researches into this question merely emphasize what has been perhaps insufficiently realized—that the chief object of our inquiries in cases of heart inefficiency must be the condition of the heart muscle.

A CASE OF CARDIAC FAILURE TREATED BY CANE SUGAR.

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THE BRITISH MEDICAL JOURNAL of March 18th, 1911, contained a paper by Dr. Goulston, of Heavitree, Exeter, on the beneficial effect of the ingestion of cane sugar in certain forms of heart disease, and several very interesting cases were reported.

I had under my care at the time a case of cardiac muscle failure, which seemed to have reached its high-water mark of improvement. The result of the cane-sugar treatment was so satisfactory that I think the case, although isolated, worth recording. In Sir Lauder Brunton's book on *Therapeutics of the Circulation* (p. 141) is the following:

Amongst the most powerful cardiac nutrients appears to be glucose; for Locke found in his experiments that the addition of glucose, even in very small quantity, to a saline fluid greatly increased its nutritive effect upon the isolated mammalian heart. Other sugars have less action. Their nutritive effect apparently runs parallel with the susceptibility to fermentation, glucose standing far ahead of the others.

Dr. Goulston appears to have been the first to make practical application of this theory, at least, on any considerable scale. I wrote to him asking for fuller particulars of his method of administering the cane sugar, and he most kindly gave me full details.

I first saw my patient, a lady aged 62, in July, 1910. She had been trying to lead her usual life until the day on which I saw her, but for two years she had noticed that she was increasingly unable to do what she had been in the habit of doing. In the spring of 1910 she had had influenza, and after recovery she had fallen, when out walking, and sprained her ankle; for this she had rested for a month or six weeks. For the fortnight which preceded my seeing her she had had an evening temperature of 100° to 101°, but this subsided with rest in bed, and did not recur. This temperature suggested that the cardiac trouble had originated in the attack of influenza in the spring. This was not my opinion, and I think her case was one of cardiac muscle degeneration and failure, possibly aggravated by the influenza, but of longer duration, as shown by the gradual failure of energy during the preceding two years.

The cardiac impulse was displaced considerably outwards, and was very feeble; the pulse was about 120, and feeble, though regular. There was an aortic systolic, but no mitral murmur; the sounds were "tic-tac" in character and faint. The heart was obviously hypertrophied and dilated. Her symptoms were marked; she had no energy, although naturally a most energetic person. She was now incapable of the slightest exertion, either mental or physical. Her blood pressure was 175 mm. Hg, but rapidly came down to normal under treatment, and was not at any time markedly abnormal. The urine was in all respects normal. There was no oedema.

For the next eight months she was treated with the usual cardiac tonics, such as strychnine, strontium iodide, arsenic, and strophanthus, and great stress was laid upon fresh air. She went to Scarborough in the late summer and Hastings in the winter, and spent in both places as much time as possible out of doors, sitting out of doors well wrapped up or driving.

In March, 1911, improvement was marked, but she could, even then, only walk about half a mile at a stretch, and was very easily tired, both mentally and physically. Her pulse was now about 90 and her heart sounds fuller and less "tic-tac" in character.

Towards the end of March I took her to see Sir Lauder Brunton with a view to asking his opinion as to whether Nauheim would do her good. His opinion was that Nauheim might possibly improve her, and was at least

worth trying; but on the whole he was of the opinion that she had reached her limit of improvement. His diagnosis agreed with that stated above, and in addition to the aortic systolic he found a slight mitral systolic bruit.

Shortly after this I saw Dr. Goulston's paper, and it occurred to me that my case was just one for a trial of his treatment.

My patient being inclined to stoutness had always particularly avoided sugar, taking none in tea or coffee and having all puddings, fruit tarts, and milk puddings made without any sugar. The Glebe Granulated Sugar, as suggested by Dr. Goulston, was used. She had some time previously given up alcohol in any form, and whilst taking the sugar she had no medicinal treatment of any kind except a blue pill once a week with a dose of Apenta water to follow it in the morning. She had for some weeks previous to starting the sugar only been taking potassium iodide in 3 grain doses twice a day. She was very averse to trying the treatment, being, as she expressed it, "gouty," and feeling sure that it would make her worse.

From April 22nd to 29th she took 1 oz. of the sugar at breakfast and one at afternoon tea; total, 2 oz. daily.

From April 30th to May 6th she took 1 oz. at breakfast, $\frac{1}{2}$ oz. at lunch, 1 oz. at tea, and $\frac{1}{2}$ oz. at dinner; total, 3 oz. daily.

From May 7th to May 21st she took 1 oz. at breakfast, 1 oz. at lunch, 1 oz. at tea, and 1 oz. at dinner; total, 4 oz.

From May 22nd to May 28th she took 3 oz. daily, and from May 29th to June 2nd 2 oz. daily. On June 2nd she started for Nauheim, and had gradually lessened the amount of sugar in case her doctor (Professor Groedel) at Nauheim should not wish her to take it.

The patient gained 5 oz. in weight between April 22nd and May 19th, and then lost 8 oz. between May 19th and 26th. Her diet was as follows:

Breakfast.—Coffee, lean tongue kedjeree or boiled egg and two pieces of thin toast. No butter, bacon, or fat of any sort.

Lunch.—One piece of dry toast, spring cabbage, broccoli, or asparagus, with boiled fish or boiled mutton or boiled chicken. No fats and no sauces, and always rice boiled in a little milk or water, the sugar being taken in this rice. No fruits or acids were taken.

A tumbler of hot water was taken one hour before lunch and one hour before dinner; nothing to drink at either meal.

Afternoon Tea.—Two slices of dry bread with sugar on it and a little in a cup of tea. No cakes, jams, or butter.

Dinner.—Much the same as lunch, only "force" instead of rice with which to eat the sugar. No fruits, sauces, or fats.

Taking the sugar in this way, she experienced no inconvenience, no flatulence, and no indigestion, but any departure from this strict diet quickly caused indigestion. She completely lost what she called her "goutiness," and no sugar was at any time found in her urine.

Her improvement began to be obvious after the middle of the second week, and by the end of the fifth week it was remarkable. The pulse was steady and stronger, and normally 72 to 78; it was not abnormally altered by exertion, and quickly resumed its normal rate after rest. The first mitral sound was stronger, and altogether of better quality. She could walk nearly three miles without a rest or undue fatigue, and a very short rest completely restored her. Her mental vigour was quite re-established, and her feeling of well-being and "fitness" after the months of weariness and lassitude was really extraordinary.

After the fifth week she went to Nauheim, as it had been all arranged some weeks beforehand. Though, if I had anticipated such improvement, she would certainly never have troubled to go at all. At Nauheim she saw Sir Lauder Brunton—he had seen her a few weeks before she started the sugar treatment—and in a letter to me from Nauheim, from which I have his permission to quote, he wrote: "She has improved enormously on the diet you gave her"; and a few days later he wrote again:

Her improvement is simply miraculous. I can find to-day no murmur at all at the apex; there is a slight systolic one over the aorta, with a slightly accentuated second sound. Her pulse is 90, quite regular (it was a little accelerated by coming to see me). Her tension is 125 mm., and the urine, according to an analysis she showed me, is specific gravity 1019, and absolutely normal.

She is still taking 2 oz. of sugar daily, and maintaining her great improvement. Her diet is not now nearly so strict, but she still drinks nothing at lunch or dinner. Her weight remains about stationary.