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Food Chemistry, Vol. 57, No. 1, pp. 77–82, 1996
Elsevier Science Ltd
Printed in Great Britain

Posters from Section III

Assay of menus as part of multicenter clinical feeding trials. K. Stewart,[a]* K. Phillips[a] & C. Champagne[b] (for the DELTA and DASH Investigators).

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In experimental feeding trials, chemical measurement of the key nutrients in prepared diets is essential to definitively link endpoint measurements to different dietary treatments. Some investigators have believed that long-term, multicenter diet studies would be difficult due to variance of key nutrient concentrations across centers and across time. The NHLBI-sponsored DELTA and DASH studies are conducting multicenter, long-term feeding trials. Therefore, it was necessary to document that the diets fed at different centers were 'virtually identical' throughout the diet interventions spanning 8 months or longer. DELTA used central procurement of fat sources, local procurement of the other foods and local preparation of the diets using standardized recipes. DASH used local procurement of the foods and local preparation of the diets using standardized recipes. Both studies used foods donated by various commercial companies. The DELTA group did a pilot study in which 3 menus were prepared 3 separate times at each of 4 centers. The diets were shipped to our laboratory, then composited individually and assayed for the key nutrients in the study. The key nutrient levels were consistent across centers and across time demonstrating the feasibility of conducting a multicenter study using local diet preparation. Both DELTA and DASH did prefeeding menu validation. To ensure that enough menus met target nutrient levels for each diet, 150% of the needed menus were designed and calculated to meet target nutrient specifications using food composition tables. Menus for each diet were prepared at each of two centers, shipped to our laboratory, composited individually, and assayed for the key nutrients (DELTA: total fat, saturated fat, monounsaturated fat, polyunsaturated fat, and cholesterol; DASH: sodium, potassium, magnesium, calcium and total fat). In DELTA 75% of the menus met design nutrient specifications for all 3 diets and were used for the dietary intervention; in DASH 60% of the menus met the design specifications; the remaining menus were omitted from the studies. Both DELTA and DASH also monitored diet composition during the feeding intervention. All diets were sampled for full diet cycles, at specified intervals at the 4 centers throughout the feeding trial and assayed as diet cycle composites. To date, the assayed contents of diet cycle composites have been reproducible and shown the designed clear separation of the experimental variables across centers throughout the long (months) experimental feeding periods. Rigid assay control, including the use of fixed assay procedures and quality control standards was essential to obtain analytical data with acceptable precision and without assay drift. These studies demonstrate that well-defined identical diets can be fed at multiple sites over periods of months, providing adequate design, validation, monitoring, and assay protocols are followed. Supported by grants no. 5-U01-HL-49644-03 and 1-U01-HL50982-01 from NHLBI.

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Nutrient losses and gains in the preparation of foods: NLG project. Lena Bergström.

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The Eurofoods Nutrient Losses and Gains Project (NLG) was established in 1983. The aim of the project was to collect data related to nutrient losses and gains in the preparation of foods with a view to recommend factors for use with the calculation of nutrient content of foods and recipes.

The suggested NLG standard factors at the recipe level were based on mean values (some values are modified) of factors published by different government agencies. Factors were applied to 11 vitamins (retinol, β-carotene, vitamin C, thiamin, riboflavin, niacin, B_6, folacin, B_{12}, pantothenic acid, biotin). Separate factors were determined for preparation without heat and the cooking methods of boiling, shallow frying and baking or roasting. These were used for all food groups, except meat and poultry, for which alternative factors were derived.

The NLG factors were used in a study in which the analysed and calculated nutrient content of six Swedish dishes was compared. The nutrient data base was PC-Kost, version 1991. The values are produced as follows: Dishes, analysed by the laboratories of the National Food Administration; Recipes, calculated on raw ingredients with factors for weight yield and vitamin retention. Computer system: AIVO AB; Recipes, calculated on raw ingredients with weight yield factors. Computer system: Rudans Lättdata; Recipes, calculated on raw ingredients. Computer system: Rudans Lättdata.

The results of the comparison show that some calculated values agree rather well with the analytical data, while others do not, e.g. in boiled beef, where some nutrients should be found in the bouillon. The differences may partly be due to different nutrient contents in the analysed ingredients than in the ingredients included in the data base.

This comparison is simply an example of a small practical experiment. Many people consider that comparisons like these must always be performed on dry matter basis. But on the other hand, a very practical method of calculating recipes on wet weight with standard NLG factors is needed.

The NLG work is described in The National Food Administration report series, Rapport 32/94.

Comparison of calculated and analyzed values: antioxidant and fatty acid composition. L. Valsta,[a,b] M. Heinonen,[c] M. Anttolainen[a,b]* & M. Mutanen.[c]

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Most often the nutrient composition of a diet is calculated from food composition tables containing data from miscellanious sources. This can cause considerable variation in the results. Recently, new data based on food composition analyses of carotenoids, retinoids, tocopherols, tocotrienols and fatty acids in Finnish foods has been produced. To evaluate the differences in antioxidant and fatty acid data obtained by different methods, the compositions of three Finnish diets differing in their fat quality were estimated by calculation and by analyzing double-portions of the diets.

The diets were a saturated fat diet (milk fat, MF), a monounsaturated fat diet (rapeseed oil and margarine, RO), and a polyunsaturated fat diet (sunflower oil and margarine, SO). The diets contained the foods of 14–25 days' menus.

The analyzed values of the antioxidants and fatty acids were in general about 90% of the calculated values with some exceptions: The analyzed beta-carotene and retinol values of the oil diets (RO and SO) were only around 50–60% of the calculated values. The analyzed gamma-tocopherol contents for MF and SO diets were 120–180% of the calculated contents, but only 90% in case of the RO diet. The analyzed gamma-tocotrienol and delta-tocopherol values were about 2–8-fold compared to the calculated values.

The analyzed values of saturated fatty acids were 85–113%, monounsaturated fatty acids 65–89%, and polyunsaturated fatty acids 83-99% of the calculated values.

The reasons for the differences found between analyzed and calculated diet composition can be explained by: real differences in food composition (time, cultivar etc.), different enrichment procedures of margarines, food preparation losses, different analytical methods used, processing of the double portion sample, and possible inaccuracies, when nutrients present in small concentrations are analyzed.

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Freezing effect on carotenoid content in raw and cooked vegetables and fruits. B. Olmedilla,* F. Granado, E. Gil-Martinez & I. Blanco.

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Our aim was to evaluate one of the factors, freezing, that can modify the value of individual carotenoids content in foods and even the bioavailability of these compounds. With this study we try to improve the information available in the Food Composition Table/ Database and used in dietary assessment and large scale surveys.

The effect of freezing/thawing (at –20°C for 1 month under nitrogen atmosphere/16 h at 4°C and protected from light) was evaluated under two circumstances: before the analysis of the sample (situation frequent in many laboratories), as well as after being cooked for consumption (situation very common in households).

Several vegetables (green celery, white celery, tomato paste, leek and peas) and fruits (tangerine, medlar, green plum, avocado) were purchased in the market seasons and used for this study. Lutein, zeaxanthin, lycopene, β-carotene, a-carotene and β-cryptoxanthin content were determined by a validated HPLC method (Olmedilla *et al.*, 1990; Granado *et al.*, 1992), under different conditions of the sample: raw, raw-frozen, cooked and cooked-frozen.

The effect of freezing and thawing on individual carotenoid content, isomerization degree and biological activity is discussed, in the light of the presence of clorophylls and/ or carotenoid esters.

This work has been partially performed under the AIR2-CT93-0888 contract of the European Union (DGXII).

Olmedilla *et al. J. Lig. Chromatog.*, **13**(8), 1455–83 (1990). Granado *et al., J. Agric. Food Chem.*, **40**, 2135–40 (1992).

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Carotendoids: new data needed in The Netherlands nutrient databank (NEVO). Corine J.M. Beemster, Karin F. A. M. Hulshof* & Susanne Westenbrink.

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In recent epidemiological studies positive health effects of some natural anti-oxidants has been observed. From this point of view there is an increasing interest in accurate data on several anti-oxidants, for instance carotenoids (such as β-carotene, lycopene and lutein).

In the Netherlands, data of the Dutch National Food Consumption Surveys carried out in 1987/88 and 1992 provide information on food consumption (2-day record), life-style and background variables. The data of the DNFCS can be converted into energy and nutrients using the Netherlands Food Nutrient Databank.