

recommendations. The animal / vegetal proteins ratio (1.7 ± 0.1 vs 2.9 ± 0.2 ; $P < 0.001$), the parts of polyunsaturated fatty acids (22.9 ± 0.6 vs $16.3 \pm 0.6\%$ of the lipid intake; $P < 0.001$) and polysaccharides (31.8 ± 0.8 vs $22.5 \pm 0.8\%$ of the total caloric intake; $P < 0.001$) were also more appropriate, the part of monounsaturated fatty acids was similar in the two groups. BMI (26.8 ± 0.3 vs 25.4 ± 0.1 kg/m²) and the waist-to-hip ratio (0.87 ± 0.01 vs 0.83 ± 0.01) were higher ($P < 0.01$), these differences being only due to the women. Fatty mass in women, evaluated by bioelectrical impedance was also higher in M than in F (31.2 ± 0.6 vs $28.4 \pm 0.7\%$; $P < 0.01$). In M the glycaemia 2 h after glucose load (75 g per os) was higher (5.7 ± 0.2 vs 4.9 ± 0.2 mmol/L; $P < 0.01$), in spite of a higher insulinemia (261 ± 16 vs 190 ± 18 pmol/L; $P < 0.01$), the serum total cholesterol (TC) was lower (4.92 ± 0.08 vs 5.83 ± 0.13 mmol/L; $P < 0.001$), HDL/TC ratio, triglycerides and apoproteins A1 and B did not differ significantly from F. Thus, in the studied group, the migration to France seems responsible for alimentary changes which, though the imbalance is still lower than that observed in F, are associated with a decrease in insulin sensitivity and an aggravation of the cardiovascular risk profile.

Impact of food supplementation from 4-7 months on physical growth of infants in four developing countries. KB Simondon, A Gartner, J Berger, A Cornu, C Ly, JP Massamba, JL San Miguel, I Missotte, P Traissac, F Simondon, F Delpuch, B Maire (*Unité de nutrition, Orstom, BP 5045, 34032 Montpellier cedex, France*).

The growth velocity of breastfed infants in developing countries falls from 4-6 months as complementary food is introduced into their diet. The objective of the study was to test whether daily supplementation with a high-quality gruel from the age of 4-7

months had a positive impact on growth in length.

Controlled randomized trials were conducted in the Congo (C, $n = 120$), Senegal (S, $n = 110$), Bolivia (B, $n = 127$) and New Caledonia (NC, $n = 90$). At 4 months of age, infants were randomly allocated to an intervention or a control group. Twice a day, supplemented infants received a high-energy-density commercial food supplement based on cereals and enriched with minerals and vitamins. Supplementation was done at home by the mothers, under supervision of field workers who measured the amount consumed. The controls received no placebo and both groups were free to eat local food in addition to breastmilk. The main outcome measure was the 4-7 months length increment.

Mean consumption varied from 558-790 kJ/day according to the country. All infants were breastfed until 7 months old, except for New Caledonia (47%). Local complementary food was introduced early in the Congo (96% of controls ate complementary food at 5 months) and late in Senegal (40% of controls at 5 months). Less supplemented infants received local complementary food compared to controls in the Congo and Senegal ($P < 0.001$). In Senegal, the 4-7 months length increment was greater among supplemented infants compared to the controls (+ 0.48 cm, $P < 0.05$) but not the weight increment. In the other countries, no impact was found.

In conclusion, food supplementation from 4-7 months is not likely to improve physical growth significantly in the settings under study.

The amino acid induced aversion acts as an alarm signal. G Fromentin¹, S Feurté¹, D Tomé¹, S Nicolaïdis² (¹GER Nutrition humaine, Ina PG Paris 5; ²CNRS UPR 9054, Collège de France, Paris 5, France).

It has been demonstrated that rats could acquire an aversion for an amino acid devoid diet (DEV) [Booth and Simson (1971), *Quart J Exp Psy* 23, 135-149]. When given ad libitum a DEV for several days, a lot of deleterious metabolic consequences have been observed, eg, fatty liver infiltration, organs atrophy, etc.

We have shown previously that (i) essential amino acid deficient rats acquire an aversion for the familiar deficient food which induces a preference (neophilia) for a novel food when available and (ii) that a 4-day delay is necessary in order to reverse the initial choice in favour of a novel deficient food and to prefer the now corrected familiar version (COR) [Fromentin et al (1996), *Br J Nutr*].

This experiment was undertaken to determine the influence of the length of pre-feeding a threonine devoid diet (THR-DEV) on the strength of aversion, as assessed by both phenomena previously mentioned (i and ii). Group 1: 12 male Wistar rats (220-255 g) were pre-fed ad libitum a THR-DEV (8 days), and given a choice between a COR and a protein free diet (PO%) during the following 6 days. Group 2- ($n = 12$) were pre-fed ad libitum a chow diet (8 days), then a THR-DEV (3 g during 15 min). After a 5 h delay, they were given the same choice as group 1. The outcome variable was the daily PO% preference ratio, calculated as the grams of daily PO% diet intake over total daily food intake.

Whatever the group and as soon as the first choice day, a daily PO% preference was measured (> 0.5). No between group difference was observed when we measured the daily PO% preference or the 4 days delay necessary to reverse the initial choice in favour of a novel deficient food (PO%) and to prefer the COR.

As soon as the first meal of THR-DEV (group 1) and after only a delay of a few hours, the amino acid induced aversion acts as an alarm signal indicating to the rat to

avoid this deficient diet if available or to depress its food intake in order to diminish the deleterious consequences. Therefore the strength of aversion is not reinforced by the real deleterious consequences dramatically increased by a repeated THR-DEV intake.

Effects of a threonine-devoid diet on plasma aminoacids, energy metabolism and feeding. V Rolland¹, S Feurte¹, S Roseau¹, G Fromentin¹, S Mahe², S Nicolaïdis¹, D Tomé², PC Even¹ (¹ CNRS UPR 9054, Collège de France, 75005 Paris; ² GER Nutrition humaine, Ina-PG, 75005 Paris, France).

The mechanism of rapid recognition of an aminoacid-(AA) deficient diet and of its avoidance is still unknown. It is usually assumed that anorexia is induced, first by an AA imbalance at the level of plasma that subsequently results in neurochemical changes which constitute in fine the active agents at the level of feeding centers. Alternatively, the plasma AA imbalance could, by itself, alter the overall oxidative metabolism and thus generate another signal that can be used for building up anorexia. The aim of this study was to reveal the existence of AA imbalance, of alterations of energy metabolism and of concomitant anorexia following a calibrated threonine-devoid diet and to see whether changes in substrate-utilisation could precede or not the first symptoms of anorexia.

Thirteen male Wistar rats raised on a standard stock diet were housed in a calorimetric chamber and given either a threonine-corrected (TC) meal (55 kJ) containing 6 g/kg of threonine (control, $n = 7$) or a threonine-devoid (TD) meal ($n = 6$). Calorimetric measurements were performed from 2 h before to 10 h after feeding.

The extra energy production induced by feeding (thermic effect of feeding) did not differ between the TD and the TC diet. The