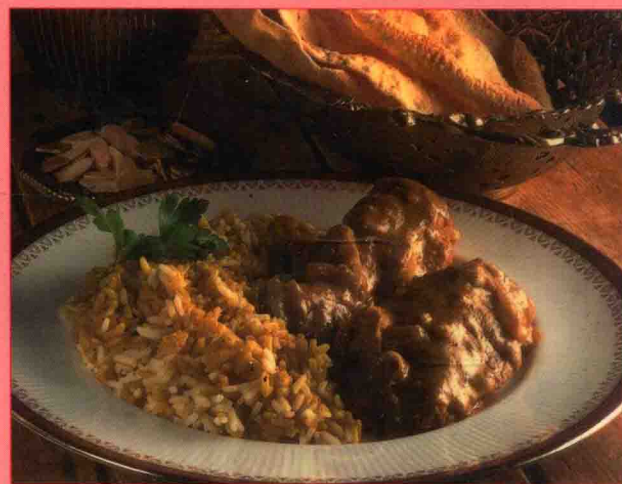


MEAT PRODUCTS AND DISHES

Supplement to
McCance & Widdowson's
The Composition of Foods



**W. Chan, J. Brown, S.M. Church
and D.H. Buss**



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Ministry of Agriculture, Fisheries and Food



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Sixth supplement to the Fifth Edition of
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INTRODUCTION

This is the ninth detailed reference book on the nutrients in food, in a series updating and extending the information in McCance and Widdowson's *The Composition of Foods*. It gives the nutrients in commercial meat products including bacon, ham, burgers, pies, sausages, canned, chilled, frozen and long-life products, and meat-based ready meals, together with values for a wide range of meat-based dishes now eaten in and outside the home in Britain. It thus complements the previous supplement which showed the nutrients in carcass meats, poultry, game and offal (Chan *et al.*, 1995).

A large number of new analyses have been undertaken on the increasing range of meat products now available in this country. The values for meat dishes are also new, either because they were not included before or because the information in the fifth edition of *The Composition of Foods* (Holland *et al.*, 1991b) was calculated from the nutritional value of meat given in the fourth edition (Paul and Southgate, 1978) and thus reflected its composition in the early 1970s. There have been substantial changes in the composition of meat since then (see Chan *et al.*, 1995), especially reductions in the amounts of fat both on the carcass itself and after trimming in the shop or in the home. There have also been changes in cooking methods and an increase in the range of poultry dishes. New values have therefore been added or recalculated using the most recent information on the nutrients in all the ingredients. As a result, the number of foods in this supplement has increased to 159 meat products and 127 meat dishes compared with 59 and 24 in the fifth edition. There is also an increase in the number of nutrients for which values are given.

These tables are part of a series produced by The Royal Society of Chemistry (RSC) and the Ministry of Agriculture, Fisheries and Food (MAFF), who have been collaborating since 1987 on the development of a comprehensive and up-to-date database on nutrients in the wide range of foods now available in Britain. The other detailed supplements cover *Cereals and Cereal Products* (Holland *et al.*, 1988), *Milk Products and Eggs* (Holland *et al.*, 1989), *Vegetables, Herbs and Spices* (Holland *et al.*, 1991a), *Fruit and Nuts* (Holland *et al.*, 1992a), *Vegetable Dishes* (Holland *et al.*, 1992b), *Fish and Fish Products* (Holland *et al.*, 1993), *Miscellaneous Foods* (Chan *et al.*, 1994), and *Meat, Poultry and Game* (Chan *et al.*, 1995). Computerised versions are also available, details of which can be obtained from The Royal Society of Chemistry.

Methods

The selection of foods and the determination of nutrient values follows the general principles used for previous books in this series. All the meat products and meat dishes were chosen to represent as far as possible those most widely available and eaten in Britain at the present time. Most nutrients in most of the meat products were determined by new analyses, although some were derived by interpolation and some were obtained from manufacturers and the scientific literature. A large number of caterers, dietitians, researchers, consumers and

recipe books were consulted before the final choice of dishes and recipes was made.

Literature values

The scientific literature as well as manufacturer's information was first reviewed for details of the composition of home-produced and imported meat products. Many of these products are new or have been reformulated, so that even for those foods included in the fifth edition the earlier values could in general not be used, while values from other countries often refer to different products. Manufacturer's information and most literature values were therefore only included where full details of the samples were known; where they were clearly the same as the products now available in British shops or caterers; where suitable methods of analysis had been used; and where the results were available in sufficient detail for a full assessment to be made. The only exceptions were for continental-style sausages, where this supplement includes some values from foreign food tables even though these products may be formulated slightly differently in the UK.

Analyses

Most of the numerous new analyses needed to complete these tables were commissioned by the Ministry of Agriculture, Fisheries and Food from the Laboratory of the Government Chemist (LGC) between 1990 and 1995, with some additional fatty acid analyses carried out by RHM Technology. Up to 10 representative samples of each of the products to be included were bought from a wide variety of supermarkets and other shops, in proportions based upon their share of the market. Items that needed to be cooked were cooked individually by specified methods until done, and any change in weight was recorded. Any cooking instructions on packets were followed, and if two or more methods were given some samples were cooked by each. Blended vegetable oil was used for frying (including stir-frying) unless otherwise specified. When ready meals included rice, this was cooked and weighed separately so that, where appropriate, nutrients could be given for both the meat-based part and the complete meal.

As in previous supplements, the individual samples of each raw or cooked food were combined before analysis. The analytical methods were as described in the fifth edition of *The Composition of Foods* (Holland *et al.*, 1991b). In addition, the individual fatty acids were determined as their methyl esters by capillary gas chromatography and vitamin D and 25-hydroxy vitamin D were determined by quantitative HPLC. For practical reasons, the vitamins in some of the fried and grilled bacon samples, sausages and breaded poultry products were estimated by interpolation from the values in the raw products, usually in proportion to the protein after allowance for cooking losses as in Table 1, except that cholesterol was related to the fat. This reflected the way in which the vitamins and cholesterol were found to vary in the products that were fully analysed. Further details of each estimation can be provided on request.

Recipes

All the values for homemade meat dishes have been derived by calculation from selected recipes, and every attempt was made to ensure that the recipes were as representative as possible. They were obtained from a wide variety of sources including caterers, dietitians, research workers who have conducted quantitative dietary surveys on representative groups of the British population, from standard recipe books, and from consumers. Where more than one recipe is commonly used, for example in different parts of the country, a judgement was made on the

most appropriate recipe to use. All the main recipes were then checked and prepared by qualified home economists. Full details of each recipe are in an appendix to this supplement, and users are reminded of the importance of allowing for any differences between these and the recipes they are using or assessing.

The calculations were done as follows. First, each ingredient was prepared and weighed, and the total amount of each nutrient in the uncooked dish was calculated from these weights and the composition of each ingredient taken from the most recent supplements, including this one and the supplement on *Meat, Poultry and Game* (Chan *et al.*, 1995). Except where noted, values for meats included any fat normally present on the cut as sold. If the meat was pre-browned or foods were fried, any uptake of fat was recorded and any fat or juices lost were separated and the weights determined. The total weight was then recorded using a scale weighing to about 2g, and the dish was cooked as specified and reweighed to determine any losses including that of water by evaporation during cooking.

As the loss of weight on cooking most recipes was solely from the loss of water, the composition of the cooked dish was calculated as below:

$$\text{Nutrient per 100g of the cooked dish} = \frac{\text{Total amount of the nutrient in the raw ingredients}}{\text{Weight of the cooked dish}} \times \frac{100}{(100 - \% \text{ vitamin loss on cooking})^a}$$

^a100 - % vitamin loss on cooking = % retention

Although there will be little or no loss of fat, protein or minerals during cooking if they are leached into the sauce, juices or liquor and these are eaten as part of the dish, there will still be losses of heat-labile vitamins. The losses that were assumed in the calculations are given in **Table 1**, which is taken from Holland *et al.*, (1991b). In practice, there will be considerable variation about these values

Table 1: - Typical percentage losses of vitamins when meat and meat dishes are cooked

	<i>Meat, grilled or fried</i>	<i>Meat dishes^a</i>
Vitamin A	0	0
Vitamin E	20	20
Thiamin	20	20
Riboflavin	20	20
Niacin	20	20
Vitamin B ₆	20	20
Vitamin B ₁₂	20	20
Folate	— ^b	50
Pantothenate	20	20
Biotin	10	10
Vitamin C	—	50

^a Some vitamins are lost on heating, but the vitamins (and minerals and fat) that leach into the liquor during cooking will not be lost if the sauce of the gravy is eaten as part of the dish. On average, therefore, the losses in meat dishes are no higher than from grilled or fried meat even though the cooking times are longer.

^b The amounts of folate in meat are too low to make meaningful calculations of losses.

depending upon the time and temperature of cooking, the nature of the ingredients, and whether conventional or microwave ovens are used, so the values for vitamins in the cooked dishes in this supplement should be treated with some caution.

More information about the principles used in calculating nutrients in recipe dishes, and related examples, are given in the fifth edition of *The Composition of Foods* (Holland *et al.*, 1991b).

Arrangement of the tables

Food groups

For ease of reference, the foods in this book have been listed alphabetically within the following groups: bacon and ham; burgers and grillsteaks; meat pies and pastries; sausages; continental-style sausages; other commercial meat products; and meat dishes. Homemade and commercial versions of similar products have, however, usually been listed together. Where meat products are cooked, values for the raw product are given first.

Numbering system

As in previous supplements, the foods have been numbered in sequence together with a unique two digit prefix. For this supplement, the prefix is 19, so that the full code numbers for raw back bacon rashers and Wiener schnitzel, the first and last foods in this book, are 19-001 and 19-286. These are the numbers that will be used in nutrient databank applications.

Description and number of samples

The information given under this heading includes the source and number of samples taken for analysis, and the source of any literature values. For meat dishes, there is a reference to the recipe given in the appendix at the end of this book.

Nutrients

The nutrient values for each food are shown on four consecutive pages as in most previous books in this series. The presentation follows the established pattern, with the nutrients on three of the pages being similar to those in other supplements, while those on the second page are those most appropriate to (in this supplement) meat products and meat dishes. All values are given per 100 grams of the food as described, but typical weights of selected meat products as bought or served can be found in *Food Portion Sizes* (Ministry of Agriculture, Fisheries and Food, 1993).

Proximates:- The first page for each food shows the amounts of water, total nitrogen, protein, fat, and available carbohydrate expressed (with a few exceptions) as its monosaccharide equivalent. No value is given for edible portion since it is 1.00 for most foods in this supplement. Where it is less than this (mainly for those few samples of bacon bought with rind on), the value is given in a footnote. The protein in each meat product was derived by multiplying the analysed nitrogen values by 6.25 after first subtracting any non-protein nitrogen, and the carbohydrate includes any oligosaccharides from vegetables or other ingredients. Each food's energy value is given both in kilocalories and in kilojoules per 100g, and was derived by multiplying the amounts of protein, fat and

carbohydrate by the factors in **Table 2**. The alcohol used in some meat dishes was, however, ignored as it was assumed to have evaporated.

Table 2: - Energy conversion factors used in these tables

	<i>kcal/g</i>	<i>kJ/g</i>
Protein	4	17
Fat	9	37
Available carbohydrate, expressed as monosaccharide	3.75	16

Carbohydrates, fibre and fats: – The second page shows the amounts of starch, total sugars and dietary fibre derived from the other ingredients. Many meat products will contain no carbohydrates or fibre, and for these zero values have been imputed. Where present, carbohydrates have as far as possible been given as their monosaccharide equivalents, while fibre is the actual weight of fibre components (determined by the Englyst and Southgate methods, as in previous supplements). In addition, the total amounts of saturated, monounsaturated (*cis* and *trans* together) and polyunsaturated fatty acids (also *cis* and *trans* together) are given for each meat product and dish, with a further column showing the total *trans* fatty acids separately. The amount of cholesterol is also shown.

Minerals and vitamins: – The range of minerals and vitamins shown is the same as in previous books. Vitamin C is present in many meat products because it is often added as an antioxidant, but it should be noted that from January 1996 isoascorbic acid (D-erythorbic acid), which has little or no vitamin C activity, may be added instead. The amounts of each should therefore be carefully noted in future to avoid overestimation of the nutritional value of the product. Values for carotene and vitamin E have been corrected for the relative activities of the different fractions using the factors given in the fifth edition of *The Composition of Foods* (Holland *et al.*, 1991b), and carotene and retinol values below the limit of detection (usually 5µg per 100g) are given as trace. Vitamin D activity has been taken wherever possible as the amount of cholecalciferol plus five times the amount of any of the more active metabolite 25-hydroxycholecalciferol known or estimated to be present. Where these were measured separately, the amounts are given in an appendix on page 154.

Appendices

There are five appendices in this supplement. The first shows the average loss of weight when various meat products were cooked. The second gives the recipes and measured weight loss for each meat dish that was prepared for this supplement, and the third shows the full nutrient database code numbers for all the ingredients in each dish so that the exact source of the nutrient data used in the recipe calculations can be identified. The final appendices give additional details of the main fatty acids and vitamin D fractions in selected meat products.

Nutrient variability

Almost all foods vary somewhat in nutritional value, and this is particularly important for meat, meat products and meat dishes. For many commercial meat products, the proportions of lean and fat in the meat and the amounts of any other ingredients can vary from one manufacturer to another. There can also be seasonal and other variations according to the cost of the ingredients, as well as gradual changes over time as, for example, manufacturers reduce the amount of fat or salt in their products. Cooking and reheating times and conditions also affect many nutrients. Homemade meat dishes can also vary in composition, because there may be substantial differences in the amounts of meat and other ingredients used, in the proportions of lean and fat in the meat, and in the length and temperature of cooking. All of these influence the composition of the dish as eaten, as can whether a conventional or microwave oven is used. Although care has been taken to ensure that each recipe is as representative as possible of the dish described, note should be taken of any regional or other variation from people systematically using different amounts of ingredients, substituting one ingredient for another, or even omitting one or more ingredients altogether.

Although some reduced fat alternatives have been included, it has not been practicable to give different nutrient values to reflect all these variations. Most values in these tables are therefore average or typical values for each product and dish. They should therefore not be used uncritically: unless the product is similar to that described here, allowance should as far as possible be made for differences in the amounts and nature of the ingredients, including the amount of visible fat on the meat, the cooking methods including the amounts of water and salt used, the length of cooking, and whether or not any fat is removed before or after cooking.

In addition, there are some apparent (but usually small) differences in composition between related products in this supplement which may reflect analytical variations as much as real differences in composition.

The introductions to the fifth edition of *The Composition of Foods* and to the supplement on *Meat, Poultry and Game* give more detailed descriptions of these and other factors that should be taken into account in the proper use of food composition tables. Users of the present supplement are advised to read them and take them to heart.

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The Tables

Symbols and abbreviations used in the tables

Symbols

0	None of the nutrient is present
Tr	Trace
N	The nutrient is present in significant quantities but there is no reliable information on the amount
()	Estimated value
<i>Italic text</i>	Carbohydrate and starch estimated 'by difference', and energy values based upon these quantities

Abbreviations

Satd	Saturated
Monounsatd	Monounsaturated
Polyunsatd	Polyunsaturated
Trypt	Tryptophan
equiv	equivalents