	
Thiamine	0·7 mg
Riboflavin	2·0 mg
Niacin	10 mg
Pyridoxine	0·7 mg
Cobalamin	1 µg
Folic acid	0·35 mg
Ascorbic acid	180 mg
Pantothenic acid	3 mg
Biotin	100 µg
<b>Fat soluble vitamins</b>	
Retinol	1·5 mg
Tocopherol	22 mg
Calciferol	30 µg
Vitamin K	40 µg

\*Citrate should be added (the same number of equivalents as MG) since magnesium chloride may induce acidosis. Iron is not included because it may increase mortality when given to malnourished children; it must be given separately during rapid weight gain. The same mineral-mix is used to make up the rehydration solution.

**Concentration of minerals and vitamins  
In diets for malnourished children**

**UV radiation in the UK**

The National Radiological Protection Board will prepare weekly summaries of solar ultraviolet radiation. Each report will consist of a chart showing relative intensity of UV radiation for each of the days concerned, a chart of solar index for each day, a figure showing the weekly solar index, and a key relating daily solar index to time for skin to burn.