

THE DETECTION OF FOREIGN FATS IN LARD AND BUTTER.

By C. B. COCHRAN.

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AS a means of detecting beef fat in lard I have made use of the following process: In a glass-stoppered twenty-five cc. graduated cylinder are introduced two cc. of the melted fat, and to this is added twenty-two cc. of fusel oil. The contents of the cylinder are warmed to about blood heat in order to obtain a perfect solution, and then allowed to cool slowly to a temperature of 16° to 17°C . This final temperature is maintained for two or three hours, during which time a crystalline deposit takes place, the amount and character of which varies with the fat under examination.

The deposit is then transferred to a filter paper and the fusel oil allowed to drain off as completely as possible. A part or the whole of the residue on the filter paper is then transferred to a test-tube and dissolved in ether. The mouth of the tube is closed with a plug of cotton and the crystals which form on standing are mounted in a drop of cottonseed oil and subjected to microscopic examination. By this method I have been able to detect the presence of a smaller amount of beef fat than I could detect when the sample was directly crystallized from ether.

A sample of lard containing ten per cent. of beef fat, when treated in this manner, will furnish a microscopic field showing abundant typical crystallizations of beef fat, which are usually much more numerous than lard crystals. When twenty per cent. of beef fat are present I have been unable to detect any lard crystals.

When the lard under examination contained five per cent. of oleostearin the crystals, although somewhat modified both in shape and manner of aggregating, yet gave decided evidence of the presence of beef fat.

A sample of lard containing two per cent. of oleostearin gave crystals so nearly like those formed from pure lard that I felt unable to say that the appearance either of the clusters or of the individual crystals indicated the adulteration.

Mutton tallow forms crystals very similar to those from beef.

So far as I know the one cannot be distinguished from the other by the character of the crystallization. All that has been said of beef fat in lard would apply also to mutton fat. The latter named fat behaves in lard like the former.

The amount of the deposit obtained from the fusel oil solution at 17°C . varies according to the character of the fat. A sample of beef suet, treated as indicated, gave a deposit of sixteen cc. The deposit obtained from a sample of oleostearin filled the tube to the level of the liquid. Pure lard in no case gave a deposit of over four cc. The relation between the amount of the deposit and the character of the fat is shown in the accompanying table and suggests a possible means of approximately estimating the percentage of beef tallow in lard, especially when taken in connection with the melting-point of the sample. Two or more pure lards of known melting-point, one high, the other low, could be kept as standards for comparison. The amount of deposit and melting-point of the sample of unknown origin compared with the deposit and melting-point of the standard would furnish a basis of comparison, as is done in the process devised by W. R. Stock. Before reading the amount of the deposit it is well to shake the cylinder, after which the deposit will settle evenly and more compactly.

The melting-points found in pure pig fats, given in the table, vary from 34°C . to 45°C ., which is a little wider range than that given in the publications on lard by the United States Agricultural Department. The samples taken from different parts of the animal were all rendered in the laboratory and the melting-points determined by my assistant, Mr. C. S. Brinton. The method adopted by the Association of Official Agricultural Chemists was followed in detail in all cases.

In examining samples of butter or oleomargarine, add eight cc. of fusel oil to two cc. of the filtered fat ; warm until a perfect solution is obtained, then cool to 16° or 17°C . A deposit will be formed which, in the few experiments I have made, has been greater in the case of oleomargarine than in butter. When this deposit is crystallized from ether very perfect crystals of large size are obtained. Up to the present time I have only examined six samples by this method, three of butter and three of oleomargarine, and as the crystals obtained in the two cases are, in some

| No. | Sample. | Deposit at 17° C. | Melting-point. | Microscopic appearance. | Refractometer reading of | | |
|-----|--|-------------------|----------------|---------------------------------|--------------------------|---------------|-----------------|
| | | | | | sample. | soluble part. | insoluble part. |
| 1 | Pure lard | 1 cc. | 40.3° C. | | 46.0 | 46.1 | 40.0 |
| 2 | 90 per cent. lard, No. 1 | 4 cc. | 43.2° C. | beef crystals abundant. | | | |
| 3 | 80 " " oleostearin | 10 cc. | 44° C. | { beef fat crystals. | | | |
| 4 | 70 " " oleostearin | 18½ cc. | 46° C. | { no lard crystals. | | | |
| 5 | 20 " " lard, No. 1 | 24 cc. full | 53.5° C. | { beef fat crystals. | | | |
| 6 | 10 " " oleostearin | 16 cc. | 47° C. | { no lard crystals. | 39.1 | 42.0 | 39.2 |
| 7 | Beef suet..... | less than 1 cc. | | | 40.8 | | |
| 8 | Head fat of hog | 1½ cc. | | { beef crystals abundant. | | | |
| 9 | 90 per cent. head fat, No. 7 | 2¾ cc. | | { very few small lard crystals. | | | |
| 10 | 80 " " head fat, No. 7 | 3 cc. | | { beef crystals. | | | |
| 11 | 20 " " beef suet | 18½ cc. | | { no lard crystals. | | | |
| 12 | 10 " " head fat, No. 7 | 1½ cc. | 52.2° C. | splendid crystals. | | | |
| 13 | 80 " " oleostearin | 4 cc. | | { resembling beef crystals. | | | |
| 14 | Pork side fat..... | 1 cc. | 34° C. | { mutton crystals. | 44.8 | 45.1 | 40.4 |
| 15 | 87½ per cent. side fat, No. 14 | 4½ cc. | 39° C. | { very few lard crystals. | 44.0 | 45.0 | 40.9 |
| 16 | 75 " " beef suet..... | 6 cc. | 40.5° C. | { mutton crystals. | 43.9 | 45.0 | 39.2 |
| 17 | Pork kidney fat..... | less than 1 cc. | 43.5° C. | { no lard crystals. | 44.5 | 45.3 | 40.2 |
| 18 | 90 per cent. pork kidney fat, No. 17 | 1½ cc. | | { beef fat crystals. | | | |
| 19 | 10 " " beef suet | 4 cc. | 45° C. | { a few lard crystals. | 43.8 | | |
| 20 | Intestinal lard | 1½ cc. | 39° C. | very long lard crystals. | 42.5 | 40.0 | 40.0 |
| 21 | Pure lard | 1½ cc. | 40.3° C. | only lard crystals. | 45.0 | 45.8 | 41.1 |
| 22 | Commercial lard | 4½ cc. | 41.5° C. | " " " | | | |
| 23 | " " " | 3 cc. | 40.4° C. | " " " | | | |
| 24 | " " " | 5 cc. | 38.8° C. | beef fat crystals. | | | |
| 25 | " " " | 3 cc. | 36° C. | | | | |
| 26 | " " " | 4 cc. | 39° C. | | | | |
| 27 | Pure lard..... | 4 cc. | 36° C. | | | | |

respects, similar, I do not feel able to make a positive statement in regard to the diagnostic value of this test in all cases. However, the difference in the appearance of the crystals, so far as I have yet observed, seems to be sufficiently great to serve as a means of distinguishing butter from oleomargarine.

From oleomargarine I have obtained perfect crystals of lard and of beef fat. Butter crystals are somewhat lard-like in appearance, but are much shorter and are frequently in rosette clusters.

The refractometer readings given in the table were made with a Zeiss butyrorefractometer. The first column gives the scale reading of the original sample, the second, of part soluble in the fusel oil at 17° C., and the third column, of the insoluble portion. The indices of refraction corresponding to the scale readings of this instrument can be found in Wiley's *Agricultural Chemistry*.

The fusel oil used in this work had a boiling-point of 129°C. and specific gravity of 0.8159.

CONTRIBUTIONS TO THE CHEMISTRY OF DIDYMIUM.

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THE announcement by Mosander¹ in 1842 of his discovery of a new element which he found accompanying cerium and lanthanum, and to which he gave the name didymium, was followed by careful and able investigations by Mosander and others upon the chemistry of this obscure group. The information which they obtained by means of purely chemical methods was, however, both meager and contradictory,² and it was not until the discovery by Gladstone³ had put into chemists' hands a new analytical method that the results began to be fairly definite and satisfactory.

The spectroscope affords a means of detecting small amounts of earths yielding absorption spectra, and thus makes possible the preparation of purer compounds of such elements as cerium, lanthanum and yttrium, which give no absorption bands; but the most interesting results of the employment of spectroscopic

¹ *Ann. Chem. Pharm.*, 44, 125.

² Hermann: *J. prakt. Chem.*, 34, 182, doubts the existence of didymium.

³ "On an Optical Test for Didymium," *J. Chem. Soc.*, 10, 219.