

IDD ASPECTS RELATED TO SUPPLEMENTATION

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I-SALT IODINATION

1-It is well established that iodine supplementation is effective in correcting iodine deficiency and reducing goiter prevalence. In **Italy**, legislation has allowed the production of iodized salt since 1972, but its **consumption is on a voluntary basis. Measures that make compulsory the availability of iodized salt** in food stores overcomes the fact that there is no law governing the exclusive production and trading of iodized salt. (1)

2-Salt with **3.75 mg** iodide per kg was introduced in Switzerland stepwise in the individual cantons between **1922 and 1952**. The iodide content was raised to **7.5 mg in 1962 and to 15 mg per kg in 1980**. 92% of retail salt and 78% of all salt for human consumption (including salt used in industrial food processing) was iodized in 1989. Under this measure, prevalence of grade 1b or larger goiter dropped continuously to a present value of 1.3% in school-children and 0.3% in male army recruits. Endemic cretinism has disappeared completely (2).

II-IODIZED OIL

1-community-based controlled trial of iodine supplementation comparing oral or intramuscular iodized oil with oral potassium iodide has been carried out in 23 severely iodine-deficient villages in Eastern Zaire. **The study conclude that oral iodized oil is an effective alternative to**

injected oil and would be feasible for iodine supplementation in remote areas with untrained people. (3).

III-WATER IODINATION

1-In southern Xinjiang province, China, **after usual methods of iodine supplementation had failed iodinated irrigation water** to increase iodine in soil, crops, animals, and human beings was used. 5% potassium iodate solution, dripped into an irrigation canal for 12 or 24 days, increased soil iodine 3-fold, and crop and animal iodine 2-fold. Conclusion was that **iodination of irrigation water was an advantageous and cost-effective method of supplying iodine in southern Xinjiang, and may be useful in other areas dependent on irrigation.** (4)

2-A recently described method for the prevention and treatment of endemic iodine deficiency and goiter, **introduction of iodine into a public water supply**, was tested in Troina, a town of about 13,000 inhabitants in northeast Sicily. **At present prices, the cost of the water iodination program in Troina would be approximately 4 cents (U.S.) per person per year.** (5)

IV-SILICON ELASTOMERS

This approach relies on the controlled diffusion of iodine into water from a silicone elastomer. Silicone matrices installed in a bore well released iodine at a rate sufficient to permit the daily per capita intake of at least 100 micrograms of iodine. This new concept, adaptable to all sources of water supply, may contribute to the eradication of iodine deficiency. (6). The effectiveness of iodinated silicone polymers placed in bore wells for combating goiter in children under 15 years of age was evaluated in two villages in Mali. (7)

V-VACCINES

Iodine deficiency can be effectively reversed by administration of iodized oil (IO). Since 1989, the WHO Expanded Program on Immunization recommended delivery of oral IO along with vaccines, in appropriate

situations. However, administration of IO at the same time as trivalent oral polio vaccine (TOPV) has not been recommended because of absence of studies addressing potential harmful effects of iodized oil on immuno-responses to TOPV. In this study an in-vitro cell culture system was used to measure possible adverse effects of IO on TOPV. (8).

VI-FOLLOW UP STUDIES ON RESULTS OF MASS IODINATION

1-urinary iodine excretion in school children in an endemic area. In a community formerly severely endemic area Klatovy region, 213 school children (100 boys and 113 girls) aged 7 to 13 years (9) were examined **after more than 20 years of iodination of table salt**. The size and type of goiter was examined, height and body weight and urinary iodine excretion were assessed. The same examinations were made for comparison in 194 children (76 boys and 118 girls) in a Prague school, i.e. in an non-endemic area. The somatic development of the children from the endemic area, expressed as height and body weight, was retarded in relation to the development of children from Bohemia as a whole and in particular when compared with Prague children. In both groups only small diffuse goiters were observed or small nodular goiters, contrary to the period before the onset of iodination when at that age medium-sized diffuse and nodular goiters were frequent. The difference in the prevalence of goiter in both groups was significant in 8-9-year-old children of both sexes. In girls it persisted to the age of 10 years, there was considerable nodulation. In boys from the endemic area, goiter was found in 34.0%, in girls in 40.7%, nodulation was observed in boys in 14.0% and in girls in 18.7%, while in Prague the corresponding values in boys were 19.7% (and 3.9%, resp.) and in girls 20.3% (and 6.8%, resp.). The mean values of urinary iodine excretion varied in both areas and in the two sexes between 30.0 and 230.0 micrograms/l. Association revealed a statistically significant relationship between iodine excretion and the presence of goiter in boys and girls of the endemic area and boys from Prague. It was revealed that dietary iodine deficiency remains a permissive factor in the development of goiter and is more marked in former endemic foci. **Prevention by iodised table salt protects newborn infants, but does not prevent the development of goiter in all subjects in the course of development of the organism. The possibility of reinforced iodination in treated areas deserves consideration.**

2-Evaluation of iodine in England.

Levels of I were determined in selected foods and dietary supplements, and in samples of the British 'Total Diet'. The average concentration of I in British milk collected in thirteen areas on four occasions during 1990 and 1991 was 150 micrograms/kg (range 40-310 micrograms/kg), compared with 230 micrograms/kg in 1977-79. **No difference was found between skimmed and whole milk. Winter milk contained 210 micrograms/kg while summer milk contained 90 micrograms/kg.** Regional differences were less pronounced than seasonal differences. Levels in fish and fish products were between 110 and 3280 micrograms/kg. Edible seaweed contained I levels of between 4300 and 2,660,000 micrograms/kg. Kelp-based dietary supplements contained I at levels that would result in a median intake of 1000 micrograms if the manufacturers' recommended maximum daily dose of the supplement was taken, while other I-containing supplements contained a median level of 104 micrograms in the manufacturers' maximum recommended daily dose. Intake of I, as estimated from the Total Diet Study, was 173 micrograms/d in 1985 (277 micrograms if samples with very high I contents were included) and 166 micrograms/d in 1991. These levels are above the UK reference nutrient intake of 140 micrograms/d for adults but well below the Joint Expert Committee on Food Additives provisional maximum tolerable intake of 1000 micrograms/d. (10)

3-Circadian and seasonal variations in iodine excretion in children.

Circadian and seasonal variations of urine volume and iodine excretion were statistically verified by the cosinor technique and the seasonal variations also by one way analysis of variance using the circadian means as input. The circadian rhythm in iodine excretion has to be taken into account whenever an estimate of the 24-hour excretion is attempted from a sample covering less than the entire 24-hour span. The seasonal variation in urinary iodine excretion thus points to a time when increased iodine prophylaxis may be of value. (11)

VII-SIDE EFFECTS OF IODINATION

Iodine is an essential nutrient for the normal growth and development of humans and animals and is necessary for normal metabolism and regulation of thyroid hormones. Iodine excess can produce thyrotoxicosis but not cancer. However, radioiodine is carcinogenic for the thyroid gland. Dietary iodine deficiency is associated with goiter in humans and animals. The goiter develops because of a feedback system between thyroid hormones, the pituitary gland, and the hypothalamus, and it regulates the synthesis and release of thyroid-stimulating hormone. Chronic hypersecretion of thyroid-stimulating hormone causes profound goiter (diffuse thyroid hyperplasia), which appears to be related to carcinogenesis. Chronic dietary iodine deficiency in rats leads to thyroid follicular adenomas by 12 months and follicular carcinomas by 18 months. An increased risk of thyroid cancer has been reported in humans with goiter and those living in some iodine-deficient areas of the world. In very recent animal studies, iodine deficiency, chemical goitrogens, and thyroid toxins have been shown to have potent tumor-promoting effects. In rats, iodine deficiency is a much more effective tumor promoter than it is a carcinogen, suggesting that a similar relationship may exist in human populations. **These studies suggest that a major role of iodine is to prevent the formation of thyroid tumors in humans and animals.** (12).

4-Environmental iodine intake in patients treated by methimazole :

These results indicate that treatment with recommended doses of MMI rapidly causes hypothyroidism in patients residing in Teheran, (13) an area of iodine deficiency. Furthermore, they support the hypothesis that the dosage of thionamide compounds and the duration of therapy with the initial doses necessary to induce euthyroidism may vary in various parts of the world.

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