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Iodine concentration in canteen meals prepared with or without iodized salt

Jod-Gehalt von Großküchen-Menüs mit oder ohne Verwendung von jodiertem Speisesalz

Summary In each of two university canteens differing in the use (canteen A) or non-use (canteen B) of iodized salt for food preparation, 15 mostly equal lunch meals were collected for iodide and NaCl analysis. With similar NaCl

content, the meals of canteen A contained on average $6.1 \mu\text{g I}/100 \text{ g ww}$ ($8.5 \mu\text{g I/g NaCl}$) more I than the meals of canteen B. Total I intake by consumption of an average meal of canteen A was estimated as $56.5 \pm 24.1 \mu\text{g}$ (canteen B: $17.0 \pm 9.9 \mu\text{g}$). Consequently, the use of iodized salt in central catering seems to play a more important role in a sufficient I intake than assumed so far.

Zusammenfassung In zwei Universitäts-Großküchen, die für die Nahrungszubereitung jodiertes Speisesalz immer (Mensa A) oder nie (Mensa B) verwendeten, wurden 15 möglichst gleiche Mittagessen gesammelt und auf ihre Gehalte an Jodid und NaCl analysiert. Bei durchschnittlich ähnlichem Kochsalzgehalt enthielt das Essen in

Mensa A im Mittel $6,1 \mu\text{g I}/100 \text{ g ww}$ ($8,5 \mu\text{g I/g NaCl}$) mehr Jod als in Mensa B. Die Gesamtjodaufnahme mit einem durchschnittlichen Mittagessen in Mensa A betrug demnach $56,5 \pm 24,1 \mu\text{g}$ (Mensa B: $17,0 \pm 9,9 \mu\text{g}$). Dem Einsatz von jodiertem Speisesalz in der Gemeinschaftsverpflegung scheint somit eine wichtigere Rolle auf dem Weg zu einer ausreichenden Jodaufnahme zuzukommen als bisher angenommen wurde.

Key words Iodine – iodized salt – canteen – lunch meals – sodium chloride

Schlüsselwörter Jod – jodiertes Speisesalz – Großküche – Mittagessen – Natriumchlorid

Abbreviation index *ww* = wet weight · *I* = Iodine

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Introduction

In contrast to the recommendations of the Deutsche Gesellschaft für Ernährung ($200 \mu\text{g/d}$) (2), presently, iodine (I) intake in western Germany amounts to only about $60 \mu\text{g/d}$ 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 ethylenoxide 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 1 Iodine concentration in 15 selected lunch meals prepared with (canteen A) or without (canteen B) use of iodized salt in university canteens (mean ± standard deviation)

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

ww: wet weight; *** significantly different means, $p \leq 0.001$ (unpaired t-test)

References

1. Ballauff A, Rost-Reichert I, Kersting M, Weber P, Manz F (1988) Erhöhung der Jodzufuhr durch die Zubereitung von Kartoffeln, Nudeln und Reis mit jodiertem Speisesalz. *Ernährungs-Umschau* 35:16–18
2. Deutsche Gesellschaft für Ernährung (DGE) (1991) Empfehlungen für die Nährstoffzufuhr. Umschau Verlag, Frankfurt/Main
3. Deutsche Gesellschaft für Ernährung (DGE) (1992) Ernährungsbericht 1992. Druckerei Henrich, Frankfurt/Main, pp 287–302
4. Matissek R, Schnepel F-M, Steiner G (1992) *Lebensmittelanalytik*. Springer-Verlag, Berlin, pp 244–248
5. Stijve T, Diserens JM, Blake C (1988) Rapid gas chromatography determination of inorganic iodide in milk products and dietetic foods. *Dt Lebensmittel-Rundschau* 84:341–344
6. Stehle P, Schindler B, Wolf H, Schimatschek HF, Classen HG, Fürst P (1991) Ernährungsphysiologische Beurteilung des Mensaessens der Universität Hohenheim: Vergleich der Nährstoffaufnahme mit den Zufuhrempfehlungen. *Akt Ernähr Med* 16:224–231
7. Weber P, Manz F, Klett M, Horster FA (1987) Die Bedeutung von jodiertem Speisesalz für die Jodversorgung von Erwachsenen und Kindern. *Monatsschr Kinderheilkd* 135:137–142