THE DETECTION OF CANE-SUGAR IN MILK AND CREAM.

BY W. H. ANDERSON.

(Read at the Meeting, February 6, 1907, by Mr. H. Droop Richmond.)

MILK, and more especially cream, are liable to be adulterated by the addition of cane-sugar, small quantities being sometimes added to mask watering of milk, though the amount which can be used for this purpose without imparting a noticeable taste to the milk is limited. The presence of cane-sugar in cream may arise from the addition of a preservative containing a sweetening agent, and though saccharine is perhaps the more widely used at the present time, preservatives for cream containing 25 per cent. or more of sugar are not unknown; a solution of saccharate of lime is also sold under fancy names as a thickening agent for cream. Artificial milks for infants are made up in which the percentage of carbohydrate is raised much above the normal in cow's milk, and it is sometimes useful to be able to rapidly test whether this increase is due to cane- or milk-sugar.

The methods hitherto available for testing for the presence of cane-sugar have included the somewhat tedious polarisation or a determination of the reducing power before and after inversion; the resorcinol test of Cayaux (*Chem. Centr.*, 1898, ii., 510); the molybdate test of Cotton (*ANALYST*, **23**, 37), which has been modified by De Koningh (*ANALYST*, **24**, 142); and the sesame-oil test described by Gawalowski (*Zeit. anal. Chem.*, xxxviii., 20), and later by Leffmann (*Chem. Zeit.*, xxx., 638).

I have found that Cayaux's test is rapid and reliable; it consists in mixing 15 c.c. of milk, 0.1 gram of resorcinol, and 1 c.c. strong hydrochloric acid (or smaller quantities in the same proportions), and raising the mixture to the boiling-point. In the presence of cane-sugar a fine red colour is produced, while pure milk is but

slightly affected, and only turns a brownish colour on continued boiling. It is quite easy to detect 0·2 per cent. of cane-sugar; by making a blank test with pure milk at the same time, and prolonging the heating, the presence of smaller quantities is indicated.

DISCUSSION.

Mr. RICHMOND said that the author, who lived in Australia, had communicated the substance of the paper to him, and asked him to lay it before the Society. It was very gratifying to find that Australian chemists chose the Society's Journal as the best means of publishing their researches. He had tried the method, and found that it worked well. None of the other commonly-occurring carbohydrates, with one exception, gave the reaction; the exception was *lævulose*, which gave, weight for weight, approximately twice the depth of colour given by cane-sugar; dextrose did not give the reaction. On investigating the matter further, he found that it appeared to be a furfuraldehyde reaction; pentosans also gave a red colour; with agar a very marked reaction was obtained, and, as agar was sometimes added to cream as a thickening agent, a red colour would not be absolutely characteristic of cane-sugar. This did not altogether detract from the value of the method, for, so far as he was aware, the detection of agar in cream was almost impossible. In his hands the test depending on the presence of *Arachnoidiscus Ehrenbergii*, described by Collin and by Leffmann, had always failed, probably because these diatoms were not always present.

He would like to refer to the fact, which does not appear to be so widely known as it should, that acetic acid very frequently contains a substance which gives a red colour when mixed with aniline, and is not improbably furfuraldehyde. It is preferable to use aniline hydrochloride and recrystallized sodium acetate when testing for furfuraldehyde, or even aniline hydrochloride, alone.

The resorcinol test presents analogies to the condensation of phloroglucinol with furfuraldehyde; resorcinol is *m*-dihydroxybenzene, and phloroglucinol is the symmetrical trihydroxybenzene, and no doubt very similar condensation products are obtained. Indeed, phloroglucinol can be substituted for resorcinol in this test, though the colour is much less easy to observe.

The PRESIDENT said that the question of the presence of a minute quantity of cane-sugar in milk was always one of considerable difficulty, and if a simple colorimetric test such as this proved successful it would be a great convenience. So far as milk was concerned, the presence of cane-sugar would clearly be an adulteration; but he was not so sure whether a little cane-sugar in cream would be so, seeing that there was no legal standard for cream at present.

Mr. BEVAN said that in a paper recently abstracted in the ANALYST (1907, 49) the substitution of aniline hydrochloride for aniline acetate was recommended for the reason mentioned in Mr. Anderson's paper—namely, that the acetate was liable to be coloured. Nevertheless, acetic acid giving a colourless solution with aniline was quite readily procurable.