MEDICAL PRACTICE

Contemporary Themes

Feeding of school children in a London borough

A E BENDER, MARY C HARRIS, ANN GETREUER

British Medical Journal, 1977, 1, 757-759**Summary**

A survey of 12 schools in a London borough showed that the protein and energy content of the average school meal was below the standard set by the Department of Health and Social Security for all age groups. Failure to meet the standards resulted from inadequate food purchases, poor menu planning and portion control, and several management problems.

A 24-hour recall questionnaire showed that 5% of the pupils were "poorly" fed. These pupils were, however, no worse off than their "adequately" fed peers with regard to absences from school or academic attainment measured by reading quotient, but there was some slight difference in height and weight. The percentage of children having no breakfast increased from 4% in the infant schools to 21% in the senior schools. Two per cent of the senior pupils regularly ate no lunch.

Introduction

The school meal has often been referred to as the "sheet anchor" of the child's nutrition, but from the extremely limited amount of information available^{1 2} this may not be the case.

Until recently the meal was intended to provide 3.67 MJ (880 kcal) and 29 g protein "with due allowance for the age of the

child,"³ although it was never clear whether this was intended to be the amount purchased or the amount offered on the plate. The guidelines were modified in 1975⁴ by stating that children in each age group should be served on the plate at minimum one-third of their recommended daily intake of energy and 42% of their recommended daily intake of protein. Although this survey was carried out from November 1973 to March 1975, the newer targets have been used in the calculations since "due allowance for age" may be assessed only by reference to the recommendations for different age groups in the Recommended Intake Tables and the figures for senior pupils are very similar—namely, 3.69 MJ (885 kcal) and 28 g protein.

Methods

Out of a total of about 100 schools in the London Borough of Brent, 12 were chosen to represent all types of school in the borough. They included two infant (525 pupils aged 5-7), two infant-and-junior (760 pupils aged 5-11), four junior (1544 pupils aged 7-11), two middle (821 pupils aged 11-15), and two senior schools (1144 pupils aged 15-18+), a total of 4794 pupils. At least two weeks were spent in each school, and the kitchen was visited on five successive days. Information was obtained on the quantity of food purchased, methods of food preparation, and the total quantity of food prepared for serving, so that food available per head could be calculated. All plate waste was collected, the different foods being kept separate.

At the same time 20 pupils were selected at random to have their meals, and subsequent plate waste, weighed on each of the five days. The selection included representation of the different age groups, sexes, ethnic groups, lunch sittings, and types of menu so that the sample of 20 was fairly representative of the whole school. When second helpings were available they were added to the original portions.

Vitamin C and thiamine were determined on samples of the bulk food at the time of serving by the fluorometric methods of Deutsch and Weeks⁵ and the Association of Analytical Chemists,⁶ respectively.

To obtain an approximate assessment of a representative day's diet, all the pupils in the four older groups and the top forms of the infant schools completed a 24-hour recall questionnaire of everything eaten

Department of Nutrition, Queen Elizabeth College, University of London, London W8

A E BENDER, BSC, PHD, professor of nutrition
MARY C HARRIS, BSC, research assistant
ANN GETREUER, BSC, research assistant

TABLE I—Energy and protein in school meals—calculated from food composition tables*

Type of school	Average age (years)	Average per pupil for whole school over five days							
		Served				Consumed		Wasted	
		Energy MJ	% Target†	Protein g	% Target†	Energy MJ	Protein g	Energy MJ	Protein g
Infant	6	1.64	65	14.5	76	1.45	12.6	0.19	1.9
Infant + junior	8	2.21	76	16.9	77	1.83	13.6	0.39	3.3
Junior	9	2.19	70	17.3	74	2.06	15.9	0.13	1.4
Middle	13	3.06	86	21.5	81	2.77	19.0	0.28	2.5
Senior	16	3.51	95	24.1	86	3.28	22.5	0.23	1.6

McCance and Widdowson food tables.

†Target is one-third recommended daily intake for energy and 42% recommended daily intake for protein.

Conversion: SI to traditional units—1 MJ $\approx$ 239.23 kcal.

during the past 24 hours. This was conducted as a class exercise, the questions were read out to the class and the questionnaire was filled in by the pupils; help was given to any pupils who had difficulty, and some of the younger children were interviewed individually and their questionnaires completed for them. The youngest children in the infant schools were excluded as their replies were considered unreliable.

The schools provided access to the attendance registers and reading quotients of the infant and junior pupils; in addition all the pupils were weighed and measured in the minimum of clothing.

Results

SCHOOL MEALS

From the total cooked food prepared, the number of meals served, and the combined waste the average consumption of energy, protein, vitamin C, thiamine, iron, and calcium was calculated (tables I and II). The average figures were verified by the 20 selected pupils whose individual portions and waste were measured at the same meals.

From table I clearly the amount of food served on the average plate reached the energy target only in senior schools; consumption was 89% of target. Protein served reached 86% of target; and consumption was 80% of target. Middle schools fell slightly below these figures, while the remaining three age groups were considerably below target. The poorest results were in the infant schools, where energy served

was only 65% and energy consumed 58% of target; the results for protein were better, being 76% of target served and 66% of target consumed.

Plate waste averaged 10% overall ranging from 2% to 25% of both the energy and protein served. Waste depended to a large extent on the menu, freedom of choice of food or portion size, and the attitude of the dinner supervisors, who either insisted that food was eaten or allowed whole meals to be thrown away.

No targets have been suggested for other nutrients but they should at least reach one-third of the recommended daily intake. Table II shows that the quantities of thiamine consumed were low. The calcium intake was highest in the oldest groups, owing to the greater use of cheese and milk drinks in the cold buffet meals served as alternatives in these schools.

The vitamin C intake appeared to be satisfactory in all groups. Nevertheless, considerable differences were found between the true and calculated figures for vitamin C in different food samples as shown in table III. Thus while calculated values for roast potatoes vary from 9 to 12 mg vit C/100 g (according to season and length of storage) the analysed values ranged from 0.8 to 18.9 mg vit C/100 g. These analyses showed that on average the true vitamin C content of the meals was about half the calculated figure, indicating that all but the senior schools were failing to reach the vitamin C target. The analysed values for thiamine were on average similar to those calculated from food tables.⁸

TABLE II—Vitamins and minerals consumed in school meals (calculated values)

Type of school	Vitamin C mg (% of RDI)	Thiamine mg (% of RDI)	Iron mg (% of RDI)	Calcium mg (% of RDI)
Infant	7.5 (38)	0.11 (16)	2.3 (29)	132 (26)
Infant + junior	8.5 (43)	0.14 (18)	2.7 (27)	150 (30)
Junior	14.0 (62)	0.20 (23)	3.2 (28)	181 (30)
Middle	13.0 (52)	0.24 (24)	3.3 (24)	292 (42)
Senior	22.5 (75)	0.31 (30)	4.4 (29)	291 (49)

RDI = Recommended daily intake.

TABLE III—Calculated and true values for vitamin C content of potatoes and cabbage

Method of cooking	Mean (and range) ascorbic acid content mg/100 g	
	Food tables*	Samples from school canteens
Potatoes boiled then mashed	9.0 (7.5–10.5)	1.6 (0–6.5)
Potatoes, roast	10.5 (9.0–12.0)	6.8 (0.8–18.9)
Potatoes fried in deep fat	10.5 (9.8–11.3)	5.5 (0.9–10.0)
Cabbage, boiled	20.0	10.1 (1.3–20.0)

TABLE IV—Eating habits

Type of school	Average age (years)	% Having no breakfast	Type of meal taken at midday				
			Home	School	Bought outside	Sandwiches	Never anything
Infant	6	4	10.5	89.5			
Infant + junior	8	8	17.4	82.6			
Junior	9	9	13.3	86.7			
Middle	13	14	18.5	74.5	1.8	5.0	0.1
Senior	16	21	32.6	37.3	18.3	10.0	1.9

and (b) the number of times they were absent for longer periods in an attempt to avoid distortion of the figures through long absences caused by serious illness or injury.

Reading quotients and absences were compared with those for the adequately fed pupils in the same school, and no differences were found between the two groups. In the infant and junior age group the poorly fed pupils were lighter than their adequately fed peers. The senior poorly fed group were shorter than their adequately fed peers. (Further information on the height and weight data will be reported separately.)

Apart from those pupils considered poorly fed there were several pupils who regularly had no breakfast: 4% in the infant schools, rising to 21% in the senior schools (table IV). Among the senior school pupils 18% purchased their midday meal outside the school, and 21 (1.9%) never ate a midday meal (table III).

Discussion

There are many reasons why the amount of food served did not reach the targets.

Food purchases and preparation—Records of food purchases showed that the amounts were often insufficient to meet the targets, quite apart from any loss in kitchen preparation and despite suggestions for purchase laid down in the Department of Education and Science circular.³ The loss in kitchen preparation was small, being between 5% and 10% of both energy and protein, except when fat was trimmed from meat. Meat was trimmed on the grounds that excess fat would cause the meat to be rejected, but this is not so when the meat is to be minced; careless trimming often caused loss of meat—that is, protein along with the fat. Many vegetables were wasted when poor quality produce was delivered.

"Surplus" food—In some schools food left after serving was available as second helpings, but in other schools food not offered in the first service was thrown away. Often more pupils requested second helpings than could be provided.

Menu planning—The practice has been growing recently of offering a cold buffet meal as an alternative to the conventional hot meal. It might be expected that this freedom of choice would help towards achieving the targets as most pupils prefer this type of meal. In the five schools where this alternative was available, however, the average food per plate was less (10-25%) than the hot meal with respect to both energy and protein. Plate waste was similar for both types of meals. Menu planning was at

fault in setting the weight of the food portions without due allowance for their energy and nutrient content. Thus a two-ounce portion of cheddar cheese providing 14 g protein and 1 MJ (240 kcal) was offered as an alternative to the same weight of ravioli which provides only 3 g protein and 0.3 MJ (65 kcal). Deficiencies in the first course were rarely made up by serving a more substantial sweet.

Portion control—Poor control of the size of portions led to variations of up to 100% in the size of portions of the same food served on to adjacent plates.

Clearly from this and two other published surveys^{1,2} school meals are inadequate as they are not meeting the targets laid down. We do not know how widespread this problem may be. The solutions lie in improving several management details, each, apart from throwing away unserved food, relatively unimportant in itself.

The knowledge that vitamin C is lost from foods by leaching into the cooking water and especially by oxidation when cooked food is kept hot is not put into practice. Clearly also several children need "dietary care" but whether they are at educational, nutritional, and medical risk needs further investigation.

We thank the London Borough of Brent Education Committee, Mr and Mrs Feather, and Zyma Products for financial support and the staff of the schools, particularly the catering staff, for their patience and co-operation.

References

- 1 Bender, A E, Magee, P, and Nash, A H, *British Medical Journal*, 1972, **2**, 383.
- 2 Essex-Cater, A, and Robert-Sargeant, S, *Health and Social Service Journal*, 1975, **85**, 758.
- 3 Department of Education and Science, *The Nutritional Standard of the School Dinner*, Circular 3.66. London, HMSO, 1966.
- 4 Department of Education and Science, Welsh Office, *Nutrition in Schools*. London, HMSO, 1975.
- 5 Deutsch, M J, and Weeks, C E, *Journal of the Association of Official Agricultural Chemists*, 1965, **48**, 1248.
- 6 Association of Official Agricultural Chemists' *Handbook*, 1965, 758.
- 7 Department of Health and Social Security, *Report No 120*. London, HMSO, 1969.
- 8 McCance, R A, and Widdowson, E M, *Medical Research Council, SRS 297*. London, HMSO, 1967.
- 9 Marr, J W, *World Review of Nutrition and Dietetics*, 1971, **13**, 105.

(Accepted 22 December 1976)

Is apomorphine of value in treating alcoholism?

Apomorphine has been used to treat alcoholism in two entirely different ways. The first is to inject the drug as the unconditioned stimulus that is paired with drinking (the conditioned stimulus) so as supposedly to set up a classically conditioned aversion to alcohol. Although this approach has enjoyed various degrees of popularity, there are no persuasive data to support any claim for its worth. It is distressing for the patient and not without danger. The claimed successes associated with apomorphine conditioning (or other aversion treatments of alcoholism) rest mostly perhaps on non-specific influences such as therapeutic enthusiasm. Weighing the evidence, chemical aversive conditioning for alcoholism is therefore today probably not justified.¹ Apomorphine has also been given by mouth in a regimen usually associated with the late Dr Yerbury Dent. The intention seems to be more the suppression of craving than induction of aversion. Although this approach has generally found little orthodox favour, some recent research suggests that there may be more value in the Dent method than has been supposed.²

¹ Litman, G K, in *Research Advances in Alcohol and Drug Problems*, eds R J Gibbins et al, vol 3, p 369. New York, Wiley, 1976.

² Schlatter, E K E, and Lal, S, *Quarterly Journal of Studies on Alcohol*, 1972, **33**, 430.

Is honey one of the foods to be avoided in the prevention of coronary heart disease?

No. Honey provides carbohydrate calories like any other sugar. There is no evidence that sugar, refined or unrefined, mono- or di-saccharide,

has any adverse effect on coronary heart disease except when it contributes to hypertriglyceridaemia or to obesity through an excess of calories.

What is the best way of removing urine stains from clothing?

Urine stains on cotton material may be removed by either boiling or bleaching. Bleaching should be used only on white cotton material. Nappisan is highly recommended. As wool and synthetic materials cannot be boiled or bleached, the clothes should be soaked in cold or warm water, according to the washing instructions supplied with the material, before washing them with a biological washing powder.

Why should antiviral agents such as idoxuridine affect herpes zoster when applied to the skin lesion if the virus is active in the posterior ganglion?

It is true that the zoster virus is active in the cells of the posterior root ganglion of the nerve, but the skin lesion is caused by the virus multiplying in the epidermis, and there is evidence that it reaches the epidermis from the posterior root ganglion along the nerves via the perineural and Schwann cells.¹ Local treatment with idoxuridine, which is fairly insoluble, probably affects only the skin lesions, but general treatment, which may be indicated in severe cases, with adenosine arabinoside (ara-A)² affects viral multiplication at, presumably, all sites.³

¹ Esiri, M M, and Tomlinson, A H, *Journal of Neurological Sciences*, 1972, **15**, 35.

² *British Medical Journal*, 1976, **4**, 1466.

³ *British Medical Journal*, 1976, **4**, 1499.