NOTE ON THE USE OF BUTTER, MILK AND MAMMARY TISSUE IN THE
MANUFACTURE OF BUTTERINE.

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ALTHOUGH the manufacture of butterine is very little understood in this country, it is not our purpose to enter at all into the details of the manufacture or to explain them in any way, but only to point out one or two facts which have come to our knowledge, and which have considerable chemical interest.

It has, hitherto, been a common error to suppose that it was impossible to mix butter with butterine, and this has no doubt led to mistakes in adulteration certificates from which we should apprehend that few Public Analysts have been free. It is quite likely that we ourselves have not been so.

The process of butterine manufacture is now conducted in such a way that there is no difficulty whatever in mixing any desired percentage of butter with the oleomargarine, which is the raw product—and it is just as easy to obtain a butterine containing 50 per cent. of true butter as one containing 1 per cent.

The manufacture of butterine appears to have been started about the year 1869, and the description of the process contained in the patent taken out then, appears to us to show clearly two things—first, that the inventor Mege, was, so to speak, ahead of his time, as regards what he saw as the future of his invention; and, secondly, that he had the idea in his mind of some chemical changes occurring in the fat under certain conditions, to which we will refer, but which, up to the present moment, have never been experimented upon by any chemists except ourselves.

The point to which we specially wish to draw attention now is the action of mammary tissue on fat. Mammary tissue in its crude form, may, of course, be taken to mean simply the chopped up udder of a cow, but it occurred to us, and the experiments show that we were right in our supposition, that this mammary tissue may also be contained in milk and in butter. We have made a good deal of inquiry on the subject, and as the result of this we are convinced that butterine is never made without the admixture of some portion, and usually a very considerable portion of milk and butter, or either one or other of these ingredients during the process.

The oleomargarine, pure and simple, which is the raw material of butterine, is simply purified suet, and as far as we have seen it is prepared with great care, melted at a low temperature so as to avoid any burning, which might produce a tallowy smell, and then sufficiently cooled to allow of the extraction by means of pressure of the excess of stearine which it contains. The more fluid part containing the larger proportion of oleine, is used for the subsequent manufacture of the butterine.

This raw material, *i.e.*, oleomargarine, is being made at the present time by a number of manufacturers in this country and abroad, and in fact the greater part of what is made here is being exported for further manipulation abroad, so as to make it into finished butterine, and export it again to this country as a more valuable article.

The next process is, to bring the fat into what is considered a different condition, and according to the experiments which we have recently tried, the process is certainly successful. It was proposed to treat the fat with mammary tissue for some few hours at animal heat, and we find that such a treatment as this does specifically alter the character of the fat, and that, as the result, an altered fat is obtained, which, even if it does not resemble butter, has at any rate been changed in character, so that it is not the pure oleomargarine fat that it was before.

We have repeatedly tried the experiment, and having taken pure animal fat, *i.e.*, melted suet, and digested it with the chopped up udder of a cow, for from three to six hours, we have found that a definite and marked chemical change in the composition of the fat was produced. This point appeared to us to open up a new field of inquiry, *viz.*, to see

whether it was really possible that the udder of a cow after death did contain any ferment or other substance analagous (we will say) to pancreatine or pepsine, but which, differing from them, might at any rate have some anomalous effect upon fat, so as to ensure its digestion, or so as to change it in any way.

Obviously it is desirable in carrying out an investigation of this kind that the udder of the cow with which the experiments are tried should be obtained from an animal which is in full lactation, and treated immediately after the cow has been killed. Up to the present we have not been able strictly to follow out this course, but we have obtained some certain results which are sufficient as serving to throw some light upon the matter, and we intend to carry it further. We took portions of the udders of cows, and extracted from them with dilute alcohol certain substances which proved on evaporation *in vacuo* to contain at least three different constituents. One of the three is a fatty body of a peculiar kind which needs further examination, and that examination must obviously present circumstances of special difficulty, which will be the more readily appreciated when we say that it appears, as far as we can see from preliminary experiments, to differ in several points both from oleomargarine and butter.

We also obtained two other products, but cannot report fully upon either of these at present. This much, however, has been found out, that one of them has a definite action upon fats, which action is of such a character that it changes the fat by altering its sp. gr., or actual density, and by producing a certain, although small amount of volatile fatty acids from the fat which previously contained nothing but insoluble fatty acids.

We have tried a number of experiments with mammary tissue, and with the extracts taken from the fresh udder; but, as far as we have gone, we find that practically there is no difference between the effect of the two.

Oleomargarine, or tallow, is in either case changed to a certain extent, and both soluble and volatile fatty acids are formed, instead of the insoluble fatty acids which were the only ones present before.

It follows from these experiments: first, that the chemical result which has been obtained so far is that the udder of the cow contains a certain substance or substances which are capable of acting upon fat, and which do by that action change its chemical composition. Secondly, that the same results can be produced by using an extract obtained from the udder of a cow.

But our experiments led us to go further even than this. Butter and milk both contain sensible proportions of mammary tissue in the shape of casts from the mammary glands, and they may, for aught we know to the contrary, and probably do, contain other matters which are not easily recognizable by microscopical examination, but which yet may be present in sufficient proportion to exert a definite physiological action, and from certain of our experiments we are inclined to think that this is the case.

Thus far, we are satisfied that both milk and butter do, to a certain limited extent, produce the same effect as we have already ascribed to mammary tissue. The action of milk, so far as we can judge at present is small, but it appears to result in the increase of the soluble fatty acids to a definite extent, which is quite sufficient to be capable of estimation. The action of butter is greater, perhaps, because it contains a larger proportion of substances derived from the mamme of the cow, but it appears identical in character with

the action of milk. This viewed from a chemical standpoint may mean solely that the milk when it passes into the udder of the cow does not contain butyric acid, but that butyric acid is generated entirely in the lacteal glands.

We have put this forward simply as a view, which may or may not be upheld by subsequent investigations, but still the probability of the fact being as we state is quite sufficient to justify its being mentioned.