Iodine concentration in canteen meals prepared with or without iodized salt

Introduction

In contrast to the recommendations of the Deutsche Gesellschaft für Ernährung (200 µg/d) (2), presently, iodine (I) intake in western Germany amounts to only about 60 µg/d for adults (3), which implicates a high risk of I deficiency diseases. To increase I intake the use of I-supplemented NaCl (iodized salt) is recommended, not only for food preparation in households, but also for central catering in institutions. However, no data are available so far which describe the increase of I content of meals by use of iodized salt in canteen kitchens under non-laboratory conditions.

Material and methods

Fifteen mostly equal lunch meals were collected from two university canteens. In canteen A usage of iodized salt was obligatory, while in the other one (canteen B) meals were prepared without iodized salt. Each meal consisted of one main dish (meat, fish or ovo-lacto-vegetarian) and...
two or three side dishes (soup, pasta, rice, potatoes, vegetables, salad, dessert). Nine of 15 lunch meals contained meat or meat products, five were ovo-lacto-vegetarian, one contained fish; if soup was included (five times) no dessert was chosen. Special care was taken over the equal composition of meals. Few exceptions were made when both canteens did not offer the same side dishes within six weeks (e.g., broccoli for cauliflower, plum compote for cherry compote). After collection the meals were minced and homogenized (Ultra-Turrax T25, Janke & Kunkel, Staufen i.Br./FRG) and aliquots were frozen at -20 °C until analysis.

I content in meals was determined as ethanol iodide by means of a GC with ECD (5). In principle, by addition of sulfuric acid and ethyleneoxide anorganic iodide of the samples is converted to ethanol iodide; the latter can be extracted with ethylacetate and injected in the GC. Meal samples were pretreated with a mixture of pancreatic enzymes (Pancreatin; Sigma Chemie, Deisenhofen/FRG). Mean recovery of added KI (Merk, Darmstadt/FRG) was 95 % (n = 6) with a mean coefficient of variation of 5.7 %. By means of reagent blanks (in each series) no I contamination during sample preparation procedure was found. NaCl concentrations in meals were determined by the method of Mohr after incineration (20 h, 550 °C) (4). Average weight of the meals was calculated according to the recipes given by the institutions. In addition, energy content of the meals was calculated by means of Prodi III plus (Wissenschaftliche Verlagsgesellschaft, Stuttgart/FRG).

**Results and discussion**

The effect of iodized salt usage on the I concentration of the meals was more distinct than expected. The meals in canteen A contained 6.1 μg/100 g ww more I than meals of canteen B (Table 1). Expressed in relation to the NaCl content, 11.9 ppm I were detected in the meals of canteen A (+ 8.5 ppm compared to canteen B) which equals about half the I concentration of iodized salt (15–25 ppm). This is in good accordance with the results of Weber and coworkers who found an actual increase in I intake of about 10 μg per g iodized salt used in households (7). The rather high NaCl concentrations measured fit in well with results published for NaCl contents in lunch meals prepared in university canteens (6). An I/NaCl quotient of the meals lower than of iodized salt results from non-iodized NaCl in purchased food with different convenience levels as well as from losses of I during food preparation (e.g. rejected cooking water, evaporation) (1). On average, a complete lunch meal in canteen A contained 56.5 μg I, that means 39.5 μg I more than in canteen B. If this result obtained from a small number of samples is representative, the contribution of iodized salt used in central catering to total dietary I supply has been underestimated; the use of iodized salt in households and in central catering together was estimated to enhance I intake by about 20 μg/d (3). However, this finding does not implicate a distinct modification of the currently proposed concept for increasing I intake in Germany (3): with the use of iodized salt in households (1.8 g/d; 7) as well as with participation in central catering in institutions which also use iodized salt for meal preparation, I intake will probably increase by about 50–60 μg/d. Together with the natural I content of food, a total intake of little more than 100 μg I/d would result for adults; this still remains about 50 % below the recommendation of DGE (2).

<table>
<thead>
<tr>
<th></th>
<th>Canteen A (+ iodized salt)</th>
<th>Canteen B (- iodized salt)</th>
<th>Mean difference (A-B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>μg I/100 g ww</td>
<td>8.6 ± 3.2</td>
<td>2.5 ± 1.7</td>
<td>+ 6.1</td>
</tr>
<tr>
<td>g NaCl/100 g ww</td>
<td>0.72 ± 0.23</td>
<td>0.78 ± 0.20</td>
<td>- 0.06</td>
</tr>
<tr>
<td>μg I/g NaCl</td>
<td>11.9 ± 3.2</td>
<td>3.4 ± 2.4</td>
<td>+ 8.5</td>
</tr>
<tr>
<td>μg I/meal</td>
<td>56.5 ± 24.1</td>
<td>17.0 ± 9.9</td>
<td>+ 39.5</td>
</tr>
<tr>
<td>μg I/1000 kcal</td>
<td>66.9 ± 25.5</td>
<td>20.7 ± 14.2</td>
<td>+ 46.2</td>
</tr>
</tbody>
</table>

ww: wet weight; *** significantly different means, p ≤ 0.001 (unpaired t-test)
References