ON THE
SUGAR IN DIABETIC BLOOD.

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IN 1841 Professor Mitscherlich communicated to the Academy of Sciences, in Berlin, a new method of distinguishing between cane and grape sugar, the discovery of H. Trommer, who had himself applied it to the detection of sugar in diabetic blood, but without success, although he found when $\frac{1}{10000}$ part of grape sugar was added to healthy blood it could be afterwards recognized by this test. Hence the conclusion was drawn, that as this most direct and delicate test failed to detect the sugar in the blood, that therefore no sugar was present there in this disease.

M. Rayer, in his Treatise “ *Sur les Maladies des Reins,*” states that M. Guibourt at his request repeated the experiments of Mr. Macgregor, Dr. Maitland, and Dr. Rees, but that by fermentation he could obtain no evidence of the presence of sugar in the blood.

The delicate test of M. Trommer consists in the perfect solution of the precipitate which first forms when caustic potash is added in excess to a solution of sulphate of copper and grape sugar, and the after formation of a peculiar coloured precipitate by heating the mixture. The first part of the test is not sufficient without the second, nor the second without the first: for cane sugar will give the same clear, blue, solution, without giving the peculiar precipitate afterwards. And uric acid used instead of sugar gives the same precipitate by heat, but does not give the clear solution.

An opportunity offering, I repeated the experiment on the blood.

Thomas Saxby, æt. 30, grocer, was admitted Jan. 20th, 1843, into St. George's Hospital, under the care of Dr. Nairne. He had been living in Sussex, was stout, florid, light hair; pulse full; skin very dry; bowels confined; tongue white. Had been attacked with looseness and vomiting about thirteen months previous to his coming to the hospital. Before this time he was quite healthy; free from rheumatism, gout, indigestion, or skin disease (excepting scabies). He suffered from the above complaints for a week, and as he recovered, he felt much thirst and weakness. He then for the first time observed an increase in the quantity of water, and was troubled with a frequent desire to pass it.

On admission he complained of these symptoms, with heaviness and weight after taking food.

Jan. 24.—He was bled to twelve ounces, three

hours after dinner, which consisted of about six ounces of bread and twelve ounces of meat, with no vegetables. The following morning the blood was well separated; the serum was milky; the clot slightly buffed and cupped.

The serum was poured off nearly free from the blood globules. A bottle filled with it at 57° F. weighed 516.46. The same bottle, with distilled water at the same temperature, weighed 506.56. The specific gravity at this temperature was 1029.7. It was alkaline. Thrown on a filter, it passed through milky, but when treated with æther it became perfectly clear. When examined with the microscope, these globules of fat were so small as not to be distinct when magnified 640 diameters. To about a drachm of serum, three drops of a strong solution of sulphate of copper were added, and then an excess of caustic potash: a dirty blue precipitate first formed, which did not dissolve, but only became much darker when heated, partly in consequence of the dark purple which is formed when sulphate of copper and an excess of caustic potash are boiled with albumen or fibrin. It became necessary, therefore, to remove the albumen before the test was applied. 516.4 grains of serum were evaporated to dryness in a water bath. The residue was reduced to a fine powder, and then treated with cold water, which after standing for some time, was filtered. The fluid which passed through was slightly yellow, clear, and of a strongly saline taste, and when tested with sulphate of copper and an excess of potash,

the precipitate which first formed dissolved entirely, and then on the application of heat a reddish yellow precipitate formed. About three ounces of the clot from the same blood were evaporated in the same way, when, powdered and treated with warm water after filtration, the first-formed precipitate dissolved, and then, by heat, the same re-action ensued as before.

The same quantity of healthy serum as in the first experiment, was treated in exactly the same way. The clear fluid also tested in the same way did not dissolve, and when heated became black.

In two fluid ounces of clear serum I put 0·15 of a grain of diabetic sugar dissolved in water, after evaporation, &c. I was unable, by the above test, to obtain a satisfactory proof of the presence of the sugar. In testing diabetic serum, it is essential first to get rid of all the albumen by evaporation to perfect dryness ; secondly, to extract the sugar from the albumen by reducing it to a very fine powder, and treating it with water for a considerable time ; thirdly, not to render the test obscure by forming too much peroxide of copper ; on this account, but a drop or two of sulphate of copper should be used.

The urine passed between three hours before the bleeding, and nine hours after, amounted to about five pints. It was acid to test paper. Very light straw coloured, specific gravity 1031·3, and, tested in the above-mentioned way, gave a very large precipitate, which was at first bright yellow, and after some hours became dark green.

In two ounces of healthy urine 0·15 of a grain of diabetic sugar was dissolved, and the test was most sufficient.

From the preceding observations it is clear that it is easier to discover sugar in the urine than in the blood ; in which last, though it may sometimes be detected, yet, at other times, it may be in so small a quantity as not to be recognisable by the most delicate test.