

**BUTTER: ITS ANALYSIS AND
ADULTERATIONS, SPECIALLY
TREATING ON THE DETECTION
AND ESTIMATION OF FOREIGN
FATS**

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Butter: its analysis and adulterations, specially treating on the detection and estimation of foreign fats by Arthur Angell & Otto Hehner

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ARTHUR ANGELL & OTTO HEHNER

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BUTTER:
ITS ANALYSIS AND ADULTERATIONS.

SPECIALLY TREATING ON
*THE DETECTION AND ESTIMATION OF
FOREIGN FATS.*

BY

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P R E F A C E.

THE Authors have been urged to undertake the production of this small treatise, by a conviction that no work has hitherto been placed into the hands of the "Food Analyst," which gives reliable methods to detect and estimate foreign fats when mixed with butter.

To take one article of food, and to describe a method of detecting adulteration in it alone, is indeed a work of no great magnitude; nevertheless, by paying special attention to their subject, and by giving a number of new facts in connection with it, the authors hope to have supplied a want.

The authors give two entirely new and original methods, described in Chapters IV. and V.

The first, a physical one, determines the fusing points; the second, a chemical one, for estimating foreign fats in butter.

The chemical research is mainly due to

Mr. Hehner, whilst the physical and microscopical part is more peculiarly the work of Mr. Angell.

To Dr. Hassall, in whose laboratory the whole of the experiments have been done, the authors are deeply indebted.

May this little work be favourably received by the Analysts and the trade: giving to the one accurate methods for detecting adulteration, and protecting the other from unjust prosecution under the "Adulteration Acts."

VENTNOR, *July 4, 1874.*

CHAPTER I.

THE COMPOSITION OF BUTTER.

BUTTER consists of the fatty portion of the milk of the cow, in which it is suspended in the form of minute oil-globules.

On allowing the milk to remain undisturbed for some hours, these globules rise to the surface, forming a layer of the so-called cream, which, besides the fat, contains a quantity of casein, and some serum. By violent agitation, the oil-globules of the cream break up, and, uniting, form a fatty mass, which invariably contains a small quantity of the casein and water of the milk. In this country, some salt is generally added during the process of preparation.

Butter obtained in this manner may vary much in colour and flavour, which qualities are governed by the season, food, kind, and health of the cows, but mostly depend upon the care and cleanliness observed during the manufacture. Thus, it is well known amongst makers that a person with warm moist hands is unable to produce a butter of fine flavour. From the same cause, butter begins to decompose in a very short time, on the spot, touched with a sweaty finger.

The better a butter has been prepared, the

more even is it in texture, pellucid in appearance, and the longer will it keep.

The constituents of butter, therefore, are fat, water, casein or curd, and salt.

I. *The Fat of Butter.*—Like all the other fats, the fat of butter consists of a mixture of the glycerides of the so-called fatty acids,—palmitic, stearic, and oleic,—but, moreover, as characteristic features, it contains butyric, caproic, caprylic, and capric acids, in combination with glycerin. To obtain an insight into the constitution of butter-fat, it is necessary to pay some attention to the physical and chemical properties of its proximate constituents.

Palmitin is a white solid, fusing at 36°C ., and crystallizing in laminae. It is insoluble in water and cold alcohol, but soluble in hot alcohol and in ether. It occurs in nearly all fats, especially in those fusing at the lower temperatures. On decomposition it yields 95.28 per cent. of palmitic acid, $\text{C}_{16}\text{H}_{32}\text{O}_2$.

Stearin resembles palmitin in appearance, fuses at 63°C ., but is less soluble in alcohol and ether. It occurs in most fats, in the largest proportion in those having a high fusing point, and yields 95.73 per cent. of stearic acid, $\text{C}_{18}\text{H}_{36}\text{O}_2$.

Olein is at ordinary temperature an oily liquid, solidifying at 5°C ., and is soluble in ether in all proportions. It is the predominant constituent of the fat oils. The quantity of oleic acid obtained from it amounts to 95.70. Its formula is $\text{C}_{18}\text{H}_{34}\text{O}_2$.

Butyrin is the most important constituent of butter; although not occurring in it in as large quantities as the olein, it imparts to it its peculiar flavour and smell, and distinguishes it from all other fats. It is at ordinary temperatures an oily liquid, yielding on decomposition butyric acid, $C_4H_8O_2$.

Butyric Acid belongs to the series of fatty acids, although it resembles in appearance and physical properties, acetic more than the palmitic, stearic, or oleic. Its specific gravity is 0.97. Boiling at $157^\circ C$. It smells strongly acid, like acetic acid and rancid butter combined; it is volatile and soluble in water, alcohol, and ether in all proportions. Butyric acid has also been found in large quantities in the locust bean (*Siliqua dulcis*), in the fruits of the soap-tree and of *Gingko biloba*, in sour gherkins, and in the sauer-kraut of the Germans. It occurs further in small quantities in some mineral springs, and is formed by the fermentation of sugar, starch, and lactic acid, in which way it is artificially prepared. It is found in no other fat but butter.

Caproic Acid, $C_6H_{12}O_2$, is a liquid possessing a sudorific smell, boiling at $202^\circ C$.; specific gravity 0.922. It is volatile and soluble in water and alcohol. It is not only found in butter, but also in cocoa-nut oil, which is said to contain, moreover, caprylic and capric acids. It occurs in human sweat, in cheese, in the root of *Arnica montana*, in *Satyrion hircinium*, and in the fruit of *Gingko biloba*.

Caprylic Acid, $C_8H_{16}O_2$, closely resembles