

Report of the Conference on the post-war loaf : presented by the Minister of Food to Parliament by command of His Majesty, November 1945.

Contributors

Conference on the post-war loaf (1945 : London)
Great Britain. Ministry of Food.

Publication/Creation

London : H.M. Stationery Off, [1945]

Persistent URL

<https://wellcomecollection.org/works/rcwxhufp>

License and attribution

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
<https://wellcomecollection.org>



MINISTRY OF FOOD

REPORT OF THE CONFERENCE ON THE POST-WAR LOAF

*Presented by the Minister of Food to Parliament
by Command of His Majesty
November 1945*



LONDON
HIS MAJESTY'S STATIONERY OFFICE
NINEPENCE NET

Cmd. 6701

COMPOSITION OF THE CONFERENCE

Chairman : Sir Henry French, K.C.B., K.B.E.

Official Representatives

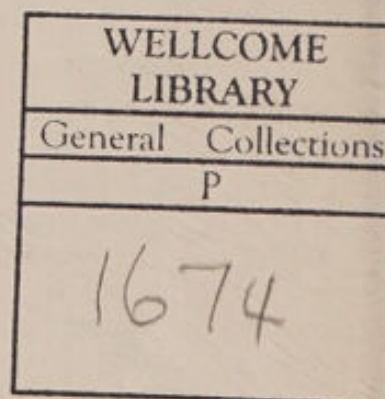
Ministry of Food	...	The Lord Horder, G.C.V.O., M.D., B.Sc., F.R.C.P. Mr. C. H. Blagburn. Sir Jack Drummond, F.R.S., D.Sc., F.R.I.C. Mr. J. N. Frears. Mr. E. G. Harwood. Mr. C. A. Loombe. Dr. T. Moran, D.Sc., Ph.D.
Ministry of Health	...	Mr. P. N. R. Butcher. Sir Wilson Jameson, K.C.B., M.D., F.R.C.P.
Ministry of Agriculture and Fisheries.		Mr. R. H. Franklin (succeeded by Mr. F. Grant). Mr. R. G. R. Wall.
The Department of Health for Scotland.		Dr. Andrew Davidson.
Medical Research Council		Sir Edward Mellanby, K.C.B., F.R.S. (succeeded by Dr. B. S. Platt, C.M.G.).

Representatives of the Milling Industry

C.W.S.	...	Mr. J. McFadyen.
Scottish C.W.S.	...	Mr. Donald Dow, J.P.
National Association of British and Irish Millers.		Professor E. C. Dodds, M.V.O., F.R.S. Mr. W. F. C. George. Mr. J. Arthur Rank, D.L., J.P. Sir W. Norman Vernon, Bt., M.A. Mr. L. Hector Read deputised for Mr. Rank during his absence in the U.S.A.

Representatives of the Baking Industry

National Association of Master Bakers, Confectioners and Caterers.		Mr. F. Phillips.
Federation of Wholesale and Multiple Bakers.		Mr. R. N. Cannon, M.A.
Parliamentary Committee of Co-operative Congress.		Mr. H. Marriott.
Scottish Association of Master Bakers.		Mr. A. J. Ferguson.
North of Ireland Bakery Wartime Economy Committee.		Mr. J. Little.



Representatives of the National Association of Flour Importers

		Mr. W. F. Peach. Mr. J. B. Russell, C.A.
Secretary	...	Miss L. E. M. Weeks (later Miss M. A. Cotterill).



REPORT OF THE CONFERENCE ON THE POST-WAR LOAF

INTRODUCTION

1. The Conference was convened in January, 1945 by the Ministry of Food, in collaboration with the Health and other Departments concerned, to assist Departments in advising Ministers on post-war bread and flour policy and in particular on any regulations which might have to be made with regard to flour and bread when wartime control ended. The Conference included, on the official side, representatives of the Ministries of Food, Health and Agriculture, of the Scottish Department of Health and of the Medical Research Council. The milling, baking and flour importing industries accepted invitations and these industries have been represented on the Conference.

2. The Conference met six times in all. Two technical sub-committees were appointed to consider special points on which scientific or technical advice was required. The first of these, under the Chairmanship of Lord Horder, was appointed to advise on the minimum quantities of nutrients to be prescribed in regulations dealing with flour. The second, under the Chairmanship of Mr. C. A. Loombe, Director of Cereal Products in the Ministry of Food, was asked to consider whether regulations governing the nutrient content of flour were practicable and could be enforced. The conclusions of the Conference have been reached in the light of the advice of these sub-committees.

3. Requests to be allowed to send representatives to the Conference were received from the Amalgamated Union of Operative Bakers, Confectioners and Allied Workers, the Cake and Biscuit Manufacturers' War Time Alliance and the Milk Powder Pool. The first two bodies were asked to state their views in writing and these views have received full consideration in the preparation of this Report. A memorandum submitted by the Cake and Biscuit Manufacturers' War Time Alliance Limited is reproduced as Appendix III. The Milk Powder Pool were informed that the Conference was concerned only with the question of the essential nutrients to be found in post-war flour and that, in the opinion of the Conference, milk powder could not be regarded as an essential ingredient.

I. POSITION UP TO THE PRESENT

Position under Peace-time Legislation

4. Powers of control over the quality, composition and cleanliness of bread and flour are provided in peace-time legislation of England and Wales by a number of Acts which were consolidated in the Food and Drugs Act, 1938, which came into operation on October 1st, 1939. Bread and flour are subject to the general provisions of the Act and relevant Regulations which prohibit the sale, to the prejudice of the purchaser, of food not of the nature, substance or quality demanded. The Act also prohibits the sale of food unfit for human consumption, and makes such food liable to seizure and condemnation. Bread and flour are also covered by those clauses of the Act which require certain standards of cleanliness and hygiene to be observed in preparing and handling food generally.

5. The composition of bread and flour is also to some extent controlled by the Public Health (Preservatives etc. in Food) Regulations, which prohibit the sale of bread and flour containing any added preservative. Section 31 of the Food and Drugs Act also makes it an offence for substances,

whose inclusion in bread and flour are prohibited by Bread and Flour Regulations, to be found in a mill or bakehouse, unless it can be proved that they are not intended for use in contravention of the Act. The Act extends the powers of the Minister of Health in making Bread and Flour Regulations, but the making of such regulations was postponed by the outbreak of war.

In Scotland only certain sections of the Act apply. These include Section 30 and 31; but instead of Section 3 prohibiting the sale of food not of the nature, substance or quality demanded, Scotland relies on Section 2 of the Food and Drugs (Adulteration) Act, 1928. County Councils and the Town Councils of the large Burghs enforce the Food and Drugs Acts in Scotland.

6. In practice, Local authorities have been able to exercise little specific control over the composition of bread and flour. Their control has been mainly confined to matters of hygiene and the grosser forms of adulteration and misdescription.

7. Apart from the regulations referred to above, home-milled flour came within the scope of the voluntary scheme for standardisation of quality of home produce initiated by the Agricultural Departments under the Agricultural Produce (Grading and Marking) Acts, 1928 and 1931.

Grade designations and appropriate statutory definitions of quality were prescribed for wheat flour, as well as for malt flour and for bakers' malt extract made from home-grown grain. The regulations defined the permissible limits of ash, fibre and moisture content for flour sold under these grade designations and prohibited artificial bleaching of such wheat flour. The "National Mark" was applied to flour complying with these grade definitions by millers and packers authorised by a National Mark Committee appointed by the Ministry of Agriculture.

Produce packed under the mark was required to be of the quality the mark implied, and was subject to inspection. The authorised packers were under the supervision of the National Mark Committee. The National Mark Schemes have been in abeyance during the war.

Wartime Developments

8. Since the outbreak of war the Ministry of Food has regulated the types of flour produced, its composition and the rate of extraction at which it should be milled.

(a) Standardisation of Grade and Minimum Extraction

9. Immediately on the outbreak of war millers were restricted, under the Control of Mills (Flour and Provender) (No. 1) Order, 1939, to the production of a straight run flour; the various grades formerly made for special purposes were abolished. Straight run flour was defined in the Flour (Prices) (No. 1) Order as having a minimum rate of extraction of 70 per cent. calculated from the weight of cleaned wheat going into the mill. On October 26th, 1939 the minimum rate of extraction on the same basis was raised by administrative action to 73 per cent. From March 1940, however, the definition of the extraction rate was altered under the Flour (Prices) Order, 1940, which required the rate to be calculated, not from the weight of clean wheat ground, but as a percentage of all the "end products" of the milling operation including the screenings, seeds and dust extracted before milling. The flour was for the first time named "National Straight Run Flour." On April 21st, 1941, the extraction rate was raised to 75 per cent. by an Amendment to the Flour (Prices) Order, 1940.

(b) *National Wheatmeal*

10. At the end of January 1941 millers were informed that the Ministry of Food, with a view to making available to the public a loaf in which were retained the valuable nutrients which occur naturally in the wheat berry, was about to commence propaganda to encourage the consumption of wheatmeal bread, and that they should therefore be prepared to supply bakers' demands for a flour containing not less than 85 per cent. of the wheat berry, to be sold at the same price as National Straight Run Flour. In February a circular to millers notified a decision to standardise this wheatmeal flour as "National Wheatmeal." Millers were urged to keep as close as possible to the 85 per cent. minimum extraction rate, to include as much as possible of the wheat germ, and to exclude the coarse bran. The actual method of production, i.e., whether by straight milling, or by mixing national straight run flour and fine wheatfeed after milling, was left to millers' discretion. The sale of National Wheatmeal, while the voluntary scheme was in force, did not exceed 9 per cent. of total sales.

On September 1st, 1941 statutory force was given to the definition of National Wheatmeal by the Flour (Control and Prices) Order, 1941, broadly on the lines of the circular of February 1941 though without any specific reference to the inclusion of germ and the exclusion of coarse bran. Later in the same month, by a further statutory order, it was made clear that the upper limit of extraction of National Straight Run flour must be something less than 85 per cent.

(c) *Compulsory Increase in Extraction*

11. In March 1942 because of the acute shipping shortage and the necessity to reduce wheat imports to the minimum, the Government decided to prohibit the production of white flour and millers were thereafter required to mill only National Wheatmeal, the definition of which by a further amending Order was altered so as to require, as well as a minimum extraction of 85 per cent., the inclusion of the maximum quantity of the wheat germ which, having regard to the type of milling plant, could be included in the flour. Coarse bran was to be excluded. The name "National Wheatmeal" was changed to "National Flour" in April 1942.

During the winter of 1942-1943, again as a means of economising shipping, it was decided to "dilute" flour with cereals other than wheat, and for a short time a proportion of barley (varying up to 10 per cent.) and small quantities of rye and oats were included in the grist. This procedure, however, was discontinued in November 1943.

(d) *Research on High Extraction Flour*

12. Although knowledge about vitamins and their occurrence in foods grew rapidly in the interval between the two wars, the information available about the occurrence and distribution of these nutrients in the wheat grain was still insufficient to enable experts to express an opinion on the subject with any conviction when the question of lengthening the extraction of flour was under consideration in 1940. All that could be said at that time was that the best level of extraction, having regard both to nutritional considerations and the acceptability of the loaf, was within the range 80-85 per cent., which it was believed would ensure a flour containing the bulk of the germ. The balance of scientific evidence and certain technical considerations indicated at that time that the best type of flour would be one of about 85 per cent. extraction. It was clear, however, that further research was urgently needed.

A research programme was, therefore, put in hand at the Cereals Research Station of the Ministry of Food (formerly the Laboratories of the Research Association of British Flour Millers) in order to ascertain more about the distribution in wheat of the more important nutrients, particularly the vitamins, and to study the path taken by the various fractions of the grain during milling. These investigations have been most fruitful, and the results obtained already have had a far-reaching effect on practical milling procedure in the future. The two outstanding discoveries resulting from this work are that vitamin B₁, formerly thought to be associated with the germ of the wheat as a whole, is now known, in fact, to be highly concentrated in part of the germ, and that this particular fraction of the wheat can be segregated during milling in such a manner as to ensure the greater part passing into the flour. The second discovery was that the outer endosperm adjoining the bran is rich not only in protein but also in iron and nicotinic acid. These two facts mean that it is possible to look at the milling of flours within the range of 80-85 per cent. extraction in a new light.

13. By December 1943 it was reported that, as a result of the experimental work in the laboratories and on the part of milling engineers, it would be possible, with fourteen days' notice, to lower the extraction rate from 85 per cent. to 82 per cent., while retaining in the flour an adequate proportion of essential nutrients. Shipping difficulties, however, prevented the reduction being made immediately, and it was not until October 1944 (S.R. & O. 1944 No. 1088) that the Government decided that the extraction rate should be reduced to 82½ per cent. With the completion of the experimental work a further reduction to 80 per cent. was effected on December 31st, 1944 (S.R. & O. 1944 No. 1436). Millers were told by circular to mill so as to include the maximum amount of vitamin B₁ even at the expense of colour. Weekly analyses were also made of the flour from all the mills in the country and each miller was advised of the figures obtained on his samples. The results as a whole have been published periodically in the scientific press.

(e) *Fortification of Flour*

14. VITAMIN B₁. In addition to its attempts throughout 1941 to popularise National Wheatmeal, the Ministry had been considering the fortification with vitamin B₁ of the mills' production of National Straight Run flour. A scheme was instituted in November 1940 for the inclusion of aneurin at the rate of 0.2 gramme per 280 lb. Technical difficulties at the mills delayed the introduction of the plan on a national scale, but in July 1941 it was in operation in the South Wales mills, and by the end of March 1942 National Straight Run flour was being fortified with Vitamin B₁ to the extent of 38 per cent. of production. When National Straight Run flour was abolished and 85 per cent. extraction made compulsory, fortification was, naturally discontinued.

15. CALCIUM. Apart from fortification designed to replace in flour nutrients lost in milling, the Ministry of Food added calcium in an amount greater than that present in wheat. This was done with two objects in view. In the first place, it was thought desirable to give a measure of protection against any adverse effects of phytic acid in high extraction flour and other articles of the diet and, secondly, it was regarded as advantageous to raise in this manner the calcium content of the diet as a whole. The addition to national flour of calcium (*Creta Praeparata*) at the rate of 7 oz. per 280 lb. was introduced on a voluntary basis in April 1942 and became compulsory on the 1st August 1943 by which date 95 per cent. of the mills in the U.K. were in fact already fortifying national flour with calcium. This addition of calcium has continued up to the date of this report.

16. **MILK POWDER.** Milk powder was first added to National Flour at the rate of 2 lb. per 280 lb. in December 1942 but was discontinued on supply grounds in the Southern part of the country in October 1943 and in the rest of the U.K. in March 1944.

Health of the Nation in Wartime

17. In considering future policy with regard to the character of the flour supply, the Conference has had regard to the effect on national health of the high extraction flour which has been consumed in wartime.

Vital statistics and the results of surveys carried out by the Ministry of Food and the Health Departments make it plain that the health of the nation in wartime has been maintained and even improved. This can be attributed to a combination of factors. The rationing and priority schemes have ensured an adequate distribution of food and made a balanced diet available to all. The increased purchasing power resulting from full employment during the war, combined with price control and subsidies, which have kept food prices down to a reasonable level, has enabled the poorer classes to buy not only more food, but a greater variety of food than was the case in the inter-war period.

Regular feeding habits have been encouraged in works canteens and British Restaurants. The consumption of milk by those classes of consumers who are most in need of it—i.e., mothers, children and invalids—has been greatly increased.

18. But after allowing for all these factors, there is still, in the opinion of the medical profession, evidence that National flour and bread made from it must have made a considerable contribution to maintaining and, on average, improving the nation's health during the last three to four years.

Technical Issues

19. Before going on to consider the control of the composition of flour and bread after the war, it may be well to set out some of the technical issues involved, particularly in connection with the question of the "rate of extraction" which so frequently arises in this Report. The "rate of extraction" expresses the percentage of the whole wheat berry which passes into flour during the milling process. As an example, an 80 per cent. extraction means that 80 per cent. of the weight of wheat milled passes into the flour. Under the present system of control, the rate of extraction is calculated by weighing regularly the whole of the "end products," i.e. flour, offals and screenings produced in the milling process and calculating the percentage which the flour represents of the total.

20. The whole wheat grain contains a number of valuable nutrients, in particular, vitamin B₁, riboflavin, nicotinic acid and iron. The only way to ensure that the whole of these nutrients are retained in the flour is by the production of wholemeal flour (100 per cent. extraction). There are, however, numerous practical objections to making the whole of the flour supply wholemeal—questions of palatability, digestibility, keeping quality, etc.

21. To produce white flour of the kind generally produced before the war it is necessary to mill at a low extraction rate—70 per cent. or 72 per cent., i.e. to exclude from the flour those parts of the wheat grain which tend to darken its colour and which also contain most of the indigestible fibre. But these parts of the grain also happen to be those which contain the valuable nutrients. It is therefore not yet possible to produce a white flour which contains a high proportion of the valuable nutrients from the wheat berry. In order to retain these nutrients an extraction rate higher than was general before the war is necessary.

The extraction rate itself is no measure of the nutritional quality of the flour. Flour milled at the same rate of extraction from different types of wheat varies in quality and appearance. The relevance of the extraction rate to the nutrient value of the flour may not be consistent. Merely to prescribe a high rate of extraction, therefore, would not necessarily ensure that the valuable nutrients are retained in flour and bread. Everything depends upon the milling process, which must be carried out so that those parts of the wheat berry which contain the valuable nutrients remain in the flour.

22. As has been already indicated research was carried out during the war years to arrive at a milling process which, while retaining in the flour as much as possible of the essential nutrients, will exclude so far as possible the fibrous parts of the wheat berry which tend to produce a dark colour. At 85 per cent. or 90 per cent. extraction the flour may contain a large proportion of the valuable nutrients, but it will certainly not be white. But, as the result of research, an 80 per cent. flour has been produced which contains an adequate proportion of the valuable nutrients and at the same time is considerably whiter than the 85 per cent. flour previously produced

II. FUTURE POLICY

23. H.M. Government will have to decide, before wartime control comes to an end, whether, in the interests of national health, the character of our flour supply should continue to be regulated, or whether the nation should regain the freedom of choice which existed before the war.

24. Members of the official side of the Conference have made it clear during the proceedings that, if at any time their advice were asked for by Ministers concerned, they would consider it their duty to recommend that, following on present wartime control, all flour sold in this country for human consumption should, if practicable, be subject to regulation, so as to maintain a desirable nutrient standard. If this is found not to be practicable, consideration should be given to the possibility of making regulations limited to flour used for bread making.

They have reached this conclusion as a result of the very definite view expressed by the official medical and scientific members of the Conference that a return to white flour, such as was commonly in use before the war, would be thoroughly bad for the nation's health. Before the war, for a vast number of people, bread and margarine formed an important part of the diet, and bread will undoubtedly continue to play a large part in the diet of the nation after the war. The members of the Conference referred to assert emphatically that, if the extraction rate of flour falls below a certain level and nothing is done to replace the lost nutrients, human beings dependent on bread for a supply of these nutrients are likely to suffer in health.

25. The Conference has therefore proceeded on the assumption that the Government will wish to continue to control the nutrient quality of bread and flour as a matter of permanent policy and has directed its attention to considering (a) the objective of such control, (b) the practical possibilities of achieving that objective.

A Minimum Nutrient Content for Flour

26. A sub-committee, with Lord Horder as chairman, was appointed to advise on the quantities of certain specified nutrients which should be available in flour for human consumption. The nutrients to which the sub-committee was asked to direct its attention were vitamin B₁, riboflavin,

nicotinic acid and iron. It was recognised by the Conference that there are other nutrient factors in wheat, but they were advised that there is at present insufficient knowledge of these other factors to make it possible to define minimum standards for them. The Sub-Committee's report is reproduced as Appendix I.

The Sub-Committee did not concern itself with the source of the nutrients which ought to be available in flour. It set out merely to establish the minimum quantity of those nutrients which should be available.

27. The Sub-Committee first considered what are the total requirements of the four "token" nutrients, vitamin B₁, riboflavin, nicotinic acid and iron, which should be supplied by the diet as a whole. Their conclusion on this question was, broadly, to the effect that, as a high standard of national health has been maintained on the diet that has prevailed in the U.K. during the war, it seems reasonable to assume that the quantity of the named nutrients provided by this diet represents a satisfactory standard. The Sub-Committee also took into account the dietary allowances recommended by the National Research Council in the U.S.A. and the figures recommended by the League of Nations (for B₁ and iron) and by the Medical Research Council (for riboflavin and nicotinic acid). The Sub-Committee concluded that a desirable standard of total requirements (per head per day) for the four nutrients after the war would be:—

	mg.
Vitamin B ₁	1.78
Riboflavin	1.92
Nicotinic acid	13.91
Iron	14.60

28. Taking into account the average daily consumption per head of bread by working class families before the war which was equivalent to 33½ per cent. of their calorie intake, the Committee arrived at a desirable minimum standard of nutrient content for flour, designed to give a total intake of the four named nutrients approximating to the quantities set out above.

The minima recommended by the Sub-Committee were as follows:

	<i>Per 100 gm. of flour.</i>	mg.
Vitamin B ₁		0.24
Riboflavin		0.14
Nicotinic acid		1.60
Iron		1.65

The Sub-Committee's report indicates that with the exception of riboflavin these minima could be supplied, without reinforcement, by a flour of 80 per cent. extraction. To ensure that the required amount of riboflavin from the wheat berry was present in the flour, it would, however, be necessary to mill at 85 per cent. extraction.

29. The Conference has accepted this report in its main essentials and considers that its recommendations could be achieved commercially.

30. The Conference has given careful thought to the question of riboflavin. It was advised by Sir Jack Drummond, Scientific Adviser to the Ministry of Food, that other foods, notably milk and meat, provide a much greater proportion of the total intake of riboflavin in the diet than do flour products. Eggs, potatoes and vegetables are also good sources of riboflavin. On the basis of the War-time Survey of food consumption in working class households,

carried out by the Ministry of Food, it is calculated that even with flour of the minimum standard recommended by the Sub-Committee, i.e., 0.14 mg. of riboflavin per 100 gm., only about 20 per cent. of the total riboflavin requirement of the diet is likely to be provided by flour and flour products.

31. The Conference is of the opinion that, on the basis of present knowledge, if the choice lay between:

(a) reducing or omitting the riboflavin target and adhering to an 80 per cent. extraction, and

(b) raising the 80 per cent. extraction to, say, 85 per cent. in order to provide the proposed quantity of riboflavin, course (a) would be preferable to (b) from the point of view of practical policy.

There is also the not unimportant consideration that the methods of riboflavin assay have not yet reached that degree of precision which is necessary if they are to be used for purposes of control. Further, it is certain that if a flour contains the specified quantities of the other three nutrients, then riboflavin on a comparable scale will also be present.

The Conference has therefore unanimously decided to recommend that riboflavin should not be one of the specified nutrients.

32. With this modification in the recommendations of Lord Horder's Sub-Committee, the Conference puts forward as the minimum desired standard the following quantities of nutrients per 100 mg. of flour:—

<i>Nutrient.</i>							<i>Quantity.</i>
							mg.
Vitamin B ₁	...	...	...	...	...	...	0.24
Nicotinic Acid	...	...	...	...	...	...	1.60
Iron	...	...	...	...	...	...	1.65

Method of ensuring a Minimum Nutrient Content in Flour

33. The question next arises as to how this minimum desirable standard should be secured. There are two possible alternatives—either by retaining in the flour the natural vitamins of the wheat grain, or by "reinforcement," i.e., adding nutrients to the flour to replace those not retained in milling.

The Conference has considered carefully which of these alternatives should be adopted. Both of them are commercially practicable. Wartime experience, as has been pointed out, has shown the possibility of producing an 80 per cent. extraction flour containing a high proportion of essential nutrients, and of good bread making quality. On the other hand the Conference is advised that there is no difficulty in producing synthetically the three constituents in question and incorporating them in flour, in whatever proportion may be desired. In the course of discussion of these two alternatives, it has become clear that it is a matter of balancing nutritional considerations against questions of administrative practicability.

Nutritional Advantages of High Extraction

34. The official medical and scientific members of the Conference hold strongly the view that flour should not only have the prescribed minimum quantities of the specified nutrients, but that those minima should be retained in the flour from the wheat berry in the process of milling. The advantage of natural over reinforced foods is something about which most nutritionists in the United Kingdom are agreed. The high standard of health which has been maintained in this country throughout the war, as already indicated, is

believed to be attributable at least in part to this policy and to the consumption of high extraction flour in which the vitamins necessary for adequate nutrition have been retained. It has yet to be shown that flour reinforced with added vitamins would produce equally good results. Knowledge of the constituents of the wheat berry and of their physiological action is still incomplete. The three token nutrients for which a prescribed minimum is proposed have been accepted because they are those with which it is practicable to deal by way of legal sanctions. These vitamins, however, are only elements in an organic complex which includes other substances some of which are known to be physiologically active, though knowledge of them is still imperfect. It is impossible, therefore, to be certain that artificially fortified flour will give results comparable to those from flour in which the known vitamins are retained, together with the less perfectly known constituents of the wheat berry. So long as precise information is not available as to what lower extraction removes, it is impossible to be sure that all the valuable constituents are replaced by reinforcement. There is a strong *prima facie* case for thinking that the vitamins in the wheat berry exist in the form of a balance which has been proved to be conducive to health, and therefore much caution is called for before starting upon a new line of action which might upset that balance with deleterious effects.

Limiting consideration to what is desirable and ignoring whether it is practicable or enforceable, the Conference is not prepared to differ from the view that natural food is to be preferred to food reinforced with so-called synthetic vitamins. There are, however, a number of important practical considerations to be taken into account.

Possibility of Enforceable Regulations

35. The Conference has given detailed consideration to the question whether the objective of a minimum standard of desirable nutrients retained from the natural constituents of the wheat could be secured by means of official regulations which could be enforced by Local Authorities or otherwise.

To consider this problem a Sub-Committee was set up, with Mr. C. A. Loombe, Director of Cereal Products in the Ministry of Food, as Chairman. The report of this Sub-Committee is reproduced in Appendix II.

36. The Conference accepts the conclusion of the Sub-Committee that it would be possible to secure, by regulation and by such enforcement procedure as proves in practice to be required, that flour contains the prescribed minimum quantities of the three specified nutrients. They also endorse the Sub-Committee's suggestion that, as many public analysts are unfamiliar with methods of assaying certain of these constituents, centralised testing would be necessary in the early stages until uniformity of technique can be assured.

37. The Conference has devoted much time and thought to the practicability of ensuring by regulation—after war-time control comes to an end—that the minimum quantities of the prescribed nutrients shall be retained in the flour from the natural constituents of the wheat grain. The Conference has not been able to reach a unanimous conclusion on this part of its enquiry.

38. Mr. Loombe's Sub-Committee considered two possible alternative methods of achieving this objective: (a) by prescribing that wheat must be milled to a minimum extraction rate, and (b) by prohibiting the addition of vitamins to flour, while at the same time prescribing a minimum standard of content of the nutrients in question.

39. The Sub-Committee came to the conclusion that a regulation prescribing a minimum extraction rate could not be enforced after the present control of the milling industry ceases. They pointed out that it is impossible to determine by analysis at what rate of extraction any particular sample of flour was milled. Different samples of wheat when milled at a given extraction rate yield flours which differ widely in composition. The only method of securing adherence to a prescribed minimum rate of extraction would therefore be the one adopted in war-time, i.e. the measurement of the total quantity of the different end-products obtained in each mill. This, however, is obviously only possible so long as a comprehensive system of Government control of the milling industry exists. Even if a minimum rate of extraction could be enforced, this in itself would not ensure that the flour contained the required quantity of any nutrient.

40. As regards the alternative possibility of prohibiting the addition of synthetic nutrients to flour, the Sub-Committee advised that there is no method at present known of determining by analysis whether the vitamins present in a sample of flour are naturally present or have been added. They recommend that further investigation should be made on this point. In the absence of any method of identifying added nutrients, the only means of enforcing a regulation prohibiting reinforcement with added nutrients would be by a system of inspection of the mills to ascertain whether any of the vitamins in question were being purchased and used. In the absence of control such as has been in operation during the war years, it is doubtful whether such a system of inspection would be fully effective.

41. In view of these enforcement difficulties, some members of the Conference felt that it would be useless to make regulations requiring that the prescribed minimum nutrient content should be attained by the retention of the natural vitamins of the wheat. The official scientific and medical members of the Conference are not, however, prepared to recommend that, because of the difficulties involved, in the present stage of knowledge, in enforcing such regulations, a decision should be taken forthwith to allow each individual miller to decide for himself whether he would comply with the requirements as to the minimum nutrient content of flour (a) by obtaining such "token" nutrients direct from the wheat grain, or (b) by producing low extraction flour and reinforcing it by the addition of vitamins. They consider that there is reason to believe that further investigation would reveal tests which would show whether the source of the vitamin is natural or artificial. Before an admittedly second best policy is adopted, this point ought, in their opinion, to be fully investigated.

Problem of Country Mills

42. A requirement that the minimum quantities of nutrients in flour were to be derived direct from wheat, without reinforcement, while it could be carried out without difficulty by the port mills, would seriously prejudice the position of country mills which are dependent wholly or to a large extent on locally produced wheat. Generally this wheat is low in nutrients compared with, say, imported Canadian wheat although this is not always the case; much of the present crop of home grown wheat has been found to have an average Br content slightly higher than Canadian wheat. The Conference is advised that, because of the composition of much of our home grown wheat, to obtain the minimum quantity of the named nutrients from home grown wheat the rate of extraction would in some years have to be considerably higher than would be necessary for imported wheat. It follows

that if reinforcement were not permitted, a country mill, in order to attain the necessary nutrient standard, would have to produce a darker flour than a port mill and would be at a serious competitive disadvantage in selling its flour, by comparison with the port mill.

43. It has been suggested that the difficulty might be overcome by giving a special subsidy to country mills, to enable them to pay the additional transport and other costs involved in purchasing and incorporating in their grist a sufficient proportion of imported wheat to comply with the minimum standard. This however would involve a substantial dislocation of existing marketing channels, would be uneconomic and would raise strong objections from farmers in that it would tend to reduce the market for home grown wheat.

44. The difficulty of the country mill might, in time, be removed or reduced, as a result of a comprehensive investigation into the production in this country of varieties of wheat for human consumption containing an adequate quantity of the valuable nutrients. The Conference recommends that research should be directed towards determining which varieties of wheat grown in this country will produce flour (a) of good bread-making quality, and (b) containing the maximum proportion of the desired nutrients without appreciable loss of yield on average soils. It is further recommended that the increased use of such varieties by farmers in the United Kingdom should be encouraged so far as practicable.

Imported Flour

45. A requirement that all flour produced in this country must be milled to a specified minimum extraction rate, would necessarily involve the adoption of measures to prevent the importation into the U.K. of low extraction flour from abroad. Any other course would be unfair to the home industry.

46. Before the war about 10 per cent. of the flour consumed in U.K. was imported in the form of flour, mostly from Canada and Australia, although considerable quantities also came to the U.K. in some years from other sources.

47. It would be simple to ensure by analysis that imported flour contained the minimum quantities of the named nutrients, but similar difficulties would arise, as in the case of home-milled flour, in determining by analysis that it had not been reinforced.

48. A regulation that only flour milled to a specified minimum extraction rate might be imported could therefore only be enforced provided the Governments of the exporting countries were prepared to agree to take the necessary action to ensure that the millers produced for export only flour so milled. If these Governments were prepared to collaborate, they would, of course, be faced with the same difficulties of enforcement as have already been indicated above.

The question whether the co-operation of the Governments of the exporting countries would be forthcoming has not been discussed with them. While it is appreciated that the co-operation of exporting countries has been secured in other directions, e.g. the enforcement of various sanitary regulations for meat, etc. these regulations have not involved substantial changes in the technique of production or in the character of the product. The enforcement, in flour exporting countries, of a high extraction rate for flour for export

would mean that they would have to adopt a different milling technique for export flour from that in use for flour for home consumption.

The trade of the Dominions mills in the United Kingdom market has been built up upon the supply of special types and grades of single wheat flours for special uses, and any limitation in supplying such needs would react unfavourably upon the Dominion milling industries.

Consumer preference

49. A further important factor to be taken into account in deciding whether it would be practicable to make a regulation requiring that the minimum quantities of the named nutrients should be retained from the wheat grain in the process of milling, is the question of consumer preference.

50. There can be no reasonable doubt that before the war the overwhelming preference of the public was for white bread.

Experience at that time—when 95 per cent. of the bread sold was made of white flour—proved that any miller or baker who was not prepared to satisfy public demand for white bread would have lost trade to his competitors.

51. There is also convincing evidence that if flour extraction had continued at the 85 per cent. rate during the period of control, the majority of people, if they had been given freedom of choice, would have reverted to white bread, after control came to an end.

52. There can be no doubt, however, that the 80 per cent. flour now in general use is far more popular than the previous 85 per cent. with the public as well as with the miller and baker. Apart from the question of appearance, what the public wants is a loaf that is palatable, keeps well, cuts well and makes good toast. The present flour fulfils these conditions reasonably well and there is evidence of a growing appreciation of it. It is possible, therefore, that in time the public would be satisfied with bread such as is being sold to a large extent all over the country to-day. It is too early to say whether the present flour would, if continued for a considerable time, attract consumers generally away from their preference for white flour. The trade members of the Conference, however, unanimously hold the view that, if they were now given freedom of choice, most people would quickly revert to white bread.

53. The Conference attaches much importance to the public attitude towards its bread supply. The decision to raise the extraction rate was originally based on the need to economise shipping by reducing our wheat consumption. Nevertheless, it may be that before war-time control comes to an end the public will have become accustomed to the present bread which is largely made from flour of 80 per cent. extraction and that there will be a much reduced demand for low-extraction flour and bread made from such flour. Moreover it must be remembered that many young children of 3 to 4 years of age have never seen any other type of loaf than the war-time National Loaf.

Reaction on British Agriculture

54. The continuance of a high rate of extraction of flour would have the following reactions on home agriculture:—

- (i). There would be some loss of wheat offals. Not only the quantity but the quality of these offals would be reduced, since the more valuable parts of the offal would be retained in the flour. Wheat offals are a very

useful feedingstuff, particularly for dairy cows, pigs and poultry. But it should be possible to replace these offals with some other suitable form of imported feed, whenever world supplies of feedingstuffs return to normal. It would merely be a matter of importing somewhat less wheat for human food and somewhat more grain for livestock feeding.

(ii) The possibility of a reduction in the demand for home grown wheat because of its relative deficiency in the desirable nutrients, has already been mentioned. A partial remedy might be, as already pointed out, to encourage in all possible way the growth of those varieties which contain the highest proportion of these nutrients. This however might be at the expense of yield and might in consequence reduce to some extent the profitability of wheat production.

Flour for Manufacture

55. The Conference has considered whether it is desirable that regulations governing the character of flour used for bread should also apply to flour used for other purposes.

56. The consumer derives less advantage from the presence of vitamin B₁ in flour used in the home for cooking with baking powder, or in the factory for making biscuits and cakes, since baking powder destroys as much as one half of the vitamin B₁. From this point of view therefore there would be less object in requiring that such flour should retain a minimum quantity of that vitamin obtained from the natural wheat grain.

57. Moreover bakers and cake and biscuit manufacturers have made representations to the Conference to the effect that they cannot produce a high quality article—suitable for export, for example—with a high extraction flour. A memorandum from the Cake and Biscuit Manufacturers' War Time Alliance setting out their views in detail is attached hereto (Appendix III).

58. All the arguments therefore are against requiring that flour to be used for purposes other than bread in the United Kingdom should be high extraction flour. Nevertheless, there would be serious complications and the difficulties of enforcement would be greatly increased if there were two different standards for flour to be sold for human consumption. These difficulties would not arise if reinforcement were permitted, since reinforced white flour would have no disadvantage from the manufacturers' point of view.

Question of Reinforcement

59. To sum up, the Conference is unanimous in thinking that it is both desirable and practicable to require, as a matter of permanent policy, that flour should contain a minimum quantity of three "token" nutrients (paras. 26-32). But it has been unable to reach agreement as to whether the miller should be left free to comply with such a requirement by adding nutrients to flour or whether he should be required to achieve the necessary standard by milling to a high extraction rate.

60. The official scientific and medical members of the Conference feel strongly that neither the difficulties of enforcement, referred to in paras. 35-40, nor the other practical difficulties discussed in paras. 42-58, are a sufficient ground for recommending at the present time that the addition of nutrients should be permitted. These members consider that the retention of the natural constituents of the wheat grain is so incomparably preferable to reinforcement that they are not prepared to contemplate the adoption of

the latter procedure. As has already been indicated, they are hopeful that continued investigation will reveal a practicable method of distinguishing between natural and artificial vitamins in flour. They feel that it should be possible to devise some means of meeting the difficulty of the country miller in maintaining a high extraction rate and that there should be no insuperable difficulty in obtaining the co-operation of flour exporting countries in enforcing a high extraction rate for flour exported to the U.K. While appreciating the importance of the public attitude towards bread, they do not despair of the possibility of creating a favourable public opinion towards 80 per cent. flour by the time the present control of milling comes to an end, particularly if, as may be hoped, developments in milling technique bring about further improvements in quality.

61. Others members of the Conference are not prepared at the present time to recommend that reinforcement should be prohibited. They consider that there is no convincing evidence of the undesirability of this course which would justify the Government in banning a process which is at present in general use in the U.S.A. They are prepared to accept the view of the scientific members that further investigation may in time reveal methods of distinguishing between natural and added vitamins in flour. They point out however that there can be no guarantee that such methods will be discovered in time to solve the enforcement difficulty before the present control of milling comes to an end, and that the discovery of such methods would not in any case, solve the difficulty of enforcement, if, as they believe, it were necessary to permit reinforcement in the case of flour to be used for manufacturing purposes such as cakes and biscuits while requiring high extraction for flour to be used for bread. They can see no means by which country mills could compete with port mills, after control comes to an end, if added vitamins were prohibited. They are not hopeful that the agreement of exporting countries could be obtained to the enforcement of a high extraction rate for imported flour, in view of the disturbance which would result in the Canadian and Australian milling industry and export trade. They consider it doubtful whether the public will have become accustomed to 80 per cent. flour by the time control comes to an end or that the demand for bread made from low extraction flour will by then be much reduced in which case white flour could only be kept off the market by regulations which are capable of being enforced.

Control of Purity and Cleanliness

62. The Conference has considered whether any further measures should be taken, beyond the existing peace-time legislation, to control the standard of purity and cleanliness of flour and bread at the various stages of manufacture and distribution.

In general the Conference was of the opinion that the existing regulations, if fully enforced, are adequate. The representatives of the bakery trade however have suggested that the regulations governing the cleanliness of bakeries and the health of the operatives should be more uniformly enforced and that Local Authorities do not in all cases make sufficient use of their power to make regulations for securing the observance of hygienic conditions in connection with the handling, wrapping and delivery of food in general, including bread.

The Conference commends these views to the attention of the Departments concerned.

The bakery trade representatives also suggested that greater use should be made, for the distribution of flour, of non-returnable containers of improved hygienic type. The Conference recommends that the milling industry should investigate this possibility.

III. CONCLUSIONS AND RECOMMENDATIONS

63. The Conference has proceeded on the assumption that the Government will, after consultation with its advisers, decide to continue to regulate the character and quality of flour and bread after the present emergency control comes to an end.

64. The Conference accepts the view that it would be practicable for regulations to provide that flour should contain not less than certain minimum quantities of the three "token" nutrients named below and is unanimous in recommending that regulations should provide for the following minima:—

<i>Per 100 gm. of flour.</i>							
							mg.
Vitamin B ₁	...	...	...	...	...	...	0.24
Nicotinic acid	...	...	...	...	...	...	1.60
Iron	...	...	...	...	...	...	1.65

These minima can be supplied by the present flour of 80 per cent. extraction.

65. The Conference further recommends that during the remaining period of control each of the practical difficulties to which reference has been made in the Report should be vigorously studied with a view to finding a means as soon as possible of over-coming such difficulties before control ends. The particular items requiring investigation are:—

(1) How low extraction flour suitably reinforced with the "token" nutrients compares from a nutritional point of view with high extraction flour obtained wholly from the wheat grain. In this connection consideration will, of course, have to be given to information which may be available as to the results of the widespread use of reinforced flour in the United States.

(2) Whether methods can be devised for determining by examination of flour whether the quantities of the "token" nutrients contained therein have been obtained wholly from the wheat grain or have been added to the flour. It is agreed that this determination is not practicable at present.

(3) Whether, given such methods, effective procedure could be devised for enforcing high extraction flour to be used for bread while permitting low extraction flour to be used for other purposes.

(4) Whether the position of country mills dependent wholly or largely on locally grown wheat could be safeguarded if they were required to produce flour containing the prescribed minimum quantities of the "token" nutrients without reinforcement.

(5) Whether it is possible to determine which varieties of home grown wheat are best suited to produce flour of good bread-making quality containing at least the prescribed minimum quantities of the "token" nutrients, with a view to the increased use of such varieties by farmers in the United Kingdom being encouraged so far as practicable.

(6) Whether the co-operation of the Governments of the principal flour exporting countries, e.g., Canada and Australia, could, if necessary, be secured in enforcing a high rate of extraction and prohibiting reinforcement for flour to be exported to the United Kingdom.

66. It will be a matter for the Government to decide in the light of the results obtained from studies such as are suggested in the previous paragraph and all other relevant considerations, including the attitude of the public towards bread made from 80 per cent. flour, whether it will be both practicable and in the national interest to prohibit, or alternatively to permit, the manufacture and sale of low extraction flour which has been reinforced by added vitamins.

67. The Conference is unanimous in recommending that in the meantime the present National flour should be maintained.

On behalf of the Conference,

H. L. FRENCH, *Chairman.*

11th October, 1945.

APPENDIX I

REPORT OF SUB-COMMITTEE ON MINIMUM QUANTITIES OF B₁, RIBOFLAVIN, NICOTINIC ACID AND IRON TO BE RECOMMENDED IN POST-WAR FLOUR

At a meeting of the Conference held on April 4th the following Sub-Committee was appointed:—

Ministry of Food: The Lord Horder, G.C.V.O., M.D., B.Sc., F.R.C.P.
Dr. T. Moran, D.Sc., Ph.D.

Ministry of Health: Dr. R. A. McCance, D.Sc., F.R.S.

Medical Research Council: Dr. B. S. Platt, C.M.G.

National Association of British and Irish Millers: Professor E. C. Dodds, M.V.O., F.R.S.

The Sub-Committee were asked to set out in their report the minimum quantity of each of the above four nutrients which the post-war flour should contain:

(a) On the assumption that they were to be retained from the wheat berry and not added artificially and

(b) on the assumption that no such restriction might be thought necessary and that the sole consideration should be the contribution which flour (and bread) could make to the nutrient intake of the diet as a whole.

After discussion the Sub-Committee considered that the question of the source of these token nutrients, whether by maintaining as high a level of extraction as would yield the minima here recommended, or by replacement in flour of a lower extraction than this, involved matters which would in any case be discussed by the Conference as a whole. It was, therefore, decided to leave this question open.

(1) The Sub-Committee interpreted the word "minimum" in its terms of reference as that level below which it may be inferred from experience that good health is not likely to be maintained.

(2) It was in the first place essential to decide on the *total* requirement of each nutrient, i.e. the amounts which should be supplied by the diet as a whole.

Figures have been put forward by the Health Organisation of the League of Nations, by the Medical Research Council and by the National Research Council of the U.S.A., but as clinical experience to support their figures is incomplete, it was finally decided to base the Sub-Committee's recommendations on experience obtained in this country during the war.

The chief argument for adopting this approach is that there is an almost unanimous body of expert opinion that the nation's food policy has been successful in maintaining at least a good standard of health during the war under conditions of considerable stress. There has been in certain respects a definite improvement in the common health. There was a further important reason for selecting this basis for the estimation, viz., that food distribution has been such that supplies have been allocated on an equitable basis, a fact which supports the adoption of average data on a per capita basis for the whole country.

(3) The most recent available data on food consumption are given in the second report of "Food Consumption Levels" in the United States, Canada and the United Kingdom, which deal with the U.K. population as a whole, and in the "Wartime Food Surveys" carried out by the Ministry of Food covering working-class homes. The comparable figures from the two sources are as follows:

					F.C.L. (1944)	W.F.S. (1st and 2nd quarters, 1944)
Calories	...	...	...	per head per day	2923	2375
B ₁	...	...	...	" " " "	1.99 mg.	1.59 mg.
Riboflavin	...	...	...	" " " "	2.09 mg.	1.78 mg.
Nicotinic Acid	...	...	...	" " " "	19.7 mg.	12.87 mg.
Iron	...	...	...	" " " "	16.3 mg.	14.0 mg.

(4) The figures from Food Consumption Levels, being potential and not actual consumption figures, are over-estimates. The War-time Food Surveys figures, on the other hand, are consumption figures, but they are over-weighted with children and are probably too low for a national average. This is borne out by the calorie intake of 2375 cal. The Sub-Committee has, therefore, proposed an adjustment of these latter figures for the likely post-war U.K. population (i.e. allowing for the return of the men and women from the Services).

The results are:

Calories	...	...	...	...	...	...	...	2670
B ₁	...	...	...	...	...	...	...	1.78 mg.
Riboflavin	...	...	...	...	...	...	...	1.92 mg.
Nicotinic Acid	...	...	...	...	...	...	...	13.91 mg.
Iron	...	...	...	...	...	...	...	14.60 mg.

These figures, in effect, apply to a U.K. population composed entirely of working-class families, consuming the same type of diet as the families covered by the W.F.S. in the first six months of 1944. The Sub-Committee considers that this is the ideal "population" to have in mind since it is the working-class diet which is the main concern.

(5) The consumption of flour in all forms amongst the poorer classes before the war was approximately 9 oz. per head per diem. Wartime consumption adjusted to the post-war population indicates a figure of approximately 9.4 oz. per head per diem.

(6) The following analytical figures were taken for the flour (85 per cent. extraction) consumed in the first and second quarters of 1944 and included in the estimate in Para. (4).

B ₁	...	...	...	...	...	...	0.30 mg/100 gm. flour
Riboflavin	...	...	...	...	...	...	0.14 " "
Nicotinic Acid	...	...	...	...	...	...	1.60 " "
Iron	...	...	...	...	...	...	2.07 " "

(7) It is of interest to compare the total intake figures in Para. (4) with (a) those which would have been provided by a flour similar to the current 80 per cent., (b) the requirement figures for the U.K. population on the basis of the dietary allowances recommended by the National Research Council (U.S.A.). (These are given in the report of the United Nations Conference on Food and Agriculture at Hot Springs as a illustration of a goal which might be set by a nation when planning a nutrition policy.) (c) The League of Nations (B₁ and iron) and Medical Research Council (riboflavin and nicotinic acid) figures.

	Estimates Para. (4) (85% Flour)	Substituting 80% flour standards	N.R.C.	L. of N. and M.R.C.
Calories	2670	2670	2640	—
B ₁	1.78	1.64	1.57	0.9
Riboflavin	1.92	1.73	2.18	1.8
Nicotinic Acid	13.91	13.91	14.7	12
Iron	14.6	13.4	11.8	10

(8) In view of the small difference between the first and second columns in para. (7), and the fact that in both cases they approximate to the N.R.C. target requirements, the Sub-Committee recommends the following minimal values:

	Per 100 gm. of flour.
B ₁	0.24 mg.
Riboflavin	0.14 mg.
Nicotinic Acid	1.60 mg.
Iron	1.65 mg.

In reference to these figures the Sub-Committee again draws attention to the definition of "minimum" as given in para. (1) above.

(Sgd.) HORDER
(Chairman of Sub-Committee)

17th May, 1945.

APPENDIX II

At a meeting of the Conference held on June 13th last, the following Sub-Committee was appointed:—

Ministry of Food:

Mr. C. A. Loombe.

Dr. T. Moran, D.Sc., Ph.D.

Ministry of Health: Mr. P. N. R. Butcher.

Department of Health for Scotland: Mr. J. Mackenzie.

National Association of British and Irish Millers:

Professor E. C. Dodds, M.V.O., F.R.S.

Mr. L. Hector Read.

Co-operative Wholesale Society: Mr. W. Bloor.

Scottish Co-operative Wholesale Society: Dr. J. Sword.

1. This Sub-Committee was authorised to appoint its own Chairman and at the first meeting, on June 27th, Mr. Loombe was elected.

The Sub-Committee was asked—

(1) to assume that it may be thought desirable to make regulations governing the manufacture and sale of home-produced flour for human consumption requiring—

(a) that no flour should be made or sold containing a smaller proportion of B₁, riboflavin, nicotinic acid and iron than is set out in paragraph 8 of the report of Lord Horder's Sub-Committee,

(b) that flour must be of not less than x per cent. extraction, and/or

(c) that flour must not be reinforced, i.e. that none of the nutrients above-named shall be added;

(2) to advise whether regulations drafted on the lines above indicated could be adequately enforced, and if so how?

2. The Sub-Committee has considered whether a regulation requiring that no flour should be made or sold containing a smaller proportion of B₁, riboflavin, nicotinic acid and iron than is set out in the report of Lord Horder's Sub-Committee could be enforced and, if so, what methods should be employed. The Sub-Committee considers that the prescription of the standard indicated would be practicable but that its enforcement would depend very largely on the provision of uniform and reliable testing facilities. The Sub-Committee considers that in the first stage some centralised arrangement for testing, e.g. the Government Laboratory, would be desirable, but that the earliest possible consultation should take place with the Society of Public Analysts both in England and Scotland to ensure at a later stage their successful co-operation in the work. At the moment the microbiological assays of riboflavin and nicotinic acid for example are undoubtedly unfamiliar to many public analysts, although a few of them already do them and others will no doubt very quickly be in a position to carry out such assays. The Society of Public Analysts has in fact just formed a Biological Methods Group, to assist in the development and standardisation of this branch of analytical work. In order to secure uniformity of results the Committee feels that the techniques to be adopted should be prescribed in the Order or else issued by the appropriate Government Department in such a way as will secure general acceptance.

3. The Sub-Committee considered whether a regulation that flour must be of no less than x per cent. extraction could be enforced, and if so, by what method. Details were available to the Sub-Committee of the various methods of calculating extraction, (a) based on the weight of wheat taken into the mill, (b) the clean wheat basis which had been tried by the Ministry of Food but was found impracticable, owing to the lack of weighers between the screen room and the mill proper in many plants. (c) The "end products" method which was now adopted by the Ministry of Food; in this method the flour, offals and screenings are weighed regularly and the extraction rate of flour calculated as a percentage of the total offtake.

It was noted that flour milled at the same rate of extraction from different types of wheat varied in nutritional quality and appearance whichever method was adopted. Abnormal moisture contents or screenings admixture were also difficulties which had to be considered, and different types of plant also gave different flours with similar grists at the same extraction level. Extraction by itself is no measure of the nutritional quality of the flour and it is possible to have flour milled at 90 per cent. extraction and still exclude valuable fractions, such as the wheat germ, whereas flour at a much lower extraction could contain this fraction.

The Sub-Committee agreed that a regulation in regard to extraction could not be enforced by inspection of the flour. The only method in the absence of such control as exists to-day would be by an examination of the books of the miller, but as this would necessitate knowing the exact time at which any particular sample was milled, it was considered that such a method presented serious difficulty. The Sub-Committee therefore considered that effective enforcement of a regulation that flour must be of no less than x per cent. extraction was impracticable.

4. The Sub-Committee next considered whether a regulation that flour must not be reinforced, that is that none of the nutrients shall be added, could be enforced, and if so, how.

(During this consideration it was pointed out that if the suggested riboflavin figure were required to be attained without artificial fortification, the general level of extraction would have to be raised to around 85 per cent.)

The important point in considering this aspect was whether it is possible to tell from the flour whether the vitamins contained in it are derived from the grain from which the flour has been milled or have been added to it. All the evidence before the Sub-Committee suggested that such a differentiation was impossible, but it was decided to consult the Medical Research Council on this point. As a result of this consultation, the Vitamin B Sub-Committee of the Accessory Food Factors Committee of the Medical Research Council had a discussion on the matter. They were unanimous in feeling that it would be unwise to say that such a differentiation could not be established, and they expressed their willingness to assist in examining this question, though it would, of course, take some time. Certain samples and information would be required for a series of experiments, and the Sub-Committee recommends that these should be made.

Pending the result of such work the Sub-Committee feels that unless these show that it is possible to tell whether the vitamins in the flour are naturally present or have been added, it would be impracticable to enforce the regulation that flour must not be reinforced, except by a system of inspection at the mills to ascertain if any of the synthetic products were in fact being purchased and used.

The members of the Sub-Committee connected with the milling industry drew attention to the difficulties which would occur in connection with the use of home grown wheat if artificial fortification were not permitted. Owing to the difference in vitamin content between the various wheats, millers of flour from home grown grain would be faced with the prospect of milling at a higher extraction in order to meet the specification. This would impair the saleability of their flour and inevitably lead to a reduction in country milling capacity.

5. The recommendation of the Sub-Committee can be summarised as follows:—

(1) The specification suggested by Lord Horder's Sub-Committee is practicable and enforceable. In the first stage centralised testing should be arranged, but later on public analysts should be brought into the work and techniques either prescribed in the Order or advised in such a way as to ensure general usage. Consultation on the latter should take place with the Society of Public Analysts as soon as practicable.

(2) A regulation that flour must be of a certain extraction was considered impracticable and unenforceable.

(3) The possibility of applying a regulation that flour must not be reinforced with synthetic vitamins depends, in the view of the Sub-Committee, on whether it is possible to tell whether the vitamins in the flour are naturally present or have been added. If this is not possible a regulation on these lines could be enforced only by a system of inspection of the mills and not by relation to the sample which was the subject of investigation. In view of the opinion of the Vitamin B Sub-Committee of the Accessory Food Factors Committee of the Medical Research Council, it is recommended that the Medical Research Council should be asked to conduct the experiments they suggest at the earliest possible date.

(Sgd.) C. A. LOOMBE.

C. A. LOOMBE,
Chairman of Sub-Committee.

July 25th, 1945.

APPENDIX III.

THE CAKE AND BISCUIT MANUFACTURERS' WAR TIME ALLIANCE, LIMITED.

CORN EXCHANGE BUILDINGS,
CITY WALLS,
CHESTER.

Our Ref. SGB/MH.

5th July, 1945.

Miss L. E. M. Weeks, Secretary to the Conference on the Post-War Loaf, Ministry of Food, Portman Court, Portman Square, London, W.1.

MADAM,

CONFERENCE ON THE POST-WAR LOAF.

I duly received your letter of the 19th ultimo in reference to the above and I have now taken instructions on the matter.

Your letter seems to make it clear that the Conference is primarily concerned with the nutritive quality of bread and/or flour for bread, and provided that any recommendations or regulations which are finally decided upon only apply to bread and flour for bread and that Manufacturers of Biscuits and Cakes are left free to use what suits them best we shall have no cause for complaint.

Attached is a statement in non-technical language setting out the requirements of Biscuit and Cake Manufacturers and the reasons why complete freedom in the selection of flour by them is necessary for the welfare of their businesses. It is hoped that the Conference after consideration of this document will be in a position to give us an assurance that any decisions which are come to in regard to the Post-War Loaf and Flour for the same will not affect Biscuits and Cakes, and if there is any doubt about this whatever we would again repeat our request that representatives from this Alliance should be heard by the Conference before any recommendations or decision are arrived at.

Yours faithfully,

(Sgd.) SYDNEY G. BAILEY,
Secretary.

**Memorandum from the Cake and Biscuit Manufacturers'
War Time Alliance, Ltd.**

General.

No close comparison is possible between cakes and biscuits on the one hand and bread on the other, the latter being a simple food while biscuits and cakes are compounded from a variety of ingredients.

Due to ingredients other than flour such as fats, milk products, eggs, etc., the food value of cakes and biscuits is high and more complete and the vitamin content more embracing.

The manufacture of cakes and biscuits, owing to their almost unlimited variety, involves much skill and craftsmanship and manufacturers have persevered over a great number of years to find the best ingredients to give the maximum attractiveness and palatability demanded by the public. Experience has shown that high quality in these goods can only be obtained with low extraction flour. It is true that in some special types of biscuit wholemeal is used and these are available for those who prefer them, but for the ordinary type of biscuit only low extraction flours will produce the type of article which the public demands. Indeed it has been shown during the war years that the public will voluntarily accept only a restricted quantity of cakes and biscuits made from high extraction flour. The important fact emerges that if high extraction flour only were available to cake and biscuit manufacturers the adverse effect on these industries would be very considerable.

Manufacturing.

From a practical manufacturing view point, high extraction flours are unsuitable for making high grade cakes and biscuits. The biscuit doughs are sad, particularly in the case of fermented kinds. The resulting biscuits are coarse, difficult to face and tend to crack or check on handling. For pastry biscuits, especially of the puff type, high extraction flour is quite unsuitable.

In addition to soft low extraction home milled flours, for a large number of biscuits a proportion of imported flours of different strength is necessary.

For cakes as well, soft low extraction flour is essential and a proportion of this must be imported, e.g. Australian. In some cases attention must be paid to granularity.

Keeping Quality.

Biscuits and cakes, large quantities of which are exported, are not made for quick consumption, and must be capable of remaining in good condition for many months. From this angle the type of flour used is of first importance.

High extraction flour is known to deteriorate in storage more rapidly than that of low extraction and tends to develop a beany or musty flavour. The effect of this on the after life of the products made from them may be profound resulting in process of time in defects ranging from rancidity to staleness. In illustration of this the extreme case may be noted that if fatty doughs containing wholemeal are left for several hours they become rancid and quite unusable.

Quality.

Quality is dependent on attractiveness, palatability and general good condition. To compete in overseas markets the highest quality is necessary and it is certain that no overseas trade could be built up with cakes and biscuits made from high extraction flour in any countries where these products were made locally from low extraction flour.

Content of Vitamins in Flour.

From the cake and biscuit manufacturers' point of view there is no doubt that if the vitamin content of flour were to be standardised the overwhelming majority of opinion would demand fortification of low extraction flour rather than the use of high extraction flour.

Summary.

1. Cake and biscuit manufacturers require complete freedom in the selection of flour both from the point of view of extraction and also of country of origin.
2. Compulsory use of high extraction flour would very adversely affect the cake and biscuit industries.
3. The public will voluntarily buy only a limited quantity of biscuits made from high extraction flour.
4. Overseas trade would be adversely affected by the use of high extraction flour as the keeping quality of cakes and biscuits made from it is inferior to that of those made from low extraction flour.
5. Cakes and biscuits made from high extraction flour would not sell in countries in which goods made from low extraction flour were available.
6. From a practical manufacturing point of view high extraction flour is unsuitable for making cakes and biscuits.
7. Cakes and biscuits with maximum attractiveness and palatability can only be made from low extraction flours.
8. If cake and biscuit flour is to be standardised in respect of vitamin content the opinion of the industry is strongly in favour of fortification as against the use of high extraction flour.
9. A proportion of imported flours is needed for cakes and biscuits. Flours milled in this country from imported wheat are not satisfactory.
10. Cakes and biscuits are of high food value which varies according to the ingredients.

On behalf of the Cake and Biscuit Manufacturers' War Time Alliance, Ltd.

S. G. BAILEY, Secretary.

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

To be purchased from

York House, Kingsway, LONDON, W.C.2 429 Oxford Street, LONDON, W.1

P.O. BOX 569, LONDON, S.E.1

13a Castle Street, EDINBURGH, 2 1 St. Andrew's Crescent, CARDIFF

39 King Street, MANCHESTER, 2 Tower Lane, BRISTOL, 1

2 Edmund Street, BIRMINGHAM, 3 80 Chichester Street, BELFAST

or from any Bookseller

1945

(Reprinted 1951)

Price 9d. net