Are Weaning Infants at Risk of Iodine Deficiency Even in Countries with Established Iodized Salt Programs?

Michael B. Zimmermann

Iodine deficiency during early life may cause irreversible damage to the developing brain. Requirements per kg bodyweight for iodine and thyroid hormone during infancy are higher than at any other time in the life cycle. Thus, it is critical that dietary iodine is adequate in this vulnerable group. Although breast milk can supply adequate iodine to infants, as they are weaned from breast milk, usually in the second half of the first year, their dietary iodine intakes may fall. With the exception of some sea foods, the native iodine content of most foods is low. Residues from iodophors used during dairying and transport of milk can increase the iodine content of dairy products. But iodized salt, either used in the household or added to processed foods, is the primary source of iodine in the diets of many countries. For example, the two main sources of dietary iodine in the US and Switzerland are bread containing iodized salt and dairy products. However, iodized salt may not contribute significantly to infant iodine intakes because pediatricians and nutritionists recommend no extra salt (iodized or not) be given to infants during the first year. After breastfeeding for 6 months, mothers are encouraged to feed their infants home-prepared complementary foods (CF) without added salt. Moreover, cow’s milk (a major adventitious source of dietary iodine in older children) is also not recommended for infants during the first year.

Thus, for many weaning infants in industrialized countries, iodine fortified into commercial infant foods becomes important. This has recently been demonstrated in Switzerland, a country with a model iodized salt program that was initiated in 1922; in national surveys in 1999 and 2004, > 90% of households were using iodized salt and school children were iodine sufficient. The objectives of a recent Swiss study were to first measure urinary iodine concentration (UIC) in a national
A sample of pregnant women and school children to confirm that the Swiss population remains iodine sufficient, and then to collect UIC data from a nationally representative sample of infants. The median UIC in school children (n=916) and pregnant women (n=648) was 120 and 162 µg/l, respectively, indicating iodine sufficiency in both groups. Twenty-four participating clinics provided samples from exclusively breastfed infants on days 3 or 4 after birth. Overall, mUIC was 91 µg/l; at day 3, mUIC was 87 µg/l, and at day 4, it was 100 µg/l. For the older infants, 18 clinics provided 507 infant/mother pairs. The mUICs in the 6- and 12-month-old infants were 91 and 103 µg/l, respectively. Mean breast milk iodine concentration was 49 µg/kg, and 57% of the 6-month-old infants and 18% of the 12-month-old infants were being breastfed fully or partly. Breastfed infants with or without IFM had a lower mUIC than infants not currently breastfed (82 vs. 105 µg/l; p < 0.001). About 60% of all infants were receiving IFM, and their mUIC was higher than those not receiving IFM (109 vs. 73 µg/l; p < 0.001). Infants (breastfed and/or

![Fig. 1. Differences in mUIC (error bars show the 95% CI) by mode of infant feeding in 6- and 12-month-old Swiss infants. Group 1 (n=131): infants receiving breast milk, partly CF, but no infant formula milk (IFM); group 2 (n=304): infants receiving infant formula, partly combined with breast milk and/or CF; group 3 (n=72): infants receiving no breast milk or infant formula, but CF. * p < 0.01, significant difference between groups 1 and 2. The dashed-horizontal line indicates the World Health Organization cutoff value for the median urinary iodine indicating adequate iodine intakes in infancy.](image-url)
CF) receiving IFM had higher mUIC than breastfed weaning infants who did not receive IFM (109 vs. 70 µg/l; p < 0.01; fig. 1). These data suggest that even where a long-standing iodized salt program provides adequate iodine to pregnant women and school-age children, weaning infants not receiving iodine-containing commercial baby foods have inadequate iodine intakes. Thus, even in countries with effective iodized salt programs, infants may be at risk of iodine deficiency during weaning, and may need additional dietary and/or supplemental sources of iodine during this period.