

THE ESTIMATION OF THE APPROXIMATE QUANTITY OF MEAT IN SAUSAGES AND MEAT PASTES.

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THE Meat Rationing Order, 1918 (No. 404), of the Ministry of Food fixes the minimum quantity of meat in first quality and second quality uncooked sausages at 67 per cent. and 50 per cent. respectively. Specifications for sausages, issued by Navy and Army authorities, and also those issued by some public institutions, specify minimum limits for the amount of meat that must be present. It is therefore desirable that the analyst should be in a position to state, irrespective of the food value of the article, the quantity of meat entering into its composition. The following method of analysis has been devised with this object in view.

Sausages and meat pastes generally consist of a mixture of minced meat and "filler," with salt, preservatives, and seasoning substances. Bread was at one time almost the only filling substance used, but, in addition to bread, cooked rice, potatoes, or maize meal are now frequently employed, and in some cases cooked soya meal has been found to occur.

The method for the estimation of the amount of meat present is based on the following considerations:

1. Meat (beef, mutton, or pork) is free from carbohydrate and crude cellulose matter, and contains a fairly uniform percentage of nitrogen, calculated on the fat-free meat, the average percentage in beef and mutton being 3.75 and in pork 4.0.

2. The substances used as "fillers" contain, when in a condition suitable for

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mixing, about 40 per cent. of water, and, with the exception of soya meal, about 50 per cent. of carbohydrate and crude cellulose matter, and 1 per cent. of nitrogen.

It is therefore possible, having estimated the amount of carbohydrate and crude cellulose matter, to allocate the quantity of nitrogen which is associated with it, the balance of nitrogen being then calculated to the quantity of defatted meat which it represents. To this quantity is added the fat for the purpose of arriving at the total meat present. The amount of fat in the filling material is not likely to be great, and is given to the credit of the meat, although in the presence of much maize meal an adjustment may in some cases be necessary.

The details of the examination are as follows :

1. PREPARATION OF SAMPLE FOR ANALYSIS.—In the case of sausages, the meat is removed from the skins, and the skins and the outside of the meat in contact with the skins are closely examined for evidence of insufficient cleaning.

A few pieces of the meat are selected for general examination, and the remainder is quickly and thoroughly mixed by passing it at least twice through a mincing machine. In the case of pastes or mixtures not in skins, the sample is mixed in a mortar or on a slab.

The sample thus prepared is at once placed in a stoppered or screw-capped bottle, from which the portions are taken for analysis.

2. ANALYSIS—(a) *Water*.—Five grms. are weighed into a flat porcelain dish containing a glass rod and about 20 grms. of ignited sand, mixed thoroughly with the sand, and dried at 100° C. to constant weight.

(b) *Fat and Non-Fatty Solids*.—Five grms. are weighed into a flat-bottomed dish containing a glass rod with flattened end, and dried on the steam-bath for thirty minutes, being rubbed down with the rod at intervals. It is then macerated with ether until the fat is extracted, the ether solution being filtered through a dried, weighed filter-paper, which is finally washed free from fat. The residue in the dish, together with that on the paper, dried to constant weight, gives the *non-fatty solids*.

The *fat* is obtained by evaporating the ethereal solution, and drying and weighing the residue: $100 - \text{percentage of (fat + non-fatty solids)} = \text{percentage of water}$, which should agree with the direct estimation.

(c) *Nitrogen* is determined by the Kjeldahl process on a suitable quantity of the sample.

(d) *Ash* is estimated in the usual manner.

(e) Salt, boric acid, sulphites, and other preservatives are tested for, and the quantity estimated if present.

(f) The portion of the original sample removed before mincing is examined microscopically as to the nature of the "filler," and generally as to the character and quality of the meat.

CALCULATION.—(1) The percentage of non-fatty solids, less the sum of proteins and ash, gives the amount of carbohydrate and crude cellulose material. If this amount is multiplied by 2, the approximate percentage of bread or cereal filler containing 40 per cent. of its weight of water is obtained.

(2) One per cent. of the "filler" is taken as the nitrogen due to the "filler." If this quantity is deducted from the total nitrogen, the balance due to the meat is

obtained. To obtain the percentage of defatted meat, the meat nitrogen is multiplied by $\frac{100}{3.75}$ in the case of beef or mutton, or by $\frac{100}{4.0}$ in the case of pork, or by $\frac{100}{3.87}$ in the case of mixed meats.

(3) The total percentage of meat in the sample is the sum of the percentages of the fat and of the defatted meat obtained under (2). (It should be noted that the percentage of chemical fat is not the same as that of fatty tissue, which contains, associated with the fat, both fibre and water.)

(4) The difference between 100 and the sum of the percentages of "filler" and total meat gives the additional water—that is, water used in the sausage or paste other than that which is natural to the meat and that which is present in "filler" containing 40 per cent. of water.

A check on the analysis can be obtained as follows :

The total percentage of water found by direct estimation should be equal to the sum of—(a) 40 per cent. of the filler as found above under (1); (b) 75 per cent. of the defatted meat as found above under (2); and (c) the additional water (if any) as found above under (4). The discrepancy should not exceed 2 per cent., unless a meal richer in nitrogen than ordinary cereal meals—*e.g.*, soya—has been used in preparing the "filler."

We are indebted to Sir James J. Dobbie for permission to publish the above method, which is in use at the Government Laboratory.

