THE LABORATORY BOOK OF DAIRY ANALYSIS

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The Laboratory Book of Dairy Analysis by H. Droop Richmond

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OF

DAIRY ANALYSIS

BY

H. DROOP RICHMOND, F.I.C.

ILLUSTRATED WITH PHOTOGRAPHS BY THE AUTHOR



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PREFACE

This work is intended to contain working directions for the analysis of milk and dairy-products; the estimation of all constituents of diagnostic value is shortly described in detail, and is in many cases illustrated by photographs of chemists actually carrying out the determination.

A chapter on the application of analysis to the solution of problems usually placed before the chemist is included, and a very short summary of the composition of milk and its products is given.

In the Appendix the composition and preparation of the various solutions is detailed. Tables are given to facilitate the working out of results; these Tables are condensed to occupy one page each, and the saving of time by avoiding the turning over of pages will more than compensate for the slight extra labour due to the condensation.

i.

While not intended to be a complete guide to the analysis of milk, it is hoped that this work will afford assistance to analysts, health officers, dairy students, and those engaged in the supervision of dairies; with this object in view the more simple tests have been described in a manner which will render their working by persons other than chemists possible; it must be remembered, however, that though these methods are easy, they are often fallaciously easy, and lack of chemical training may lead to the making of errors, and the overlooking of important points; no amount of careful following of directions can replace a thorough training in chemical science and manipulation, and though simple tests have a real value as a guide, they have not the reliability of an analysis made by a skilled chemist.

H. D. R.

September 1905.

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CHAPTER I.

INTRODUCTION.

Milk consists of (1) fat in small globules (Fig. 1) ranging in size from 0.01 mm. in diameter to 0.0016; (2) milk-sugar and (3) various salts in solution in water; and (4) casein, combined with lime and



FIG. 1.-Milk (magnified 400 diameters).

phosphoric acid, and (5) albumin in less perfect solution. There are in addition (6) other compounds in

small quantities.

The fat will be treated of in the section on butter; the milk-sugar belongs to the class of carbo-hydrates and crystallises with 1 OH₂, and is one of the hexabioses. It rotates the plane of polarisation, its specific rotatory power being 52.5° for the crystallised sugar;

and reduces solutions of copper salts.

Casein is a proteid belonging to the class of the nucleo-albumins; it contains carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus; in milk it exists as a salt of lime and soda combined with calcium phosphate; acids precipitate the free casein if dilute, while strong acids re-dissolve it. Rennet splits casein up

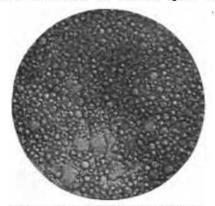


Fig. 2.—Cream (magnified 400 diameters).

into curd, which is a combination of para-casein with the lime and the calcium phosphate of the casein, the soda being split off, and whey proteid which is free from phosphorus.

Albumin is a proteid which is distinguished by coagulating on heating to 70° C.; in milk it probably exists as a salt, and this does not coagulate until the milk is acidified. Unaltered albumin is not precipi-

tated by acids.

When micro-organisms act on milk various products are formed; the most important change is the formation of lactic acid from the sugar, which causes milk to become sour, and curdles it by precipitating the casein.

The fat globules are lighter than the aqueous serum,