

COMMITTEE ON TOXICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

STATEMENT ON IODINE IN COWS' MILK

Introduction

1. We have considered a draft Food Surveillance Information Sheet ¹ describing the results of a survey carried out for the MAFF/DH Joint Food Safety and Standards Group on the concentration of iodine in cows' milk.

Results of the survey

2. Representative purchases of whole (93 samples), semi-skimmed (107 samples) and skimmed (20 samples) pasteurised cows' milk on sale in the UK were made during the summer of 1998 and the winter of 1998/1999 from Belfast, Edinburgh, Swansea, Sunderland, Leicester and London and were analysed for total iodine. We welcome this latest survey of iodine in cows' milk. The overall mean iodine concentration in cows' milk was 311 µg/kg. We note that mean iodine concentrations were lower in summer (200 µg/kg) compared to winter (430 µg/kg). The higher concentrations in winter may reflect greater use of supplemented compound feedstuffs during this period. We also note that the fat content of the milk did not influence these values.

3. Since 1989 we have reviewed iodine concentrations in cows' milk on a number of occasions, most recently in September 1997.² In our 1997 review we noted that iodine concentrations in cows' milk were higher than in previous surveys, though the reasons for this were unclear. We considered that these higher concentrations of iodine were unlikely to pose a risk to health but we recommended that the monitoring of iodine in cows' milk should continue. Possible sources of iodine in cows' milk include iodine in the animal diets and the iodophors used as sterilants of cow teats and milking vessels. Therefore, we encouraged investigation of the bioavailability of iodine in iodophors and the different chemical forms of iodine in cows' milk. This would help to identify potential sources of iodine in cows' milk. Additionally, we requested study of the different chemical forms of iodine in infant formulas. We have been informed that research is underway to investigate the iodophors and the different chemical forms of iodine in cows' milk and infant formulas.

4. We note that the concentrations of iodine in cows' milk reported in this latest survey are similar to those we considered in 1997 but are higher than values reported in the earlier surveys.³⁻⁵

Dietary iodine intake

5. Iodine is an important nutrient element and is required for the synthesis of thyroid hormones. An inadequate intake can lead to a broad spectrum of iodine deficiency diseases. For protection against iodine deficiency the Department of Health's Committee on Medical Aspects of Food Policy has recommended a Reference Nutrient Intake (RNI) for adults of 140 µg/day. The RNI for children ranges from 50 µg/day (for children aged 0-3 months) to 140 µg/day (for children aged between 15-18 years).⁶ However, a high intake of iodine can result in functional impairment of, and tissue damage to, the thyroid gland and death has been caused by extremely high intakes. In our previous review,² we took reassurance from a study in which 1-11 year old children were given doses of iodine up to 1000 µg/day over a period of 4 months without signs of toxicity.⁷ In order to protect individuals against the toxic effects of excessive iodine intake the Joint Expert Committee on Food Additives (JECFA) of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) has recommended a Provisional Maximum Tolerable Daily Intake (PMTDI) of 0.017 milligrams per kilogram body weight (mg/kg b.w.).⁸ This is applicable to individuals over the age of 12 weeks and is equivalent to 1000 micrograms (µg)/day for a 60 kg adult (the equivalent values for children are reported in the Table).

6. There are few data on which to base estimates of the potential intake of iodine by different age groups. Iodine intakes from milk have been estimated for adults and for children aged 1½ - 2½, 2½ - 3½, and 3½ - 4½ years, using mean iodine concentrations in milk from this survey¹ and consumption data from the National Dietary and Nutritional Survey.^{9,10} No intakes were estimated for schoolchildren as the available consumption data for this age group are limited and outdated. It is understood that new data to address this point will be available soon. To estimate the current total dietary intake, incorporating the latest concentrations of iodine in milk, the mean population dietary intake estimated from the 1995 Total Diet Study¹¹ minus the contribution from milk was added to the intakes from milk alone estimated from this survey. These intake estimates from milk alone and from the total diet are presented in the Table. We note that the estimate of mean population dietary intake is based on household, rather than individual, consumption. Therefore the estimate of the non-milk intakes will be biased by the intakes of adults in the household; in consequence the value added for non-milk sources (123 µg/day – see the Table) is likely to be an overestimate for children.

7. Calculations for adults suggest that the average and high level (97.5th percentile) consumer of milk would ingest 194 and 301 µg/day respectively from the total diet (including milk), which are both within the guideline intake calculated from the JECFA PMTDI of 0.017 mg/kg b.w. As detailed in the Table the estimated total dietary intakes for average level consumers of milk in the 1½ - 2½, 2½ - 3½, and 3½ - 4½ age ranges are 221, 215, and 204 µg/day respectively, which are close to the guideline intake. For high level consumers of milk in the 1½ - 2½, 2½ - 3½, and 3½ - 4½ age ranges the estimated total dietary intakes are 362, 379, and 330 µg/day respectively, all

of which exceed the relevant guideline intake. For high level consumers of milk in the 1½ - 2½ and 2½ - 3½ age ranges, though not the 3½ - 4½ age range, the estimated intake from milk alone exceeds the relevant guideline intake. As shown in the Table exceedence of the guideline intake occurs mainly in the 1½ - 2½ and 2½ - 3½ age ranges and after children reach the age of 3½ exceedence is restricted to high level consumers only.

Recommendations

8. Our recommendations are:
- The revised dietary intakes estimated from the results of this survey support our conclusions of September 1997 that monitoring of iodine concentrations in cows' milk should continue;
 - We have been informed that the UK Expert Group on Vitamins and Minerals will be reviewing the toxicity of iodine in due course and we may wish to reconsider these survey results in the light of the findings of that group;
 - The revised dietary intakes increase the need for data on the different chemical forms of iodine in cows' milk and infant formulas and on the bioavailability of the iodine in iodophors. We therefore request that we see the results on the studies on the different chemical forms of iodine in cows' milk and infant formulas at the earliest opportunity and we reiterate our previous recommendation that the bioavailability of the iodine in iodophors is investigated.

Conclusions

9. We have made a number of recommendations, including investigation of the bioavailability of iodine from iodophors in milk. However, we conclude that the new data from this latest survey do not alter our previous advice that the concentrations of iodine in cows' milk are unlikely to pose a risk to health, even in those children who are high level consumers.

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Table 1: Estimated dietary iodine intakes of adults and young children

	Dietary exposure ($\mu\text{g}/\text{person}/\text{day}$) *				Guideline intake ($\mu\text{g}/\text{day}$) ²
	<i>via</i> milk only		<i>via</i> total diet ¹		
	Mean	97.5%ile	Mean	97.5%ile	
Summer					
Adult (16 - 64 years)	46	118	169	241	1000
Child (1½ - 2½ years)	59	147	182	270	210
Child (2½ - 3½ years)	58	171	181	294	250
Child (3½ - 4½ years)	51	138	174	261	280
Winter					
Adult (16 - 64 years)	96	234	219	357	1000
Child (1½ - 2½ years)	142	332	265	455	210
Child (2½ - 3½ years)	129	329	252	452	250
Child (3½ - 4½ years)	114	266	237	389	280
Average					
Adult (16 - 64 years)	71	178	194	301	1000
Child (1½ - 2½ years)	98	239	221	362	210
Child (2½ - 3½ years)	92	256	215	379	250
Child (3½ - 4½ years)	81	207	204	330	280

* values in **bold** text exceed the relevant guideline intake

¹ To estimate total dietary intake the mean population dietary intake of iodine minus the contribution from milk (i.e. $209 \mu\text{g}/\text{day}$ [total diet] - $86 \mu\text{g}/\text{day}$ [milk] = $123 \mu\text{g}/\text{day}$) was added to the intakes from milk alone estimated from this survey. For example, to estimate the average total dietary intake for adult consumers during the summer the intake from milk i.e. $46 \mu\text{g}/\text{day}$, is added to $123 \mu\text{g}/\text{day}$ to give a final value of $169 \mu\text{g}/\text{day}$

² This guideline intake, calculated for the purposes of this statement, is equivalent to the JECFA PMTDI of $0.017 \text{ mg}/\text{kg}$ b.w. when expressed on a total body weight basis. For example, for children aged $1\frac{1}{2}$ - $2\frac{1}{2}$ years weighing 12.3 kg the PMTDI is equivalent to $210 \mu\text{g}/\text{day}$ (rounded to 2 significant figures)

References

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