



Regional patterns of median UI ($\mu\text{g}/100\text{ mL}$) in adults aged 45-60 years (male/female)

The age-related decrease in iodine intake, although moderate in degree, might be the result of food-pattern changes paralleling the observed physiological reduction in energy intake, but could also be due to the public awareness of the need for a voluntary reduction in added salt to control hypertension. Regional variations in median concentrations of UI are in part a reflection of fluctuations in the total iodine content of foodstuffs and pasture grasses, which depends on the quantities supplied to soil by the weathering of primary bedrocks, by the atmosphere in the form of rain or aerosols, through incidental additions of iodine to the environment, by agricultural practices (compound fertilisers, herbicides, iodine-supplemented feedstuffs), and food processing (iodine-sanitising agents on farms). Conclusions from recently published data on iodine nutrition in the USA should remind health officials in industrialised countries of the inconsistency of iodine intake, since the presence of iodine in the food chain may be driven largely by commercial rather than health interests.⁴

Although iodised household salt was introduced on a voluntary basis from 1952 onwards (10-15 mg sodium iodide per kg salt) results of the SU.VI.MAX study definitively underlined the risk for the French adult population of being exposed to mild iodine deficiency. By contrast, a study pointed to a significant improvement of the hitherto prevailing borderline iodine deficiency among French school pupils (10-14 years of age).⁵ Surveillance of iodine nutrition in pregnant women to prevent the occasional risk of intellectual impairment should be emphasised, and a nationwide effort to promote iodised salt and to provide women of child-bearing age with advice on dietary sources of iodine should be implemented. In addition, efforts to improve iodine nutrition through generalised iodine prophylaxis would reduce radiation-induced damage to the thyroid in case of nuclear accident.

In our study, the overall goitre prevalence ranged from 11.3% for the entire male population to 13.9% for the female sample, suggesting that the thyroid is most probably exposed to a mild goitrogenic effect due to moderate iodine deficiency. Forthcoming results concerning thyroid function tests, and results from goitre surveys and ultrasonographic scans will illustrate the interrelations between iodine nutrition and underlying thyroid dysfunctions.

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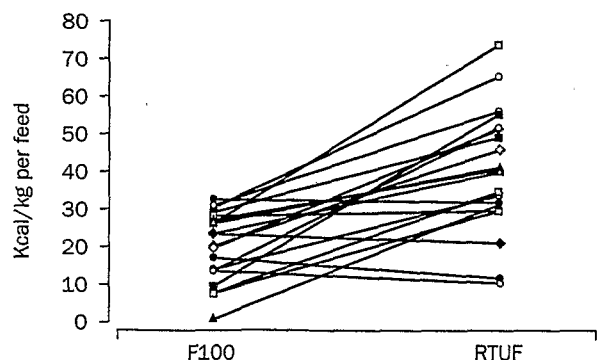
Ready-to-use therapeutic food for treatment of marasmus

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Children with severe wasting are treated with special diets. After a child's appetite returns, a diet is given that enables rapid weight gain. This diet is usually F100, a liquid diet with 100 kcal/100 mL. It is prepared by mixing dried skimmed milk, oil, sugar, and a vitamin and mineral mix (without iron) with water.¹ Specifications for its industrial preparation have been published.²

Because F100 is an excellent medium for bacteria, it has to be prepared before each meal and used by experienced staff. This is a problem because recovery usually takes 4 weeks, residential facilities are limited and expensive, and outpatient management with F100 not advisable. Therefore we formulated and tested a ready-to-use therapeutic food (RTUF) with a nutritional composition similar to F100, but that could be eaten directly. The RTUF complied with the F100 formula,² except that part of the dried skimmed milk was replaced with lactoserum and groundnut paste (Nutriset, France). The formula contained 543 kcal/100 g. Bacteria, when added to the product, failed to grow. The product looked and tasted like peanut butter.

The study took place in a therapeutic feeding centre, in Mao, Chad, run by Action Contre la Faim (Paris) and the Tchadian Ministry of Health. 20 severely malnourished children without oedema (weight-for-height <70% of



Comparison of energy intake with F100 and RTUF (20 children, average for three meals)



standard), aged over 12 months, were sequentially included in the study when they had been gaining weight rapidly for at least 3 days. The objectives of the study, with the description of the new food, was explained to the mothers in detail in the different local languages. Mothers were free to choose not to be included in the study.

Before the study, children received six locally prepared F100 feeds daily. During the study, alternative F100 feeds were replaced by RTUF. The order of the feeds was changed every day to avoid bias. Each day, one child was randomly selected to have its intake measured by weighing the cup-sachet (to 1 g) before, during, and after the six meals. The mothers fed the children. They were told to repeatedly offer food over 1 h, not to force-feed the child, and to give plain water to thirst. Each feed was compared with the subsequent feed in the same child (3×20 pairs of observations) with the Wilcoxon-rank test.

The energy intake was 40.2 (SD 20.9) kcal/kg per feed for RTUF versus 20.2 (11.5) kcal/kg per feed for F100 ($p < 0.001$) (figure). There were two children who took substantially more F100 than RTUF—one with a chronic cough and another with a peak of fever on the day measurement.

The higher intake of RUTF compared with F100 does not mean that overall energy intake increased, because we calculate that the average energy intake of F100, before the study, was about 30 kcal/feed—the same as these children took from the combined diets. This comparison suggests that ultimate replacement of all F100 by RTUF should not lead to a major increase in overall energy intake. Heart failure has been reported in case of excessive energy intake³ and a major increase from those obtained with F100 is clearly undesirable.

RTUF might be useful in contaminated environments or where residential management is not possible, such as during a war or disaster. It might also be useful for treatment at home⁴ or in centres without a kitchen. In this case, the amount of RTUF needed for the treatment should be given regularly in small quantities to avoid overfeeding and misuse. Frequent contact with the health service, ideally daily, would also be needed to closely monitor the progress of the child. This scheme could, however, lead to an increase in the cost-effectiveness and coverage of nutrition rehabilitation programmes.

Currently recommended treatment protocols are derived from studies and experience over 30 years.¹ Such information is lacking for RTUF, which has not been tested in infants (in whom an assured water intake is more critical) or in cases of oedematous malnutrition, and may not be appropriate for children with infection. Thus, wide promotion of this new diet is premature in settings where the use of standard protocols is possible. Nonetheless, RTUF avoids problems of quality control and bacterial contamination.

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Wernicke's encephalopathy induced by magnesium depletion

Jordan McLean, Simon Manchip

A teetotal woman aged 85 years had congestive heart failure managed by daily 40 mg co-amilofruse. She became confused, anorexic, and had ophthalmoplegia. She was admitted to hospital with hypotension. A demand pacemaker was fitted. She developed ptosis and lost consciousness. Intravenous thiamine, 250 mg, was administered for suspected Wernicke's encephalopathy. She regained consciousness within 2 h. 8 days later, she became stuporous with low blood pressure and responded again to thiamine. She had severe anterograde memory loss and confabulation. Over the next few weeks she developed gegenhalten, cogwheel rigidity, grasping reflexes, and signs of tetany.

Her family searched for an explanation. She had taken 40 mg co-amilofruse for 3 years. Frusemide impedes magnesium (Mg) reabsorption in the kidney by up to 400%. Mg is an essential cofactor in the conversion of thiamine into active diphosphate and triphosphate esters.^{1,2} There have been reports of thiamine deficiency aggravated by Mg depletion with refractory response to thiamine until Mg was given.^{1,2} Mg depletion has been reported among patients on long-term diuretics.^{3,4} It seemed plausible that Mg depletion could provoke Wernicke's encephalopathy, possible by suboptimum thiamine phosphorylation. Her diet was supplemented with 500 mg daily chelated magnesium and thiamine diphosphate. Gegenhalten and cogwheel rigidity, grasping reflexes, and tetany subsided within 4 weeks. There has been a sustained improvement in her Korsokoff amnesia. Computed tomography scan showed Binswanger type periventricular hyperintensities. Her pacemaker precludes magnetic resonance imaging which would elucidate further the diagnosis.

Many cases of Wernicke's encephalopathy may also have magnesium depletion. Alcohol ingestion causes increased excretion of Mg; hyperemesis gravidarum can lead to Mg depletion;⁵ and diarrhoea due to Chron's disease or gluten enteropathy hinders Mg absorption from the gut.⁵ In elderly people, Mg intake may be suboptimum. Stress, hypochlorhydria, secondary aldosteronism provoked by congestive heart failure, and loop diuretics all prejudice Mg reserves.⁵ Confusion, ataxia, and ophthalmoplegia makes Wernicke's encephalopathy as plausible in someone taking diuretics as in an alcohol abuser. Symptoms may be misattributed to senile dementia. If a depletion of Mg reserves impedes the phosphorylation of thiamine, Mg depletion could have an effect on other enzymes whose activities depend on Mg. The patient's gegenhalten and cogwheel rigidity with grasping reflexes, which are atypical of Wernicke's encephalopathy and are generally ascribed to pyridoxine deficiency. Pyridoxine is only phosphorylated into its coenzyme in the presence of Mg. Because 70% of enzymes are dependent on Mg, it would be interesting to know how many other enzyme systems are affected by Mg depletion.

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