

gnawing prolonged his pleasure. When he came home, he said, he could still recollect the pleasant feelings by taking an occasional sniff at the fingers.' To true vegetarians I tender apologies for the quotation. Does this not point to the possibility that while it is desirable to wash hands before meals, it is inadvisable after?

That, however, in passing. To sum up I would submit that, in spite of sentimental utterings, Scotland's food traditions are not all good, that old customs and habits tend to persist, and that the school meals scheme is the most efficient way of improving the dietary of Scotland. Credit is due to the Scottish Education Department for the standards it has set, and we may be proud that so much has been achieved.

The Composition of School Meals

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I present this short paper rather apologetically, for my own direct analyses of school meals were done mainly during the years 1942-4 and my knowledge of more recent work is secondhand. Some of the old figures, however, may still be of value, for the problems which, in the war years, confronted those charged with the task of providing school dinners have not all been solved, and the supply position has deteriorated rather than improved.

Originally it was suggested that the proper target for a school dinner was 1000 Cal., with most of the daily requirement of first-class protein and much of the fat, these latter recommendations being interpreted as meaning 20-25 g. first-class protein and about 30 g. fat. A meal of this kind contains a minimum of 215 g. dry matter which, allowing for roughage and water, means a gross weight of over 450 g. (1 lb.). Such an amount of food cannot comfortably be consumed by small children, though doubtless voracious 'teen-agers' can dispose of it without undue trouble. It has, therefore, always been accepted that the desirable calorie value for a school meal must depend on the age of the child for whom it is intended. The estimate of 1000 Cal. is based on the assumption that 2500 Cal. is the desirable daily allowance, and this applies to children of 10-12 years, according to the standards of the U.S.A. National Research Council, Committee on Food and Nutrition (1941). For children of 7-9 years, requiring 2000 Cal. daily, the dinner should, on the same basis, supply 800 Cal., and for children below that age, requiring 1600 Cal. daily, the dinner allowance should be 640 Cal. These calculations, however, can provide no more than rough guides, indicating that the 1000 Cal. target must be subject to some modification.

During the war years, it was arguable that the calorie value of a school meal was really of secondary importance and that attention should be more closely directed to the provision of protein, important inorganic elements and those vitamins which were likely to be insufficiently supplied in the other meals of the day. Now, with increased restrictions in the supply of energy foods, calories have increased in importance. Where, before, one might regard as satisfactory a meal of small bulk rich in protein, minerals and vitamins, and trust the home meals to provide adequate calories, it is

now essential that the school dinner should contribute effectively to the supply of energy.

My own opinion is that two-fifths of the day's calorie requirement is an unnecessarily high proportion for the midday meal to supply, and that one-third should be ample. For the child of 10-12 years of age this lower standard would mean a meal of 800 Cal. and since the mid-morning milk yields another 130 Cal., under 1600 Cal. would remain to be supplied by breakfast, tea and supper at home.

It is interesting that the method of careful questioning and calculation has shown that dinners eaten at home by children whose family conditions are good approximate to this level rather than to the higher 1000 Cal. level. Average figures for twelve children in each age group were: ages 11-14, 750 Cal. with 26 g. protein; ages 8-11, 575 Cal. with 27 g. protein; ages 5-8, 460 Cal. with 16 g. protein (private information). The dietetic survey of which this calculation formed a part showed that the total calorie and protein intake of the children was up to the standard of the National Research Council.

In February and March 1943, we analysed fifty-six meals collected from nine schools. One of these was attended only by children up to 8 years of age; the others were elementary schools for children up to 14 years of age, but in these we found no signs of differential serving according to age. The general average for the calorie content of the meals was 455 Cal.: the school averages ranged from 353 to 624, and the individual meals from a little over 200 to 860 Cal. The infant school, incidentally, supplied an average of 407 Cal., with a range of 215-634 Cal. A difficulty in calculation is introduced by the fact that often, but not always, second helpings are available, at least of some of the foods, e.g. potatoes and other vegetables. No accurate account can be taken of this. Even with a reasonable allowance for second helpings, the calorie content of these meals was evidently too low, and was far too variable, giving evidence of bad planning and of insufficient use of unrationed foods to supplement the fixed allowances of rationed foods. Similar evidence was supplied by the protein analysis, for, with a general average of only 11 g. total protein, the school averages ranged from 8.15 g. to 16.4 g., and in some meals, consisting of soup and a sweet, the protein content was as low as 5 g. Inspection of the menus confirmed this, for eleven of the fifty-six meals consisted of soup and sweet only; cheese was used as a main dish only once, and the only other protein foods from unrationed sources were sausage meat (in four meals) and 'spam' (in one meal); fish was not used at all. Fat was also too low, so low, in fact, as to suggest that the available sources were far from being fully utilized. The iron content of the meals was satisfactory. The ascorbic acid was very low, partly because of the season, partly because of the insufficient use of green vegetables, but largely because of unsatisfactory cooking methods: in five cases the meals were supplied from a central depot, with intervals up to 4 hr. between cooking and serving, in two cases they were supplied by British Restaurants and in only three were they cooked at the school.

The following year the analyses were repeated at one of the schools and a series was done at another school under the same education authority. It was obvious that the lessons of the previous survey had been learned. At one school the energy content

increased from 624 to 1015 Cal./meal (this latter figure, however, was somewhat too high, for the meals analysed did not include any of the soup and sweet type, which was still served on some days); the protein had increased from 16·4 to 34 g./meal, and the fat from 19 to 32 g./meal. Ascorbic acid was still low, for the meals were still sent from a central cooking depot, but the local cooking of potatoes was a distinct improvement. As a result of this the loss of ascorbic acid from potatoes had fallen from over 60 to about 30%. At the second school, energy averaged 860 Cal., protein 22 g., fat 34 g., but ascorbic acid was again very low.

The figures I obtained in 1943 could at that time be paralleled in many other parts of the country, though even then analysis showed that much larger meals, such as those just mentioned for 1944, were being provided in some places. I suspect, though I do not know, that the improvement I found was general and could be attributed in part to the normal development of what was, on such a large scale, a comparatively new service. In part, however, improvement was due to a greater awareness of the problems of communal feeding and the application to these problems of proper dietetic principles; in this, surveys and actual analysis of meals were important in that they supplied data on which school catering officers and dietetic advisers could work.

In recent years there has been a tendency to omit this collection of factual data, except for the calculation of average meal composition based on bulk food supplies. Such few analyses as I have seen, however, suggest that the average meal for the older children of elementary schools now supplies about 650–700 Cal.

REFERENCE

- U.S.A. National Research Council, Committee on Food and Nutrition (1941). *J. Amer. med. Ass.* **116**, 2601.