

PROBLEMS OF COLLECTIVE FEEDING IN WAR TIME

Morning Session: Chairman, Dowager Lady READING

The following letter was read from Sir John Orr, Chairman of the Society, who was unable to attend:

I would like, not only on my own behalf but, I am sure, on behalf of all the members of the Society, to congratulate Lord Woolton on the success of his work at the Ministry of Food. In spite of the grave shortages of some foods, the people in this country are most fortunate in being as well fed as they are. The results of a survey in Scotland, done at the request of the Ministry of Food, showed that large sections of the people, including many of our children, are actually enjoying a better diet, from the point of view of health, than they did before the war.

Lord Woolton is well served by my friend, Professor Drummond, the Scientific Adviser to the Ministry, and by Lord Horder, his personal consultant. It is gratifying that these are both members of our Society.

Lord Woolton's presence here today is a further indication of his interest in the science of nutrition and his desire to establish and, I hope, to maintain after the war, a food policy based on the nutritional needs of the people.

It must be a great encouragement to Lord Woolton to contrast his position in this country, as head of a successful ministry, with that of Herr Walther Darré, the Food Minister in Germany, who has just been relieved of his office. For the sake of the nation, we wish Lord Woolton continued success.

We can assure him that the members of this Society realize the difficulties of the great task he has undertaken. If the conferences held by this Society during the war can bring together and clarify the knowledge on present day problems and assist in getting that knowledge across to the people, they may strengthen the hands of Lord Woolton in his fight on the food front.

I hope the Conference will be a great success.

Yours sincerely,

JOHN ORR.

The Rt. Hon. Lord Woolton (Minister of Food): I came here today because I wanted an opportunity, publicly, to express my belief in you.

Almost the first thing I did when I found myself a minister, without any knowledge of food values and with very little knowledge of the food trades, but with some knowledge of people and their requirements, almost the first question I asked was: "Tell me, what is the policy of His Majesty's

Government regarding food?" And then, I said: "Where are my scientific advisers?" because I was quite clear that if we were going, as we obviously were, into a period of considerable shortage, we should have to begin to make up in quality what we were going to lack in bulk.

Of course, this great beef eating nation of ours has, in the past, really rather enjoyed large meals with plenty of meat, in fact, plenty of most of the things that we were not likely to get during war.

The problem that the Ministry of Food had to face was how, with these inevitable shortages and restrictions, we were going to maintain the physical well being of the nation, because my business was, primarily, to keep the nation well during war, to keep it energetic and, lastly but very important, I think, psychologically, to keep it feeling satisfied. I do not mean physically satisfied but mentally satisfied that, at any rate, everybody was being treated equitably, and there were, in the Lancashire phrase, "fair do's" all round, and that, whatever the restrictions might be, in point of fact there was enough to go round. Well, that is the fact of the case there is enough to go round. I think I almost dare tempt providence by saying that there is little doubt that there will be enough to go round.

The only problem in front of us is the intelligent use of knowledge as to what we shall eat and how we shall cook what we do eat. The problem is very different from the problem of the last war. To start with we lost in a night all those sources of supply in Europe which were so useful for us in the last war. We lost a great deal of our fat supplies when we lost Holland, and there is no more important factor in feeding a nation in war than securing its supplies of fats. That, to my mind, is of more importance than securing its supplies of meat; with the help of the agriculturists in this country who are doing marvellous work in the provision of milk, there is, I hope, going to be no doubt about it; in fact, I am certain that our supplies of fat will be available.

During the last 20 years there have been very great alterations in our habits. When you compare this war with the last war, we have notably the problem to which you are going to address yourselves today, the problem of feeding the public outside the home. It is not enough that we should be satisfied that we are looking after the domestic ration. There is a wider call. We are in the front line today, in the last war we were not. There is the very wide problem of the evacuation that has taken place. There is the problem of the woman who has decided, and rightly decided, that she may be of more value to the nation in the factory than in the home. That is an individual problem. But her home has to be kept clean, her children have to be fed, she herself has to be fed, and it is not reasonable to say to people because they are women, they shall not only go and be factory workers, but that they shall do all the housekeeping work just as though they were not factory workers. It is, therefore, of the greatest importance that the state that demands that women shall go and work in factories should also do what it can to make provision for communal feeding. We have tried to do that by this great development of canteens. One of the great differences between this war and the last is the extent to which people are now fed "on the job." We have done it by the development of British Restaurants, and there are 1400 of these, created during these last 12 months, a very

vol. 1, 1944]

considerable extension. Altogether, "off the ration" we have some 94,000,000 meals a week being provided. Now, that is a subject, I think, to which you are going to address yourselves today. I am very anxious for your help in this matter. It is not enough that a government department shall provide canteens, British Restaurants and feeding arrangements in schools. We have a greater obligation than that, and the obligation is to provide food appropriate for the work done by the people who go to these canteens.

Surely I am well advised when I say that the children of this country ought to be fed differently from the adult population, that they require different foods, and I do hope that local authorities who have now a great opportunity, a wonderful opportunity, of seeing that the children of this nation are fed, will add knowledge and learning to their equipment, and see that they are properly fed.

There is no difficulty in providing the right sorts of foods. I will guarantee that, if those who are responsible for the detailed work will see that the selection of these foods is right. It is a great opportunity. And we are taking the opportunity because there still remains in the mind of the British public the idea that feeding children in schools has something to do with poverty. You remember that we only used to feed children in schools if it could be demonstrated that they were so poor that they would not be able to partake of the education unless we gave them some food as well. That was in the very dark days when I was a young man, only 20 years ago, that we thought like that. We do not think like that any more. We realize, I hope, in this country, that at any rate in war time, and that is the limit of my responsibility, we can keep the children of this country healthy if we take the opportunity of feeding them where they are, in their schools. Then, having seen that they have got the right food, do, by all means, let us decide that those who can afford to pay, should pay. But the problem of physical need has got nothing at all to do with the capacity to pay.

All these problems of the correct sort of organization and the correct sorts of foods are problems that I am glad to see are going to concern your Conference today. I am glad you are holding the Conference. I am quite certain that you will have great influence on public opinion. I hope you will see to it that both local authorities and employers of labour know the results of your Conference. On this subject of nutrition and of food values the scientists of this country during the last 20 years have given us a great deal of information. We now have knowledge. If we fail to use that knowledge, if we do things badly, then we are sinning against the light and I am told there is a special and terrible punishment reserved either in this world or the next for those who sin against the light. I, at any rate, am always in danger of that punishment, because I am so well advised by both my scientific and medical advisers that if I fail, then I do indeed sin against the light, and I assure you, I will do my best not to fail, at any rate in that respect.

I am grateful to your Society for the work that it is doing, and I do wish your Conference a great success.

Lady Reading (Chairman, Women's Voluntary Service): Malnutrition in the past has frequently arisen from ignorance of small things, from

lack of consideration as well as from other causes. The Women's Voluntary Service knows very well how little attention is paid to academic findings. Full use should be made of the results obtained by scientific workers. A sufficiency of good food is a matter of interest not only to the individual, but to the nation. The economic causes of malnutrition have been to some extent alleviated by price control. Rationed foods are available to everyone alike. Fruit juice, cod liver oil and milk are available to children under Government schemes. The war has aroused much interest in nutrition, which is no longer an academic subject, but one of practical importance. The Nutrition Society represents both sides. The meeting today is a great chance for the practical people to benefit from the results of academic research workers. Both should work together to their mutual benefit. As the result of the war we shall know more about feeding in the home as well as in the school centres and industrial and service canteens.

The Organization of Catering in the Royal Air Force

Squadron Leader J. Salmon, R.A.F.V.R. (H.Q. Technical Training Command, R.A.F.)

There is much in common between service and civilian catering, but there are important differences. In civilian life, it used to be said that the customer was always right, for ultimately the choice was with the customer, who could always take his custom elsewhere. In the R.A.F. the airmen and airwomen have no alternative except possibly the Navy, Army and Air Force Institute, where only limited fare is now provided. In order to safeguard the interests of airmen and airwomen who are tied to their mess for meals, weekly mess committee meetings are held. These are attended by representative airmen and airwomen as well as by the president of the airmen's mess committee and the catering officer. There is another important difference between civilian and service catering. In civilian life you can pick and choose your staff and, having trained say a cook or waiter, you can be tolerably sure of retaining him. In the service, the majority of the catering personnel are untrained on entry and, after great efforts have been made to train an individual, he is liable to be posted elsewhere, owing to the exigencies of the Service.

The R.A.F. ration is issued partly in cash and partly in kind. The total amount of money that may be expended per airman and airwoman per day is fixed monthly. The sources of supply for foodstuffs are the Royal Army Service Corps and the N.A.A.F.I. All nationally rationed commodities except butter and bacon are obtained from the R.A.S.C. Butter and bacon and all unrationed commodities and articles rationed on points are obtained from the N.A.A.F.I. Foodstuffs which are nationally rationed for the civilian population are rationed for R.A.F. personnel. A careful check is kept on overdrawals. Underdrawals of rationed commodities are also carefully watched, particularly those which have a high calorific value, to ensure that underfeeding does not occur.

It cannot be pretended that catering officers are experts in food values, but this is a subject on which great emphasis is laid. The aim is to give an airman 3500 Calories per day, and an airwoman 80 per cent. of this

vol. 1, 1944]

figure. This is no easy matter. The first rule is to draw the full amount of those nationally rationed commodities which have a high calorific value. The second is to supply potatoes and bread in generous quantities. In order to encourage the consumption of bread, great efforts are made to ensure that it reaches the airman and the airwoman in as fresh a condition as possible. Important food values can be lost in cooking but, thanks to advice from Squadron Leader Macrae, great attention is being paid to the correct cooking and serving of vegetables and to the importance of using yeast instead of baking powder, particularly now that national wheatmeal flour is being used exclusively.

At a typical R.A.F. station there is usually an officers' mess, a sergeants' mess and one or more airmen's messes. The size of airmen's messes varies considerably. Frequently they consist of a cookhouse and two dining rooms capable of feeding 1000 to 1500 at one sitting. There may be 4 or 5 or even more such messes on one station. By staggering meal times, cookhouses and dining rooms are made to cope with considerably greater numbers than they were originally equipped to deal with. Cookhouses are generally well equipped. Ovens or ranges, coke or coal fired, are provided, also steam jacketed boilers or coal fired boilers, steam ovens, fish fryers, and steam heated hot closets.

In obtaining food the queue system is as a rule employed, but some stations use the "family" system, which means that one man from each table fetches the food for the table and serves it out.

On all stations of a strength over 600 there is a catering officer, and on the larger stations there are two. The assistant catering officer often belongs to the Women's Auxiliary Air Force. The catering officer is responsible for making up the menus and ordering the correct quantities. He must make sure that he is within entitlement and that the diet is balanced and contains the required food values. He is responsible for costing, for stock control and for the prevention of waste. Catering officers have the benefit of advice from an expert on the question of food values and the way to retain them in cooking.

On large stations with many cookhouses, messing is centralized, that is to say, a single menu is used for all messes, one messing account is maintained and the catering officer decides the quantities based on ration strength which shall be sent to each cookhouse. Until the advent of catering officers each airmen's mess on a station was governed by a warrant officer messing who made out his own menus, kept his own messing account and made his own demands. Centralization has the advantage of giving the catering officer control and eliminating a great deal of paper work, while not preventing the needs of an individual mess being met. It does not for instance preclude a catering officer from giving a W.A.A.F. mess a special menu. On some stations, centralization is carried further. Meat and bacon for all messes are cut up centrally, fat is rendered centrally and considerable strides have also been made in manufacturing sausages, brawns, galantines, meat pies and sausage rolls.

Great efforts are made on R.A.F. stations to eliminate waste. The first source of waste is what is left on airmen's plates. To reduce this to a minimum, original helpings are not too large and second helpings for the hungry are encouraged. Anti-waste posters are prominently shown in dining rooms, their purpose being to discourage airmen and

airwomen from taking more than they require, or taking an item they do not intend to eat. For instance, an airman seen to accept a particularly large portion of cabbage was asked whether he liked cabbage, and replied "No, sir, I never eat it". Under the heading of anti-waste come also the recovery of first, second and third class fat, the correct sorting of the swill and the disposal of cooked bones. Food left over after meals can be another great source of waste. If this is merely reheated and served, much is usually wasted, but if a palatable made-up dish is concocted, the food is consumed.

Perhaps the most important factor in achieving a high standard of messing is the standard of cooks. With the rapid increase in the size of the R.A.F., which has grown to many times its original size in a few years, the training of cooks has presented a difficult problem. The R.A.F. has several schools of cookery where courses are run for catering officers, warrant officers and N.C.O.s, as well as for ordinary cooks.

Owing to the great need for cooks, most of whom have latterly been from the W.A.A.F., the period of training has to be exceedingly short. Training lasts 6 weeks, 3 are spent at the school of cookery for elementary training, and 3 in cookhouses at selected R.A.F. stations where practical training is given. It is intended also to use some of the very excellent technical colleges in London, where W.A.A.F. cooks will be trained side by side with civilian cooks. There is always a danger that training in a school of cookery will be too theoretical. Inevitably owing to the shortage of foodstuffs only small scale cooking can be taught. Great importance, therefore, is attached to the practical training at stations where trainees can gain experience of cooking for large numbers on large apparatus. Cooks are, of course, not yet expert after only 6 weeks training, for most of those taken into the service as cooks have had little or no previous experience. Where they have cooked, it has usually been for small households. Efforts are being made at all times to raise the standard of cooks at stations.

It is interesting to speculate what the effect may be on post-war feeding of having all these thousands of cooks trained in the services. When to the public interest in feeding stimulated by the Ministry of Food through the wireless, the press, the cinema and the Food Advice Centres, is added the skill in cooking acquired by thousands of service personnel, it seems possible to look forward to a period of vastly improved feeding in the homes, restaurants and industrial canteens of this country.

Discussion

Major R. G. Leggett, R.A.M.C. (The War Office (S.T.4)), opener: The Army and the R.A.F. cater much on the same lines, but there is a slight difference in calculating the cost of the ration. The R.A.F. has a value fixed monthly and, except for nationally rationed articles, purchases practically what it likes. The Army works on a fixed ration plus a small cash allowance, but is equally tied in the matter of nationally rationed items. The Army aims at "well cooked food; clean and comfortable surroundings and a quick and effective service with all meals served on warm plates". Unlike the R.A.F., the Army has to cater, in addition to large units, for very small units such as searchlight stations, gun crews, and even for the one or two men employed on traffic

vol. 1, 1944]

control duties. It is not, therefore, possible to think in quite the same terms of mass catering. Very close attention is given to both economy and waste. Cases of waste reported are very carefully investigated. Overdrawals are not permitted and underdrawals only when they do not in any way reflect on the messing standard. Mess meetings are ordered to be held weekly in all units as a means of keeping down complaints. All men have therefore an outlet for their grumbles.

The training of cooks is closely watched and at present large numbers of Auxiliary Territorial Service women are being trained to replace men. Messing officers are trained at centres in all commands. Butchers receive their training at Smithfield, Aldershot and elsewhere. It is the aim in all units to have qualified understudies for messing officers, cooks (both N.C.O.s and men) and butchers to replace casualties. The chain of catering and messing responsibility is approximately as follows: Quarter Master General, Director of Supplies and Transport, Catering Branch, Catering advisers in all formations. The catering staff is selected from civilian experts. All large static training units have permanent messing officers who are employed whole time on catering and messing. The supplies are drawn from the R.A.S.C. and N.A.A.F.I. All units are frequently visited and help and advice is given by experts.

Miss R. H. Hamilton Crichton (Ruxley Towers, Claygate, Surrey): The N.A.A.F.I. is closely affiliated to the three services; it is the largest trading concern in the world today. It caters not only for the service man but also for his wife and family.

Mr. F. Le Gros Clark (6 East Common, Harpenden, Herts.): It is fitting that a tribute should be paid to Russia as a country hitherto entitled to be called the classical land of communal feeding. Squadron Leader Salmon's remarks on centralized food preparation suggest reference to Soviet experience. In 1925 the practice commenced there of despatching cooked food in insulated containers from central depots but a regulation in 1931 laid down that these depots were progressively to be converted to the preparation of food only up to the last stage before cooking. The final process of cooking was to take place in the canteens. By 1935 there were 26 such preparatory depots in Leningrad and 25 in Moscow, one for each administrative quarter of the city. There were probably about 120 in all. One was quoted in Moscow which provided prepared food for several factories and for 55,000 school children, as well as for public restaurants associated with the depot. It was assumed that this method was best calculated to conserve the nutritional qualities and the palatability of the food but it is questionable whether vegetables prepared in such a way are likely to retain their ascorbic acid content.

Temporary Surgeon Rear Admiral J. W. McNee, R.N. (149 Harley Street, London, W.1): Circumstances of catering in R.N. shore establishments are not greatly different from those in the Army or the R.A.F. In H.M. ships they are, however, very different and vary greatly in different sizes and types of ship. In the submarines for example all cooking with the exception of tea is done only when on surface.

Professor J. A. Nixon (7 Lansdown Place, Clifton, Bristol): An aircraftwoman expressed the opinion that rations served to the W.A.A.F. are excellent but often spoilt by poor cooking and that one reason is

that women who are cooks in civilian life conceal the fact because they do not want to be cooks in the service. The aircraftwoman thought that inducement for cooks is small and that there should be extra pay for cooks which could be forfeited if they cooked badly.

Dr. W. A. Nicholson (Howbeck Infirmary, West Hartlepool, County Durham): Is there any overlapping of N.A.A.F.I. canteens and canteens provided by local bodies?

Dr. P. A. Galpin (Tuberculosis Dispensary, 40 Balaam Street, Plaistow, E.13): What is done about men displaying aversion to vegetables?

Miss F. J. Keay (Clatterbridge (County) General Hospital, Wirrall, Ches.): It has been suggested that on stations where pig swill is not collected the caterers and cooks are more careful to avoid waste.

Miss M. Abrahams (Chilterns, Amersham Common, Bucks.): Are there special opportunities for women who are experienced dieticians and caterers to obtain positions in the catering branches of the R.A.F. or other Services?

Professor A. C. Frazer (Department of Pharmacology, Hospitals Centre, Birmingham, 15): The nutritional control in the services is essentially a central one. The catering expert is not usually particularly competent in the field of medical nutrition, nor, indeed, is the average medical officer. A very real need exists for a special nutritional section of the Hygiene Services which would advise on and control nutritional problems on the spot.

Miss E. Trechman (Central Restaurant and School Canteen, Hart Road, Hartlepool, County Durham): Labour difficulties of civilian catering are caused by the calling up of young women which leaves older and less efficient women for the important duties of feeding school-children and manual workers.

Squadron Leader J. Salmon gave the following replies:

To Professor Nixon: W.A.A.F. cooks are given extra pay. There are 3 grades of cook, A.C.W.2, A.C.W.1, and L.A.C.W. Pay is progressive according to grade. An A.C.W.2 cook receives more than the minimum pay for an A.C.W.2.

To Dr. Nicholson: There is machinery to prevent the overlapping which might occur by the opening of voluntary canteens where N.A.A.F.I. canteens exist.

To Miss Keay: The keeping of pigs on R.A.F. stations is now discouraged and stations are encouraged to dispose of their swill to neighbouring farmers who can rear pigs more economically. Where pigs are kept supervision of waste is so strict that there is no opportunity to amass swill in excessive quantities.

To Dr. Galpin: Every effort is made to induce R.A.F. personnel to eat a variety of vegetables. It is very rare to find an airmen's mess without two vegetables besides potato on the menu, and cabbage is included as often as possible.

To Miss Abrahams: The opportunity has been given to women entering the W.A.A.F. with civilian knowledge and experience of dietetics to become catering officers in R.A.F. hospitals and stations.

To Professor Frazer: Short courses are being given to medical officers and catering officers to stimulate interest in nutritional problems.

Food Supplies for Collective Feeding

Dr. M. Pyke (Ministry of Food, Portman House, Portman Square, London, W.1) (In absence of Dr. J. C. Drummond)

The adoption of the principle of supplying food through collective feeding centres has been an important part of the policy of the Ministry of Food during this war. British Restaurants, industrial canteens and other catering establishments give a valuable elasticity to the necessary restrictions of war time rationing. In planning the type of meals to be served in British Restaurants the scientific advisers of the Ministry first had in mind the example set by "Oslo meals". The "Oslo meal" was intended to supply at a single sitting the full daily requirement of animal protein, vitamins and minerals. Other food eaten during the day was relied on to provide calories. While the first duty of British Restaurants was to supply palatable and satisfying hot meals, implicit in the advice issued to organizers of canteen catering was the aim that each meal, while providing one-third of the daily calorie and protein requirement, should supply two-thirds of the daily needs of vitamins and minerals. When, as at the present time, there are 1430 British Restaurants aiming at this target, it is inevitable that some of them will not hit the bull's eye first shot, but in many cases, as will be shown in a moment, the quality of meals, at least in one aspect, is surprisingly high.

Two points are worth considering when discussing the aims just stated. First, while knowledge of the requirement of many food constituents has grown very greatly during the last few years, it is by no means complete or exact. A good deal is known about vitamins A, B₁ and C, for example. Nevertheless, except in exceptional circumstances, the Ministry has always been averse to remedying dietary deficiencies by giving vitamins in pills. The nation must be fed, not dosed. During the last war margarine, containing the same amount of calories, was substituted for butter, and vitamin A deficiency resulted. It is necessary to guard in this war against remedying a vitamin B₁ deficiency for example with the synthetic vitamin and running the risk of a shortage of riboflavin or nicotinic acid or biotin or pantothenic acid or vitamin B₆. It is important, therefore, to seek to provide vitamins in the form of natural foodstuffs so that, while giving a balanced diet with respect to those factors about which a little is known, enough of those substances about which nothing is known may also probably be supplied.

The second point which is important in considering the food supplies for collective feeding is the variation between individuals. Allowances to catering establishments must, perforce, be based on the average needs and multiplied by the total number. In actual fact, individual needs differ. Variation in the calorie content of sample meals taken by investigators from British Restaurants has been made the subject of criticism. Nevertheless, the helper who hands out over the counter more potatoes to the navy than to the clerk is, in fact, unconsciously showing her grasp of practical physiology. The Ministry tries to exhibit an equal wisdom. Certain restaurants serving principally sedentary workers receive an allowance of food per head at the normal catering scale. This includes a pennyworth of meat, 1/10th oz. sugar, 1/10th oz. cheese and

1/6th oz. fats. A second category, B, serving industrial workers, receives 1½d. worth of meat, 1/8th oz. sugar, 1/10th oz. cheese and 3/10th oz. fats; while a third group, A, includes canteens serving heavy workers who get 2d. worth of meat, 1/5th oz. cheese and 1/2 oz. fats. Thus, where the requirement is greater, increased supplies are made available. Children whose protein requirements are comparatively greater than those of adults, are allowed the maximum meat ration in their school meals.

As regards vitamins the aim is to provide two-thirds of the daily requirement in each meal. A single vitamin, vitamin C, may be taken as an example of the problems which arise. Many workers have been concerned as to the likelihood of deficiency of vitamin C, particularly during the hard winter through which we have just passed. Besides the problem of selecting foods containing the initial amounts of vitamin C needed, there are losses which may occur in cooking and preparation and, in addition, losses due to special difficulties peculiar to large scale catering. In March of this year, therefore, an investigation was begun to see how much vitamin C actually reached the plates of diners in British Restaurants. Helpings of food likely to contain vitamin C were weighed, mixed and samples placed immediately in bottles containing metaphosphoric acid as a preservative. The concentration of vitamin C in the samples was then determined within about an hour in the laboratory. During the month of April, 36 restaurants were visited in London, Reading and Tyneside. If the meal most judiciously selected from the items offered is taken as representative of each restaurant, 8 of these 36 provided 10 mg. or less of vitamin C per meal, 9 provided 11 to 20 mg., 14 supplied 21 to 40 mg., and 5 gave more than 40 mg. If the very moderate target of 30 mg. daily set by the Technical Commission on Nutrition of the Health Committee of the League of Nations (1938) is taken as the daily requirement of vitamin C, it appears that two-thirds of this was provided by 20 out of the 36 restaurants. The Committee on Food and Nutrition of the U.S.A. National Research Council (1941) suggests that the full vitamin C requirement is 75 mg. The evidence supporting this estimate has been refuted on the somewhat disingenuous grounds that no one could get as much, at least in war time. Nevertheless, in the above survey, the best restaurant provided a meal containing 77 mg. of vitamin C.

In the meals the most important source of vitamin C was greens, principally cabbage. The amount of vitamin C present in cooked cabbage may vary very widely. Although the concentration of vitamin in raw cabbage reaching the market in early spring after a difficult growing period in frosty weather is less than that present in leaves grown in the more favourable weather later in the season, an important cause of variation in the nutritive value of boiled cabbage is the method of cooking. No doubt Squadron Leader Macrae will have something to say on this point later on. In the course of the present investigation, while 6 samples of boiled cabbage were found containing no vitamin C at all, 10 samples contained 1 to 10 mg. per 100 g., 18 from 11 to 20 mg., 12 from 21 to 40 mg., and 4 contained more than 40 mg. The average size of helping was about 3 oz. Thus it appears that cooked cabbage may be an excellent source of vitamin C and, when boiled satisfactorily, a serving may easily provide 30 mg. or more.

vol. 1, 1944]

Vegetable soups containing greenstuffs may form a minor, but nevertheless a useful, source of vitamin C. The average contribution made by soup in 10 restaurants was 6 mg. Soups made from dried peas, carrots, soya flour, etc., are quite common. While these may be excellent from other points of view it was sometimes necessary to point out that they do not contain vitamin C.

In potatoes the concentration of vitamin C is not large and decreases on storage. Hence it could not be expected that the amount in boiled potatoes in March and April would be high. The concentration found varied, in fact, from 1 to 6 mg. per 100 g. with an average of 2.7. The values for mashed potatoes tended to be lower due, possibly, to loss during mashing or to the practice of re-cooking once cooked portions in this form. The size of the helpings of potatoes varied enormously. The smallest was 1 oz. and the largest helping met with was 14 oz. The average contribution of vitamin C, however, was only 3 or 4 mg.

Particularly in the early spring when green vegetables are difficult to get, swedes, parsnips and carrots are commonly served instead. Although better than nothing, they are unsatisfactory substitutes. The average helping of swede gave 7 mg. and of parsnip 3 mg. of vitamin C. With regard to carrots there appears in some canteens to be a certain amount of misunderstanding. Carrots are an excellent source of vitamin A. They do not, however, contain more than trifling amounts of vitamin C. It is important, therefore, that they should not be allowed to take the place of green vegetables.

From this work on the choice of food supplies to provide the desired amount of vitamin C in British Restaurants the lesson is very clear. It is that the presence or absence of green vegetables is the single most potent factor influencing the vitamin C content of the meals. Of the 36 restaurants visited in April, the average vitamin C in the meals of the 22 serving greens was 34 mg., while the 14 not serving greens only supplied an average of 11 mg.

The consideration of food supplies for collective feeding must include some reference to transport problems. While, on nutritional grounds, it is preferable for food to be eaten as soon as it is cooked, that is to say, for restaurants to provide cooking and seating accommodation in the same building, this may not always be possible. In certain circumstances where preparation must be made for feeding after air raids it is undesirable for cooking equipment to be situated in the target areas where the greatest need for feeding facilities will exist. To overcome this difficulty the expedient has been adopted of transporting in insulated containers the hot cooked food from the kitchens to the people. Recently a certain amount of criticism of this practice has appeared in the medical press. In this connexion it may be of interest to refer to an investigation recently carried out.

When containers of a number of different types used by the Ministry and by several local authorities were compared it was found that about 50 per cent. of the vitamin present in freshly cooked cabbage and about 60 per cent. of that in freshly boiled potatoes was lost after storage in the containers for 2½ hours. Nevertheless, in spite of this loss, the average vitamin C content of the cabbage from 18 containers after 2½ hours' or more storage was 8 mg. vitamin C per 100 g., and the average

content of potato was 3 mg. per 100 g. Hence the 3 oz. helping of cabbage and 4 oz. of potato will still provide 10 mg. of vitamin C. Where other means, therefore, are unavailable, the use of insulated containers enables hot meals to be brought to those who may need them. The vitamin C content of well cooked vegetables transported in such containers will still be substantial and may be greater than that of vegetables badly cooked on the spot. The loss of vitamin C from vegetables in insulated containers was referred to above as the *average* loss but a curious fact has been noticed on several occasions that in the vertical cylindrical 5-gallon containers of the type used by the Ministry there is more than twice as much vitamin C in cabbage in the bottom of the vessel than there is in the rest after 2½ hours' storage. The explanation is possibly associated with the circulation and condensation of steam inside the container.

To sum up, insulated containers cause the loss of a proportion of vitamin C, but they do not destroy it all and, if vegetables are excluded, they are very suitable for many other types of food for, though vitamins are important, they do not form the whole diet.

It may be argued that the best way to avoid loss of vitamin C is to serve food raw. Five of the 36 restaurants examined in April served salad as part of their meals. Of these salad meals, two provided 21 to 40 mg. of vitamin C; the other three provided more than 40 mg. On the other hand helpings of raw salad have been analysed providing 5 mg. or less, while servings of boiled cabbage containing 30 mg. or more are by no means uncommon. Properly cooked cabbage, in fact, can be a most suitable source of vitamin C and it must not be thought that, while loss always occurs in cooking vegetables, it is always avoided by eating them raw.

The cells of uncooked vegetables contain an enzyme which can destroy vitamin C very rapidly. While the plant cells are intact their structure keeps the enzyme separate from the vitamin but when the cell is broken the enzyme comes into action and vitamin C is lost. It has recently been shown that if raw Savoy cabbage was grated with a kitchen grater, 34 per cent. of its vitamin C was lost within 5 minutes. A shredder destroyed 10 per cent. of the vitamin. Shredding with a sharp knife destroyed too few of the cells to cause material loss of vitamin C, but even with a sharp knife all chance of loss had not been avoided. In an experiment suggested by Wing Commander Tisdall of the Royal Canadian Air Force to Professor Drummond, a cabbage was shredded with a knife and samples were analysed. A portion was chewed for 10 seconds and was transferred with several washings into a mortar containing metaphosphoric acid and immediately analysed; 7 per cent. of the vitamin C had been lost. A second portion was chewed for 30 seconds, 19 per cent. of the vitamin was lost. A third specimen was chewed for 60 seconds and 29 per cent. of the vitamin C was found to have been destroyed.

The Ministry of Food has a big job in planning collective feeding, and to carry it out successfully all the help is needed which scientific workers can give. This assistance has always been given, and given willingly, by nutritional workers, many of whom are in this room now. In supplying food for communal feeding, the Ministry can exercise considerable control. They can supply the calories, the protein and many other factors, but,

as I have shown, it is difficult to legislate, for example, against the loss of vitamins before they get into the consumer's body. While there are underlying principles upon which scientific workers may hope to guide those responsible for the administration of collective feeding, it is always necessary to realize that food is not a standard product, cooking is not a standardized process, and restaurant customers are not uniform animals. We are not concerned with the administration of optimal doses, we are serving meals.

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Discussion

Dr. J. Barker (Dehydration Branch, Ministry of Food, Queen's Hotel, Old Colwyn, Denbigh), opener (read by Dr. R. J. L. Allen): Dried foods are not new products. Dried fruits and dried milk are examples of foodstuffs which were well known commercial commodities for long before the outbreak of the war. Saving of space and weight in storage and transport becomes increasingly important in war, and it is thus not surprising that much work has recently been devoted, in laboratories and in factories, to the drying of various foodstuffs.

Two such dried foods were already on the market in peace time, namely, dried milk and, in small quantities, dried egg. Dried milk has penetrated into most households during recent months and dried egg will shortly become generally available. Other dried foodstuffs which have not yet reached the general market are dried fish, dried minced meat and dried vegetables. In the drying of these products the main purpose has been to obtain a dried food which, when freshly dried or after storage, would retain to a high degree the palatability and nutritional value of the fresh food. Another object has been to produce the dried food in such a condition that its preparation for consumption should be as simple as possible, avoiding, for example, the need for long soaking in reconstitution. A further aim has been to cause during drying or packing as large a decrease in volume as possible to save space in storage and transport.

Questions of quality and palatability of foodstuffs are controversial subjects but, in view of the numerous tests which have been carried out during the past months with samples of dried fish, dried meat and dried vegetables, not only in laboratories and ordinary households, but also in canteens, it can confidently be said that these products, when consumed as part of a meal, retain sufficiently well the quality of the fresh materials to escape comment or criticism. Thus, fish cakes or fish pie made with dried fish, minced meat or shepherd's pie containing dried meat, and dried cabbage or carrot reconstituted and served as part of a meal, will be accepted in place of the fresh foodstuffs.

Retention of quality and retention of vitamins are in general correlated, and it is safe to say that, in the dried foodstuffs mentioned, the bulk of the nutritional value of the fresh material is retained, even after prolonged storage.

Professor J. R. Marrack (Haymeads Emergency Hospital, Bishop's Stortford, Herts.): In a survey in school canteens and British Restaurants, mainly in Hertfordshire, but also in Bermondsey, Islington and Leytonstone, I found the ascorbic acid in vegetables as served, higher than Dr. Pyke reported, particularly in potatoes and swedes. About one-third of the meals supplied under 10 mg. and one-third over 20 mg. Midday meals may be practically the only source of vitamin C and should contain over two-thirds of the day's requirements. The amounts of raw vegetables that are needed to supply sufficient vitamin C appear very large and the amounts commonly eaten may furnish very little. Studies in three schools illustrate how the type of vegetable grown in the school gardens may influence the amount of ascorbic acid in the school meals and the nutritional state of the children with respect to vitamin C. It is essential that school gardens should grow those vegetables that become available during the lean months, February, March, April. Kale which is very important in this respect is not sufficiently mentioned in Ministry leaflets.

Dr. L. W. Mapson (Dunn Nutritional Laboratory, Cambridge): It has been proved that if cabbage is shredded 1/2 to 1 inch in width, the loss of ascorbic acid is insignificant. Such shredded cabbage can be cooked in less water than a quartered cabbage. The relative volume of water to cabbage is the main factor which determines the amount of ascorbic acid lost during cooking, if proper precautions are taken to destroy tissue enzymes in the early stages of cooking.

Dr. F. Wokes (Ovaltine Research Laboratories, King's Langley, Herts.): Vitamin C tests on potatoes from canteens in works and schools showed values varying from 0.4 to 4 mg. per 100 g. at the same season. This might be due to loss on standing as well as during cooking.

To overcome the frequent refusal of children to eat their greens, these should be cooked mixed with other foods as in stews and hot pots.

I have confirmed and extended the results obtained by Pyke on the rapid loss of vitamin C in minced or finely grated vegetables. The ascorbic acid oxidase causing this loss appears to be present in largest amounts in green leaves; hence loss is much more rapid in leafy vegetables than in roots. In minced lettuce three-quarters of the ascorbic acid disappears in 1 minute.

Surgeon Commander C. C. Ungley, R.N.V.R. (R.N. Auxiliary Hospital): In 51 patients with sore and bleeding gums, a condition often wrongly called scurvy, vitamin C intake was not particularly low, unsaturation was not more marked than in normal controls, capillary resistance was unimpaired, and there were no clinical signs of scurvy or sub-scurvy. Ascorbic acid, nicotinic acid and other vitamins were ineffective, but local treatment alone had a prompt effect. Local causes such as infection in the mouth were sufficient to account for the gum conditions encountered.

In a subsequent survey in Nov. to Dec. 1941 the food actually consumed by each of eleven seamen in a trawler was weighed and its vitamin C content measured. The average daily intake of ascorbic acid for the group was 23 mg., 16 mg. in the first week during a temporary hitch in supplies of vegetables other than potatoes, and 30 mg. in the second week.

vol. 1, 1944]

The main sources of vitamin C, with the average helpings consumed, and the amount of ascorbic acid derived from them were, respectively, potatoes (dinner) 10 oz., 12 mg.; potatoes (supper, often twice cooked) 6.75 oz., 3.5 mg.; turnips 4.7 oz., 12.5 mg.; cabbage 6 oz., 10.8 mg.; vegetable soups 11.7 oz., 5.7 mg.; Brussels sprouts 2.5 oz., 21.5 mg.; canned tomatoes 3 oz., 11.4 mg. In spite of the high daily consumption of potatoes a satisfactory intake of vitamin C was attained only when other vegetables such as turnips and greens were included in the diet. The subjects of this survey were free from signs of nutritional deficiency.

Miss R. Simmonds (Hammersmith Hospital, Ducane Road, London, W.12): What are the nutritional values of meals served in hospitals not only to patients, but to the staff and particularly to young nurses?

Mr. A. L. Bacharach (Glaxo Laboratories, Ltd., Greenford, Middlesex): What is the effect of chewing on the vitamin C content of cooked cabbage?

Dr. S. W. Swindells (1 and 2 Albion Terrace, Cartergate, Grimsby): According to the Ministry of Food, school dinners should provide one-third of the daily requirement of first class protein while the Board of Education in Circular 1571 stipulates that 20 to 25 g. of protein should be of this type. When helpings of meat actually served were weighed they amounted to $\frac{3}{4}$ to $\frac{7}{8}$ of an ounce containing 7 g. of protein. This is a large gap and it must be remembered that mothers would believe that the children have had at school their "meat" meal or dinner. In any case home supplies of additional meat or egg are doubtful.

Dr. M. Pyke gave the following replies:

To Professor Marrack: In reference to the variation in the vitamin C content of potatoes, newly dug potatoes may contain high concentrations of vitamin; these concentrations fall off on storage and, no doubt, conditions of storage affect the rate of loss.

To Dr. Wokes and Mr. Bacharach: The work we have been able to do on the effect on vitamin C of the enzyme in raw vegetables is journeyman work. Dr. Leslie Harris, I believe, must take at least some of the responsibility for the discovery of the principle involved. In doing our work on chewing raw vegetables we had this principle in mind so that the answer to Mr. Bacharach is "No, we did not investigate the effect of chewing on cooked vegetables".

To Miss Simmonds: One can sympathize with a desire for an investigation into hospital feeding; perhaps this, however, falls within the province of the Ministry of Health.

To Dr. Swindells: With regard to protein supplies to schoolchildren, I will repeat what I said before that meat is provided for school meals at the maximum scale. To ensure that the children get the meat is an administrative problem.

Afternoon Session: Chairman, Professor V. H. MOTTAM

Effects of Large Scale Preparation on Nutritional Values

Squadron Leader T. F. Macrae, R.A.F.V.R. (R.A.F. Institute of Pathology and Tropical Medicine)

Knowledge of effects of large scale preparation of foodstuffs on their nutritive value is meagre, almost in the extreme. Something is known about the effect on ascorbic acid, a little about vitamin B₁ but practically nothing about all other nutrients such as the mineral salts, with the exception of those effects which result from the discarding of the water in which foodstuffs are cooked.

Of necessity the effect of large scale cooking on the ascorbic acid content of vegetables must receive the chief attention. Let it be understood, however, that it is not considered that ascorbic acid is the only nutrient worthy of consideration, nor vegetables the only class of foodstuff. Were riboflavin as easy to estimate as ascorbic acid and meat as easily procurable as vegetables, it might become fashionable to study the effect of the cooking of meat on its riboflavin content. The results of such studies might be just as valuable in helping to maintain an adequate standard of feeding as the present studies on vegetables.

Vegetables cooked on a large scale are usually strikingly low in ascorbic acid. The ordinary cook, cooking for about 500 men, usually destroys about 9/10ths of the ascorbic acid present in cabbages in the course of preparing these for the plate. The housewife, on the other hand, usually retains about half the ascorbic acid. Large scale cooking is, therefore, particularly conducive to large losses in nutritive value and in the Royal Air Force there are good facilities for studying these effects.

The three main reasons for the low vitamin C content of vegetables cooked on a large scale are: (1) Green vegetables are usually cut several days before cooking. During this period they are sometimes stored under unfavourable conditions and often severely handled with the result that about half of the ascorbic acid originally present in the vegetable is destroyed. A reduction in the time which elapses between the cabbages leaving the field and entering the cookhouses would increase the nutritive value of the cooked product. (2) Large scale cooking favours destruction of ascorbic acid by ascorbic acid oxidase. This is particularly so with green vegetables. The usual procedure employed in the cooking of cabbages in, say, a 60 gallon boiler, is to add simultaneously all the cabbage to boiling salted water. The cold cabbage lowers the temperature of the water to about 65° C., a temperature favourable to enzymic oxidation, which continues until the temperature of the contents of the boiler reaches about 85° C., when ascorbic oxidase is destroyed. It is possible to prevent enzymic destruction by avoiding temperatures below 85° C. This can be done by adding the vegetables gradually. Instruction to cooks to use a small amount of water in cooking cabbage may do more harm than good; the less water employed, the lower the temperature falls on addition of the vegetables and the longer the enzymic destruction is allowed to proceed. The reason the housewife avoids enzymic loss of ascorbic acid is that she uses comparatively small

bulks and with a comparatively strong source of heat and thus ensures that the temperature of 85° C. is reached much more rapidly than is possible when cooking on a large scale. Not enough care has been given to design of large scale cooking equipment. To reduce loss of food value, rapid heating is essential but with the present equipment this is often impossible. (3) Keeping vegetables hot for long periods causes great losses of ascorbic acid in cooked green vegetables and potatoes. The rate of destruction of ascorbic acid is rapid. In half an hour a little more than half is lost and in an hour more than three-quarters. It is impossible to prevent losses through this cause but the amount of destruction can be reduced by proper planning of the time of cooking. It is important to plan so that potatoes and green vegetables are not kept hot for long periods.

It is apparent from the above that greenstuffs and potatoes may be less nutritious when cooked on a large scale. To offset this, large scale cooking has certain advantages: (1) In large scale feeding it is possible by careful rendering to obtain consumption of a larger proportion of the fat entering the cookhouse than in the home, where the fat is not always used to the best advantage. The housewife, for example, usually adds the fat present on meat to her stew because there is so little of it that it is not worth while trimming; this fat is often left on the plate. In large scale feeding all fat is removed before stewing. (2) In cookhouses feeding large numbers it is practicable to keep a stock pot, the nutritional advantages of which are many and palatability is improved. Vegetable water can be used. (3) In baking, the housewife usually uses baking powder as leavening agent; this destroys vitamin B₁ and probably riboflavin. In large scale preparation, however, it is practicable to use yeast which instead of destroying food value actually adds to it.

To sum up, it would appear that large scale cooking, inadequately supervised must most certainly produce food low in ascorbic acid and probably in some vitamins of the B group. With good supervision by persons aware of the dangers, food produced on a large scale need not be low in these factors; it may be even more nutritious than when produced on a small scale. Close collaboration between the caterer and the nutrition expert is essential, for food must be both palatable and nutritious. Further, the co-operation of the medical profession can do much to ensure good feeding. There should be no conflict, for flavour and food value have much in common, both being easily destroyed. In the R.A.F., because of the interest taken by the medical branch, close collaboration is being secured between catering officers, nutrition experts and medical officers; there is reason to believe that these efforts are not entirely without success.

Discussion

Miss M. Olliver (Messrs. Chivers and Son, Ltd., Histon, Cambridge), opener: The nutritional constituent most likely to be lacking in communal feeding is vitamin C, especially from late winter until midsummer. The reason for this is that fruit and vegetables are the only significant sources of this vitamin. Fruits are scarce, being virtually absent from the diet under present conditions between winter and early summer, and are expensive for communal feeding. During late winter and spring the scarcity of green vegetables means reliance on root vegetables which have

been stored and, therefore, are low in vitamin C, swedes and turnips being exceptions. Even where green vegetables are available frequent storage before they are cooked, due to transport difficulties, results in destruction of vitamin C. Vitamin C is rapidly destroyed when food is kept hot. It is also extracted into the cooking water which is frequently discarded.

To correct the seasonal deficiency of vitamin C it is advisable to:

- (1) Encourage schemes whereby communal centres can become self supporting in vegetable production wherever possible.
- (2) Encourage the growing of green vegetables, especially for late winter and early spring use.
- (3) Educate the organizers of communal kitchens to appreciate the advantage of using freshly harvested green vegetables.
- (4) Emphasize the need for reducing the time during which vegetables are kept hot.
- (5) Reduce the volume of water in communal cooking to a minimum to reduce destruction and to obtain as concentrated an extract as possible.
- (6) Make full use of green vegetable water wherever soups or gravies can be used.
- (7) Encourage the consumption of fresh salads made from raw vegetables. A fine grating should be avoided.

It should be noted that there are disadvantages in utilizing raw vegetables as salad because of the large quantities which have to be consumed. Possible exceptions are highly potent salads, such as watercress.

Professor J. R. Marrack (Haymeads Emergency Hospital, Bishop's Stortford, Herts.): To what extent is vegetable water used in British Restaurants?

Dr. L. W. Mapson (Dunn Nutritional Laboratory, Cambridge): It is not sufficiently realized that the coarse outer leaves of cabbage can be used to enrich the cooked edible portion. For this purpose the outer leaves are put into water and cooked for 10 minutes. The edible leaves are cooked in this solution, which will contain an appreciable amount of ascorbic acid. In these conditions the loss by leaching of ascorbic acid from the edible leaves is considerably reduced. A modification of this technique for canteens is to use serial cooking, the same water being used for successive batches of cabbage. This method can be used for other vegetables. Work at Cambridge has shown that the other water soluble nutrients are leached out during cooking to the same extent as vitamin C.

Dr. M. D. Wright (Research Laboratories, Vitamins Ltd., 23 Upper Mall, Hammersmith, London, W.6): In preparing a meal, soup should be made first and boiled slowly with little water, while the remainder of the meal cooks. The water from potatoes and greens should then be used for diluting the soup just before the meal, to enrich it with vitamin C. The vegetable water is used before it loses its main value, and space for storing it is not needed.

Professor E. J. Bigwood (Belgian Commission for the Study of Post-War Problems, 115 Eaton Square, London, S.W.1): Reheating of potatoes causes a greater loss of vitamin C than the original cooking.

Dr. R. G. Booth (Research Association of British Flour Millers, Old London Road, St. Albans): Cooked greens served in British Restaurants in St. Albans contain on the average 40 mg. of ascorbic acid per 100 g. This high value is due to rapid cooking in small quantities. Multiple small cooking units should be used instead of large vessels.

vol. 1, 1944]

Dr. A. Pollard (Agricultural and Horticultural Research Station, Long Ashton, Bristol): Is the loss of vitamin C in cooking due to complete destruction or to formation of dehydro-ascorbic acid?

Professor A. C. Frazer (Department of Pharmacology, Hospitals Centre, Birmingham, 15): Vitamin C is probably stored in the adrenal cortex and such storage is necessary in view of the seasonal occurrence of vitamin C in the normal diet.

Dr. L. J. Harris (Dunn Nutritional Laboratory, Cambridge): The total amount of ascorbic acid stored in the adrenal glands would not provide many days' supply of vitamin C, the human vitamin C requirement being taken as 30 mg. daily. Vitamin C could not be stored to the same extent as, for example, the fat soluble vitamins A and D. A previous large surfeit of vitamin C does not greatly increase the time taken for scurvy to develop in animals, or presumably in men.

Dr. G. Bourne (University Laboratory of Physiology, Oxford): When an animal receives a scorbutic diet, vitamin C disappears from the liver before it disappears from adrenal and pituitary glands. These latter organs are the last to lose their vitamin C and cannot therefore be regarded as a store of this vitamin in the sense suggested by Professor Frazer. It seems more likely that the vitamin is intimately associated with the metabolic processes of these organs.

Dr. H. E. Magee (Ministry of Health, Whitehall, London, S.W.1): Where is ascorbic acid absorbed? If in the small intestine, it is probable that there is considerable destruction of vitamin C by the plant oxidases in the mouth during mastication, in the stomach before the food mass becomes acidified to the extent necessary to inhibit the oxidases and perhaps even in the intestine where the reaction is alkaline. If there is destruction in these parts of the alimentary canal before absorption the proportion absorbed may be very small. This is a field worthy of research.

Dr. S. W. Swindells (1 and 2 Albion Terrace, Cartergate, Grimsby): Methods of cooking at restaurants and more particularly for school dinners are such that sufficient vitamin C cannot be provided, even with big helpings. In two areas it was found that 7 oz. of vegetables (equal parts of potatoes and greens) provided under 5 mg. Probably more destruction had been caused by keeping the food hot from 9.30 to 12.0 or 12.30, than in actual cooking.

Mr. A. L. Bacharach (Glaxo Laboratories, Ltd., Greenford, Middlesex): All possible use should be made of the opportunity presented by the present enormous extension of communal feeding to carry out detailed analyses on properly taken samples of the foods that the people, civilians and members of the Services, are now consuming. The difficulties of applying results obtained in domestic or laboratory cooking to the foods eaten by the majority of people will disappear if proper organization, adequate methods of sampling, and utilization of modern chemical and biochemical technique are applied to the problem. Not only do we need the information now, but we shall also need it, possibly even more urgently, during the period of post-war reconstruction.

Miss E. Trechman (Central Restaurant and School Canteen, Hart Road, Hartlepool, County Durham): Vegetable water should be used in all gravies, as an addition to stews and should form the bulk of the liquid content of soup. Cooking of vegetables in relays is in every way desirable. Staffing must, however, be adequate to meet the demands of a prolonged service of meals needed to make this method possible.

Squadron Leader T. F. Macrae replied: The suggestions made regarding the utilization of vegetable water are very helpful. In R.A.F. cooking it is used on the same day.

To Dr. Pollard: Dehydro-ascorbic acid is absent from cooked vegetables.

To Mr. Bacharach: The opportunity now exists of furthering our knowledge of the effects of large scale cooking on food values. Absence of scurvy cannot be taken as evidence of the adequacy of a diet as regards ascorbic acid. It is not enough to prevent the occurrence of scurvy or other nutritional disease. Our aim should be to maintain positive health rather than to avoid disease. During the months of October to December the average vitamin C intake of airmen was about 25 mg. per man daily and in March about 15 mg.

General Dietetics of Communal Feeding

The Role of the Dietician

Miss M. Abrahams (Chilterns, Amersham Common, Bucks.)

Communal feeding before the war was regarded as a necessity only for adults who could not go home for the midday meal. Some realized the advantages it afforded for a pleasant meeting with friends, but very few thought of their meals in restaurants or canteens as a means of improving their state of nutrition or educating their taste. School meals were introduced in order to provide good nourishing meals cheap or free to children who without them could not benefit from their schooling. A change was coming before the war, and school meals were beginning to be regarded as a means of educating children in good food and good table habits as well as of feeding the needy. The Board of Education, the London County Council, and some other public authorities, colleges and schools appointed dieticians or other highly qualified women to supervise school meals. Those who know the excellent results of the catering under Dr. Friend at Christ's Hospital will realize what prolonged and meticulous care will do in improving and maintaining health and growth.

The outbreak of war increased very largely the field that communal feeding had to cover. It had to provide for many more industrial workers who could not have meals at home. In rural areas school canteens were needed to relieve harassed hostesses of their evacuees at dinner time, and to save the children long walks in the dinner hour. A number of civil defence workers also had to be catered for, and later miners' canteens were organized. In 1940 the provision of canteens was made compulsory in factories engaged on war work, employing more than 250 workers. Air raids and precautions against invasion made it essential to provide centres for emergency feeding mainly in populous districts. These were

vol. 1, 1944]

organized all over the country, and most of them were used also to supply regular communal meals to adults or children.

Rationing in the United Kingdom has been planned to secure the equal distribution of foodstuffs, with as few exceptions as possible. From birth till old age, regardless of activity, everyone receives the same amounts of sugars, fats and animal protein, the half meat ration of the under fives being compensated for in protein by extra milk and eggs. Agricultural workers and miners, and a few other heavy workers who cannot use canteens receive 12 oz. of cheese instead of the usual 3 oz. By using all the rationed foods, and making up with others as inexpensive as possible so as to obtain a reasonably palatable diet, it cost 9s. a week in January, 1942, to obtain 3000 Calories daily. This diet was adequate in all respects except vitamin C and calcium. It contained 730 mg. of calcium, including 103 mg. from wheatmeal bread and some from porridge oats much of which would not be utilizable because of the presence of phytin; 800 mg. is reckoned as the adult requirement of calcium. The raw foods, including 19 oz. of potatoes, supplied 57 mg. of ascorbic acid daily of which 30 to 40 per cent. would probably remain after cooking, leaving 17 to 23 mg. out of the 30 mg. required. A diet for a child of 7 to 12 years, calculated on similar lines, gave for 7s. 6d. a week 930 mg. of calcium out of a requirement of 1400 mg., but again the phytin in wheatmeal bread and porridge would probably reduce the amount available. The ascorbic acid was 53 mg. a day from the raw foods, giving when cooked a total of 16 to 21 mg. out of the desired 30 mg.

For practical catering purposes, calcium is obtained almost entirely from milk and cheese, and only small quantities can be added from unrationed sources. The bigger needs of growth were taken into consideration in the allowance at home of a pint of milk for children up to five years and of half a pint of milk a day to children up to 17 years, but bone growth is not finished at that age. If a youth eats at a category A industrial canteen intended for heavy workers, he obtains from cheese, and milk in beverages and foods 266 mg. calcium besides that from his home rations, but he is slightly worse off than his agricultural fellow worker who gets 296 mg. calcium daily from his extra cheese. A child receiving milk in school with only 8 weeks' holiday a year gets 136 mg. calcium from an average of 4 oz. milk daily to add to his 930 mg. at home, 1066 mg. in all. If besides this he gets a school dinner he obtains an extra 220 g. calcium, rather less than other restaurant and canteen eaters, bringing his total up to about 1251 mg. a day, including a proportion which is not available owing to the presence of phytin. Out of 315 education authorities 230 supply such dinners and 6.2 per cent. of children attending public elementary or secondary schools take advantage of this scheme.

Vitamin C comes from unrationed foods, and communal cooking, if carried out to meet war time conditions of labour and equipment, is likely to destroy a great part of that present in vegetables. Salads are hard to obtain in winter and spring at a cost within the means of workers, and where shredding and exposure to air are involved, lose some of their vitamin C. In large scale cooking the addition of vinegar to shredded vegetables, or the use for instance of specially prepared pickled cabbage, or the frying of potatoes in deep fat, if that were obtainable, might be of value in increasing at little cost the ascorbic acid content of meals. At

present communal meals are likely in most cases to reduce rather than increase the vitamin C intake of those who eat out instead of at home.

Catering establishments are divided into four categories, according to the amount of rationed foods allowed to them. The ordinary catering establishment, which includes children attending private schools, receives from rationed foods, apart from those bought under the points scheme, 244 Calories per person daily. Category B canteens receive similarly 305 Calories, while category A industrial canteens, catering for heavy workers, get 413 Calories. Finally, public elementary and secondary schoolchildren and the under fives in war time nurseries receive 420 Calories from rationed foods.

I collected and weighed 41 dinners from neighbouring British Restaurants in Bucks., Oxford and London. To estimate Calories and mineral content McCance and Widdowson's (1940) analyses were used; these would probably be on the high side as they are based on peace time recipes which would very likely have had to be altered in the British Restaurants. The number of Calories ranged from 494 to 1797, and the Calories per penny from 41 to 163. Only seven meals gave over 100 Calories per penny. The prices which ranged from 8d. to 1s. for a main course and a pudding seemed unrelated to the food values provided, the meal lowest in calories, for instance, costing 1s. and the highest, over three times as large, costing 11d. Only six meals gave 1000 Calories or over, enough to give a third of the day's needs of a person requiring 3000 Calories. Twenty-six gave less than a third of a 2500 Calorie diet. Bread was not included in the calculation as it was not taken regularly. In some places it was sold at about $\frac{1}{2}$ d. an ounce, and in a few it was free. The variation in other food values was as wide as that in calories. In calcium, 28 dinners yielded less than 266 mg., a third of the day's requirement of 800 mg., and 9 less than 133 mg. or half the requirement for one meal. Ten gave less than 3.33 mg. of iron, a third of the required 10 mg. a day. Inclusion of wheatmeal bread, however, in the other meals might compensate for a low iron content of the dinner.

The dietician's role in communal feeding, assuming that she cannot alter rationing policy to meet physiological needs, is still very wide. If non-experts produce meals with such a wide variation in nutritional value as that referred to above, a trained woman would have great scope in giving her customers the best food value for their money as well as the best cooked meals. She could use her discretion in portioning unrationed foods or selling different sized dinners as is done in some communal restaurants, and so avoid underfeeding those with large needs, or overfeeding those with smaller ones who usually waste the extra food. She could watch the needs and the supply of foods rich in mineral elements and vitamins, buying and serving them to the best purpose. Above all, she could secure the most important feature of communal cooking if it is to acquire a permanent value, the attractive service of really well cooked food suited to local taste. She could make communal restaurants pleasant meeting places where workers could relax whilst they enjoyed good nourishment at a cost well within their means. From their canteens and restaurants they could learn by experience to improve their meals at home, and the dietician would also have the opportunity of giving them advice on food and cookery. Thus she should be able

vol. 1, 1944]

to help in raising the standard of nutrition in homes and restaurants in her neighbourhood. More and more authorities will come to realize the social and financial benefits gained by expert supervision of their meals service, and will follow the example of the Board of Education, the London County Council, and the Factory Department of the Home Office in appointing to responsible posts dieticians experienced in the practical application of nutritional knowledge to communal catering.

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School Canteens

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Before the war, some of my colleagues in the Dietetic Association and myself were asked to advise in a few public and private schools on the school diet. In many cases the diets were poor, but tuck boxes from home and the tuck shop did much to fill the gaps. Since the war, I have heard little about the public school diets and I am therefore unable to speak of them with authority today but, in the light of personal experience at school and college in the last war, I should like to urge that these schools also should share in the effort which is being made to give a really adequate diet to the growing children of today.

It is the elementary schoolchild who receives most of the attention. Before the war, efforts were chiefly directed to the provision of meals for "necessitous" schoolchildren, that is, under the terms of the Education Act, for any child who through lack of proper nutrition was unable to benefit from the instruction given. In many cases the children received a free meal; in some cases the parents paid. The children having school dinners were rather looked down on by their fellows. For instance a daily woman in hospital, asked to send her child to a school dining centre, was horrified at the idea because the neighbours would think she was a pauper! Before the war some 17,500 children had school meals daily; that figure included 10,000 elementary schoolchildren and 7500 children in open air and nursery schools, and schools for mental and physical defectives. During the first two years of the war the evacuation of children from London and other large towns meant the closing of existing dining centres and the burden fell on local authorities in reception areas. In the summer of 1940 before the heavy raids, the centres were gradually reopening as the children came back to their homes. Then came the heavy raids and the children again left London. In no part of the country was the child population stabilized and school feeding throughout was beset with many difficulties; it was not until October, 1941, that a concerted effort was made to get schoolchildren into dining centres. The call up of women meant that arrangements had to be made to feed the children while the mother was at work. At the same time the Ministry of Food increased the rations for school meals and pressed the local authorities, through the Board of Education, to open school dining centres. This step is one of outstanding importance and should have far wider results than can as yet be foretold.

The actual planning of menus and the choice of food is governed by availability of foods and cost. The Board of Education issued a circular in which certain standards were set up. For the midday meal children over 11 should have 1000 Calories, 20 to 25 g. protein and 30 g. fat; children under 11 should have 25 per cent. less calories. Local authorities were urged to ensure that these rations were given. Every effort is made to see that properly balanced meals are served; for example, if the first course is steak pudding, vegetables and potatoes, the second course should not be boiled jam roll, but fruit and custard, or even fresh fruit if available. Or, if the first course is mince, the pudding should be something which requires biting. Green vegetables and fruit are included whenever possible, and very often the meal finishes with raw carrot. Schoolchildren will eat raw carrot when cooked carrot is often left on the plate. They are conservative in their tastes and do not like highly seasoned foods or fancy dishes, and it is more difficult to arrange menus for them than it is for adults.

Meals are supplied to schoolchildren by two different methods. (1) The food is cooked on the same site as the school dining room, in a kitchen used for the preparation of school meals only, or also of meals for a meals centre for adults, more usually known as a British Restaurant. (2) The food is cooked in a central kitchen and conveyed in insulated containers to school dining centres. This method is used in nearly all large towns and in some places for supplying outlying rural districts. The advantage of the central kitchen is economy in staff, fuel, food and cost. The disadvantages are loss of vitamin C from vegetables, and loss of attractiveness in appearance; puddings, especially steamed puddings, do not look so good after a rough journey in a motor van; potatoes tend to blacken, and green vegetables lose colour; salads are not as crisp and fresh after being in a container as when served straight on to the plates.

The responsibility of those in charge of school feeding does not end with the provision of the food. Table appointments and table coverings are important as children respond to an attractive setting. The service of the food is equally important, a hot dinner on a cold plate on which fat has set to a hard rim means that the dinner will be wasted.

The number of children attending school dinners in London alone has increased to some 50,000 a day, and it is no longer a sign of poverty but the thing to do.

There are certain obstacles still to be overcome, and the most important is the ignorance of the importance of proper feeding shown by the people actually responsible for cooking and serving the meals. They find it difficult to understand why a child should be given 2d. worth of meat, when a customer in a British Restaurant has only half as much. Behind this is the old tradition that the only member of the family who really needs meat is the man. The people supervising the meals see little reason for trying to make the child eat, and lastly and most important of all is the child itself, who refuses to eat. Such a state of affairs is not found in the secondary or the public school, but in elementary schools in London it certainly exists. Two things contribute to this; the child is naturally lazy and the only dinner it likes is one it can shovel up with a spoon without the use of a knife and fork, and it is keen to get out to play as the meal is too much like being in school to be enjoyed and must,

therefore, be got over as soon as possible. There is another possible reason. Waste is greatest in the poorest districts and this is often due to the fact that from early childhood the child received food whenever it wanted it; as a baby, it got a bottle whenever it cried, later a biscuit or a bit of bread and jam, and only at the weekends did the family all sit down to the meal. Such children, therefore, are not used to sitting down to a large plate of food and 1000 Calories at a midday meal mean a fair bulk. It is also worth remembering that the average town child is small for its age and its requirements are, therefore, not as great as those of the average text book child.

The question of avoiding waste in the school dining centre is serious and can only be corrected by educating the public. When studying dietetics in America I visited several schools and was impressed by the meals served and the children's enjoyment of their food. There were classes where children were taught personal hygiene and about food. One lesson in particular impressed me. It was a series of photographs of a tiny baby lying down, then, in the next stage, toddling and so on up to manhood, the development of teeth and bones being shown and the importance of drinking milk to bring this about. I feel that in this country some education of the children themselves would help to bring about far better results than can be hoped for at present. The children are not the only people who need educating. Those who are responsible for the supervision of the meal should be made to realize the responsibility of encouraging the child to eat, and to believe that the Ministry of Food has increased the children's rations in the hope that the cases of malnutrition which occurred as the result of poor food during the last war may be prevented in this.

Industrial Canteens

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The chief problem which faces industrial canteen managers at the moment is how to supply the workers, during possibly shorter meal times, with energy for longer working hours in circumstances of greater strain, and how to do it with supplies of food and fuel both uncertain.

All workers in industry at this time are regrettably and unavoidably regimented and mass controlled. Industrial caterers have the delightful opportunity of helping to keep alive the power of discriminating between two courses of action, even though it may be only deciding whether to have greens or carrots, or parsley sauce, or all three. Therefore, we should try always to offer a choice of meals.

Canteen managers are among the few people who can plan and carry out for *now*, and in the kitchens of the industrial canteens of today should be found the groundwork for the preventive medicine of tomorrow. Even now, the works doctor and the canteen can work together for the rehabilitation of the worker after sickness. On the most utilitarian grounds it is good business for a firm to have healthy work people; low sickness absentee figures can be set off against canteen costs, but it must be remembered that in feeding John Worker, to a great and ever greater extent, John Citizen is being built up and, with the influx of women into

industry for full or part time, his wife and family too. For this Company the sickness absentee figures for 1940 compared with 1941 showed an increase of 0.65 and 0.44 days per head for females and males respectively. This is small considering the cumulative effect of war strain.

An order was made in November, 1940, giving the Chief Inspector of Factories power to direct a factory employing on essential work more than 250 persons to provide a suitable canteen where hot meals could be purchased. This was an immense step forward and the following figures were most kindly furnished by H.M. Chief Inspector of Factories. Approximately 7500 factories now have canteens where possibly only one-fifth of that number had them before 1940; this means that there are now opportunities for influencing the diets of thousands more than in 1940. In setting up such canteens there are three groups of people to be considered, the kitchen, the customer side of the counter, and the service side of the counter. The customer wants, quite rightly, bulk, palatability, and that his food shall be pleasing to the eye. The canteen manager wants him to have the protective, body building, and energy conserving foods that he needs, and works to educate the kitchen and both sides of the counter so that the two sets of wants shall not be incompatible. The difficulty is that most canteen managers have to make do with the man and woman power that is left, after the needs of the factory side of industry have been satisfied, which means that in the great bulk of industrial canteens the kitchen staff has been trained "on the job" and does not much care about food values as such. There are lecture courses available for canteen cooks and visits by canteen and food advisers from the Ministries, but in the end it is the catering manager in the day to day contacts with the kitchen who must put theories into practice and, unless he carries his staff with him, it will be unnecessarily uphill work.

When I had convinced the kitchen staff of the necessity for using to the best advantage the foods obtainable, I found that the idea of waste of *value*, as opposed to waste of *material*, was to them a new and exciting attitude to war economy. One of the best ways of making them realize the importance of vegetable cooking and preparation of salads was to raise the status of the vegetable cook to that of the pastry cook and meat cook. It should be as unheard of for the vegetable cook to be cleaning floors as for either of the others to do so, and it is possible to have continuous cooking of green vegetables during the whole of the service period, if there is a cook in charge of the task of preserving the vitamin C values.

Through the counter staff come the actual contacts with the customer, and the "value conscious" counter hand who draws attention to the thickness of the sweet filling between the pastry covers has gone a long way to making possible that peak in the life of a catering manager, when a factory worker asks for a recipe for "the wife" and is amazed to hear that carrot and oatmeal are the main ingredients.

Once upon a time it was taken for granted that factory workers would not eat salads. It was probably because they were not offered to them; up to 70 per cent. of our workers will eat them in the summer, and at least 20 per cent. all through the winter as main meals or dinners but, if there

is a prejudice to be broken down, most men will buy salad sandwiches to eat during the tea break, particularly if there is a layer of sardine mashed with cod liver oil as well as the green stuff, or dried egg scrambled with minced outside leaves of leak or cress. From the users of the night canteen definite requests have been received for salads, particularly during the hot nights. The first time water cress was offered with fried fish it was in a bowl on the counter, and 8 out of 232 said yes. Four weeks later 3 out of 301 said no. Custom is a great help and everything has to be done for the first time, but if the first time that a new food is offered it is made an *addition*, rather than an alternative, one lessens the conservative reaction against the new thing.

In this Company's canteen roughly 1800 meals are served in 24 hours and the staff consists of 1 catering manager, 2 forewomen (1 night and 1 day), 42 full time day staff, 3 part time day staff and 5 full time night staff; these serve meals from one kitchen to 6 dining rooms, and issue tea and snacks in thermos urns for service in the shops in the mid-morning and mid-afternoon breaks.

The staff is decentralized functionally so that there are in effect 8 or 9 small teams all concerned with, and taking a craftsman's pride in, their own special job from the pastry cooks experimenting with the new flour to the washers up on whose foundation the work of the others is built.

The heads of these teams with the forewomen and the canteen manager meet once a month, or oftener if any special need arises, to discuss as the Canteen in Council any new ideas in food or cooking, staff problems, waste, etc. This Council is very newly formed, but has already been most useful in increasing a sense of responsibility in the members who do feel that part of the world's wealth is in their hands to deal with as they can.

In 1940 a snack bar was started as an experiment for serving new kinds of meals, most of them with salad foundations, for the younger people coming into industry with large appetites and small purses. The customers have more than trebled since the beginning, and the definite atmosphere of adventure in the snack bar is one of the ways in which food education reaches the other side of the counter.

For each of the dining rooms a different menu is constructed for the week and weekly orders are given to greengrocer and butcher, so that if the supply of anything gets worse suddenly, there is a framework into which to build the substitute so that the balance of food value is unchanged. Knowledge is unconsciously absorbed by the cooks when beans are not allowed as a substitute for green vegetables, and a sweet has to be altered because of an alteration in the first course.

Wheatmeal bread is popular; when there was a choice on the counter, 40 per cent. took brown rather than white after about three months' trial. One can justly say that with the present rations it is possible to serve nutritious meals that the average factory worker will like. It is hard to overcome prejudice with regard to eating but it is magnificently worth while doing, and it *can be done*.

Collective Feeding and the Housewife

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There seems to be general agreement that housewives are a section of the community making relatively little use, so far, of the facilities for collective feeding, and it is worth while to enquire what are the reasons for this, and to what extent any difficulties can be met. In speaking of housewives, I shall exclude those with no ties of family or work, whose personal inclination or lack of need may be the only reason for not going out to eat. Those are excluded, too, who are able to make use of canteens at their place of occupation if they are employed, whose menfolk have similar opportunities, and whose children are provided for in schools and nurseries. There still remains a large body of women who need some relief and are not at present getting it. It is true that in some cases the constitution of the household and the daily programme of its members would not preclude the use of the British Restaurant, and only disinclination to start on a new venture prevents these women from finding a real boon in the use of it once or twice a week. In many instances the housewife has to do singlehanded the work of a household that has increased in size through the addition of billets in a house that can only be adequately covered with extra domestic help, now unobtainable. In addition, services such as laundry, window cleaning, garden work and delivery of goods are now unobtainable, or too expensive, and it is the housewife who has taken them over. The same women are frequently engaged in business or professional work, or have undertaken some form of voluntary social or civil defence work that they rightly wish to continue. When the other members of her household cannot use collective feeding facilities at all regularly, her case is serious. This may happen if she has in the home young children or elderly or invalid people for whom transport, especially in bad weather, is impossible, or whose nutritional needs are different; or some of her family might just have time to come in from shop, workshop or other occupation if the meal were ready instantly, but would not have time to travel to the nearest British Restaurant and risk having to wait. There might be other reasons, apparently trivial, but important to the life of the family, making them wish to visit their home for the midday meal. Further, it might be that the whole household, housewife included, was elderly or in some way incapacitated from going to a communal centre, or indeed even from undertaking much in the way of cooking or shopping.

For such cases the cash and carry system of collective cooking rather than of collective feeding would meet many difficulties, and there is considerable demand for an extension of this service. In some areas, where British Restaurants have the accommodation, the same kitchen could provide for both types of custom. In others, separate kitchens might meet the case better, especially where distances were great. There might be in addition a service of mobile vans or trolley bicycles which could operate at given times along different streets or at fixed points. Preparation of vegetables and other foods by individual housewives, rather than in quantities large enough for hundreds of homes, is a great waste of time in busy lives, particularly if the vegetables are bought and

VOL. 1, 1944]

collected by those who cannot grow them. It should not be impossible to provide relief by offering partially or wholly cooked meals, and a very real economy of labour, material and fuel would ensue. Communal catering services would in this way reach a much larger proportion of the population.

Summing Up

Sir Joseph Barcroft (Physiological Laboratory, Cambridge): Lord Woolton expects the Nutrition Society to help him. He certainly can rely on us doing this in every way possible. Today's discussions have shown how it can be achieved. There is gathered at the meeting an enormous fund of experience and the Society could, better than any other body in the country, pool information, enunciate problems and weld into a coherent whole the knowledge which is available. Food problems have to be tackled all the way from production to consumption. The preparation and treatment of foods are almost as important as the foods themselves. Variety is required in the diet. High class cooking, which can be defined as the production on scientific lines of a meal of the greatest possible value, is not a luxury but an economy. Not only nutritive value but also palatability and aesthetic value should be considered. The psychological effect of choice is great but in nutrition unguided choice between good and bad should not be encouraged. In old days cooking was a domestic affair but in this industrial age home cooking has very frequently to be supplemented and obviously the machinery for this will have to be developed. In this the Nutrition Society could help and one way is by the publication of its Proceedings. Another possibility is for the Society to form specialised discussion groups.