Evaluation of dietary fibre in meals-on-wheels meals in Melbourne

(for editorial comment, see page 171)

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ABSTRACT The elderly are considered to be a group of persons who are at risk of suffering the health problems that are associated with inadequate nutrition. The delivery of meals to homes, the meals-on-wheels programme, has been an approach to reduce this risk, but there is little information about the contribution of such a programme to the total diet or to particular nutrient intakes. The dietary-fibre content of meals that were collected over four seasons from three Melbourne metropolitan meals-on-wheels areas was determined chemically and compared with the fibre content as calculated by means of food-composition tables. The analysed and calculated dietary-fibre contents of meals-on-wheels meals were 7.3 g and 6.4 g, respectively. The total daily dietary-fibre intake was assessed in recipients of the meals-on-wheels services by a three-day food-record, and also by means of a dietary history. The dietary-fibre intake was 16 g/day by both methods. Most dietary fibre came from vegetables; the fruit fibre was derived exclusively from citrus fruit, and no cereal fibre was provided, except in desserts. The contribution of meals-on-wheels meals to the estimated daily dietary-fibre intake of meals-on-wheels recipients was 46% as determined by chemical analysis and 40% as calculated from food-composition tables. The contribution of meals-on-wheels meals to a suggested desirable total intake of dietary fibre of 25–30 g/day for the elderly was 24%–29% as analysed and 21%–26% as calculated. Thus, the contribution of meals-on-wheels meals to the total dietary-fibre intake was reasonable but low in comparison with the desirable intake. Home-delivered meals could contain higher levels of dietary fibre by the inclusion of more foods which contain whole-grain cereals, nuts, legumes and vegetables. (Med J Aust 1989; 150: 173-174)

About 800 meals-on-wheels services provide 10 million meals per year in Australia,[1] but few data exist on their nutritional value. As a group, elderly persons are considered to be at risk of the health problems that are associated with inadequate nutrition. Dietary fibre may play a role in the evolution of large-bowel disease,[2] macrovascular disease[3,4] and diabetes.[5,6]

In 1977, the Commonwealth Department of Health suggested that meals-on-wheels meals should provide two-thirds of the Australian recommended dietary allowance for vitamin C, and one-half of the allowance of other nutrients, although there was no specific recommendation about dietary fibre.[7] It is not known if Australian meals-on-wheels services' menus or delivered meals meet these criteria. The present study was undertaken to investigate the dietary-fibre content of meals-on-wheels meals and to compare the values that are obtained by chemical analysis with those that are calculated by means of food-composition tables.

Methods

Meals were obtained at random from three Melbourne metropolitan meals-on-wheels services over four seasons in 1985. This was carried out just before the dispatch of the meals and they were then held under simulated delivery conditions. Each component of the meal (soup, meat, vegetables, dessert and orange juice or a fresh orange) was weighed rapidly and stored at −20°C for a maximum of seven days before homogenization. Dietary fibre was determined by the enzymic method of Prosky et al.[8] The dietary-fibre content of the composite meals also was assessed by calculation by means of the CSIRONET DIARYAN program, which is based on British food-composition tables and some Australian additions, as described previously.[9]

The daily dietary-fibre intake was estimated in recipients of the meals-on-wheels services by a three-day food-record, and also by a dietary history. Statistical analysis was performed with the Statistical Package for the Social Sciences (SPSS).

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Results

From the three Melbourne metropolitan services, the mean (±SE) daily dietary-fibre content as determined by chemical analysis and the mean (±SE) calculated daily dietary-fibre content of meals-on-wheels meals were 7.3±0.6 g and 6.4±0.5 g, respectively (Table). There was no significant difference between the two methods of estimating dietary fibre ($P>0.05$). The dietary-fibre content of meals-on-wheels meals in Service 2 was 5.6±0.4 g (analysed) and 4.7±0.4 g (calculated) (Table). These figures were significantly lower than were those that were found for the other services ($P<0.01$).

TABLE: Dietary-fibre content (mean ± SE) of meals from three Melbourne metropolitan meals-on-wheels services

Meals-on-wheels service	No. of meals	Dietary-fibre content (g/meal)	
		Analysed*	Calculated†
1	15	7.7±0.8	6.9±0.6
2	15	5.6±0.4	4.7±0.4
3	15	8.5±0.6	7.6±0.6
Total	45	7.3±0.6	6.4±0.5

Analysed refers to values obtained by chemical analysis. †Calculated refers to values derived from modified McCance and Widdowson's food-composition tables.

The total daily dietary-fibre intake was assessed in recipients of the meals-on-wheels services by a three-day food-record and also by a dietary history. The estimate of dietary-fibre intake was 16±0.6 g/day by both dietary methods.[10] The contribution of the meals-on-wheels meals to the estimated daily dietary-fibre intake of the meals-on-wheels recipients was 46% and 40% for the analysed and calculated values, respectively. The suggested intake for dietary fibre is 25–30 g/day. This amount is based on food intakes that have been shown to be associated with "optimal" mortality rates,[11] and takes into consideration problems with the bioavailability of micronutrients in the elderly which are associated with dietary fibre.[12] The contribution of the mean dietary-fibre intake from the meals-on-wheels meals from the three services to the suggested daily intake of dietary fibre ranged from 24% to 29% and from 21% to 26% for the analysed and calculated intakes, respectively.

A typical menu of the meals-on-wheels services for one week is shown in the box. From this box we can see that most of the dietary fibre is derived from vegetables.

Discussion

Research into the effects of dietary fibre on health is complicated by the lack of a single analytical method to characterize all the components in fibre. The physiological properties of dietary fibre depend on the composition of these individual components and whether they are consumed in food, in fibre-rich supplements or as isolated components. In some cases, the classification of dietary fibre into soluble or insoluble fractions is useful in describing its characteristics and effects.[13] However, although this classification is convenient, it depends on the analytical method that is used and is complicated further because some dietary-fibre constituents (pectin and hemicellulose) can be detected in both fractions. Similarly, the current analytical methods for dietary fibre are inadequate to estimate the amount of fermentable and non-fermentable fibre. This depends on the composition and physical nature of the dietary fibre

Typical menu of a meals-on-wheels service

Monday	Tuesday	Wednesday	Thursday	Friday
Peas (49 g)	Pumpkin (61 g)	Boiled carrots (85 g)	Brussels sprouts (68g)	Fried chips (52 g)
Cauliflower (93 g)	Cabbage (62 g)	Beans (57 g)	Carrots (53 g)	Mixed vegetables (60 g)
Mashed potatoes (66 g)	Boiled potatoes (55 g)	Mashed potatoes (63 g)	Roast potatoes (39 g)	Hake in butter (130 g)
Sausages (131 g)	Mustard sauce (26 g)	Chicken breast (149 g)	Roast beef (98 g)	Jellied two fruits (224 g)
Gravy (31 g)	Corned beef (83 g)	Gravy (15 g)	Gravy (22 g)	Cream (18 g)
Tinned apricots (59 g)	Creamed rice and plum	Baked egg custard (154 g)	Steamed pudding	Vegetable soup (187 g)
Sponge cake (37 g)	sauce (136 g)	Pea and ham soup (242 g)	(70 g)	Orange juice (60 g)
Minestrone soup (199 g)	Chicken noodle soup	Orange juice (62 g)	Custard (32 g)	
Orange juice (64 g)	(238 g)		Vegetable soup (170 g)	
	Orange juice (62 g)		Fresh orange (150 g)	

as well as on the nature of the colonic flora of the person who is ingesting the fibre.

The characterization of individual dietary-fibre components which better can be related to the physiological properties of dietary fibre is not practical for large numbers of samples. The procedure that was adopted in the United States by the Association of Official Analytical Chemists for the routine analysis of total dietary fibre[14] is based on the method of Prosky et al.[8] This procedure involves enzymic treatment of the sample and the gravimetric determination of the residue after correction for ash and protein.

The main food sources of dietary fibre are cereals, fruits, vegetables and nuts. Most dietary fibre in the home-delivered meals in the present study was derived from vegetables; cereals were not provided, except in desserts. The fruit fibre was derived exclusively from citrus fruit, either oranges or orange juice. The dietary-fibre content of meals from meals-on-wheels in Service 2 was lower than was the fibre content in the meals that were provided by the other services because there were fewer vegetables in the meals of this service. The dietary-fibre values that were obtained by means of calculations from food-composition tables were not significantly different from those that were obtained by chemical analysis over the range of foods that was encountered in the meals-on-wheels meals.

The values that are reported here represent the maximal dietary fibre that was available through the three meals-on-wheels services and do not allow for the non-consumption of food. The percentage potential contribution of the meals-on-wheels meals to the current daily fibre intake of the recipients was reasonable, as based on the estimated intake of 16 g/day. It is difficult to determine appropriate intakes of dietary fibre for elderly persons. Considerations must include what is known about the effects of dietary fibre on optimal life expectancy,[11] its effects on the reduction of the risk of diseases such as constipation and diabetes,[5,6] and its potentially-adverse effects on, for example, faecal incontinence and micronutrient bioavailability.[12] We have proposed that a dietary-fibre intake per day of 25–30 g is desirable for most elderly persons,[12] but this may require adjustment in accordance with energy intake.

Thus, the contribution of meals-on-wheels to a desirable daily intake of dietary fibre was low. There would appear to be scope for the meals-on-wheels services to provide more of the suggested daily dietary-fibre intake for community-based elderly persons who depend on these services.

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