source of immediate danger than the lungs. Indeed, this condition is very common, apart from phthisis, and produces or attends a state of languor, feebleness, defective appetite, mental depression, and general exhaustion.

It may seem out of place to offer a remark as to the best method of relieving the cough in cases of phthisis; but the great success which has attended the small and repeated doses of morphia encourages me to mention it. I believe no other substance is so certain and uniform in its action, and so deserving of confidence. Regarding the cough as sympathetic, when not directly induced by local mischief in the pharynx, I never administer expectorants, but give simply one-sixteenth of a grain of morphia in water, or in two ounces of acacia mixture, four to six times in the day and night. It is a dose which may be repeated in half an hour without injury. It seldom affects the head or the bowels; and, when repeated, I venture to say, will always allay cough, and give sleep. I use no other remedy for the cough, whether in phthisis or bronchitis, and could adduce some thousands of cases to prove the utility of the plan.

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Notes of Lettsomian Lectures

ON

CERTAIN POINTS CONNECTED WITH DIABETES.

DELIVERED BEFORE THE MEDICAL SOCIETY OF LONDON.

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LECTURE I.

[Delivered November 23rd, 1859.]

IN 1848, M. Claude Bernard stated that he had discovered that the liver had a function very different from that usually attributed to it—that, in short, it had a glucogenic power, or the property of forming sugar. This assertion startled physiologists; and now, after it has obtained almost universal credence, the theory of M. Bernard appears in danger of being completely overturned. But, considering the high scientific position of M. Bernard, and the undoubted exactitude with which his experiments were conducted, it is necessary for all who inquire into the same subject to take care that they are not deceived.

The object of the present lectures is first to give a general account of the physiology of the sugar-formation in the animal body.

Sugar exists in the animal body in the form of glucose or grape-sugar; and, fortunately, the chemical tests for it are not only numerous but trustworthy.

A very common method used for detecting sugar is Moore's or the liquor potassæ test. If a fluid containing glucose be boiled with liquor potassæ, the colour of the fluid is changed to sherry or darkish brown. Although this test is useful in the wards of a hospital, it is almost completely useless physiologically; for colour is not to be depended on in strict physiological experiments.

The fermentation-test is generally looked on as more trustworthy; but Berthollet has pointed out that there are several other substances than grape-sugar which undergo an alcoholic fermentation with yeast. This test is very readily applied. If a solution of grape-sugar be added to a little yeast in a test-tube, and exposed for a short time to moderate heat, carbonic acid will be evolved. Alcohol may also be detected. This test has been suggested for determining the quantity of sugar in solution. According to Christison, every cubic inch of carbonic acid denotes a grain of sugar. It is necessary to be careful that for this purpose the yeast is perfectly pure. The ordinary yeast, as obtained from brewers, always contains saccharine matter; which, however, may be easily removed by washing.

Barreswil's and Trommer's tests consist in the use of a cupro-potassic solution. There is an objection to Trommer's test, that the liquid is thick; while Barreswil's solution is transparent. Barreswil's liquid contains the following ingredients:—

Bitartrate of potass	-	-	-	960 grains.
Carbonate of soda	-	-	-	960 "
Caustic potash	-	-	-	640 "
Sulphate of copper	-	-	-	320 "
Distilled water	-	-	-	1 pint.

This forms a beautifully blue and transparent solution; being essentially a tartrate of copper dissolved in an alkali. It is very delicate, and will detect the presence of an extremely minute proportion of sugar. It may also be used in quantitative analysis with the greatest accuracy. A certain amount of sugar is required to throw down the oxide of copper; so that, the quantity of the solution used being known, the amount of sugar may be readily determined.

A modification of this test, used by the lecturer, is the following:—

Tartrate of potash	-	-	-	10 grains.
Sulphate of copper	-	-	-	5 "
Liquor potassæ	-	-	-	2 drachms.

The tartrate here used is the neutral tartrate. The potash and copper are mixed, and the liquor potassæ is added. The same kind of liquid is produced as in Barreswil's solution. There is an important source of fallacy attending this test: if the solution be kept long, it will of itself form a precipitate on boiling, though not so much as from a saccharine liquid. But the liquid is very easily rendered pure by the addition of a little potash.

It has long been known that in diabetes the urine contains saccharine matter. In the seventeenth century, Willis pointed out that diabetic urine was very sweet; and, a century afterwards Cowley isolated the saccharine matter. Later, Rollo thought that he had ascertained that the sugar in diabetes was formed by the action on the aliments of a depraved gastric juice, and that, so formed, it was taken into the circulation and eliminated by the kidneys. No doubt the blood of diabetic patients contains sugar; but its origin—the origin of the abnormal quantity—is not due to vitiated gastric juice. It was afterwards found by Magendie that sugar was formed normally in the intestinal canal during the digestion of certain materials, and that it was thence taken up and carried to the liver.

It is easily shown that, by the action of certain digestive fluids, starch is changed into sugar. If a solution of starch is agitated with Barreswil's solution, no change occurs; but if starch is mixed with a little human saliva, and exposed to a moderate heat, Barreswil's solution will show the presence of sugar. The pancreatic juice has the same effect, as may be proved by obtaining some of this fluid from the pancreatic duct of a dog. This is probably the especial agent in the animal system for changing starch into sugar. The saliva of man has this effect; but not that of the horse or dog; and besides, the materials remain but a short time in the mouth, and the further action of the saliva would be checked by the gastric acids as soon as the food arrives in the stomach. In the intestines, however, everything is favourable to the transformation: the gastric acid is neutralised; there is a sufficiently high temperature; and the alimentary mass and the pancreatic juice are kept for a length of time in contact. [The effect of pancreatic juice on a solution of starch was shown by an experiment.]

If pancreatic juice is mixed with oil, an emulsion is formed: the fat is minutely divided, and rendered fit to be taken up by the lacteals. If fatty matter or oil is mixed with saliva, the mixture is less perfect: in a little time, the oil floats to the top, while in the other case it remains blended with the pancreatic juice.

Sugar, when formed from the ingesta, is taken up by the portal system of veins, and conveyed to the liver. Bernard, who took up the matter where Magendie left it, says that the sugar is carried to the lungs, and there decomposed. It occurred to Bernard that there might be in the liver some material capable of forming sugar independently of the digestive process. To ascertain this, he fed a dog with strongly saccharine food, and traced sugar in the liver, the lower vena cava, the right side of the heart, and the pulmonary arteries as far as the lungs, but no farther. He then fed a dog with animal food alone. On killing the animal, he found a large quantity of sugar in the inferior vena cava, and in the right side of the heart; hence he inferred that there was somewhere a power of forming a saccharine principle. On examining the blood in the portal and abdominal veins, he found no sugar. He suddenly killed an animal fed without sugar or starch, and

placed a ligature on the portal vein. In a little time, he opened the chest, and found sugar in the blood of the vena cava and right side of the heart. This experiment has been confirmed; but sometimes there is a little sugar in the blood of the portal vein. This is supposed by Bernard to arise from a reflux of blood—an event which is liable to occur in death from pithing.

[Dr. Pavy performed some experiments with blood from the right side of the heart and from the liver of an animal. On adding Barreswil's solution to each, sugar was distinctly indicated in the former, while there was but a small trace in the latter.]

Finding, then, that blood which had passed through the liver contained much sugar, while some was found in the blood going to the liver, Bernard concluded that the liver had the property of forming sugar—that it had, as he expressed it, a *glucogenic* function. He went a step further, and discovered what he thought to be a material in the liver capable of conversion into sugar, to which he gave the name of glucogenic material, but which might be better termed amyloid substance. He took a liver, and, inserting a cannula, washed out the sugar by a stream of water. Next day, and for some days afterwards, he found that the liver yielded a large quantity of sugar. The inference from this experiment, which has been confirmed, is, that the sugar-forming property of the amyloid substance at least continues after death; and that the formation of sugar in the animal body is not a vital process.

According to Bernard, then, it appears that sugar is formed in the liver; that certain materials conveyed to the organ by the portal vein are changed into the amyloid or glucogenic substance; that this is changed into sugar, which is conveyed to the right side of the heart, and thence to the lungs, where it undergoes decomposition.

No doubt this transformation of the amyloid matter takes place after death; but does it occur during life?

Some years ago, Dr. Pavy was making experiments to ascertain what became of the sugar during the passage of the blood through the lungs. In some of these experiments, he took blood, which he believed to contain sugar, from the right side of the heart of a dead animal, and injected it through the lungs of a dead animal supplied with air. Sometimes there seemed to be a disappearance of sugar. Meeting, however, with an impediment from the coagulation of the blood, he modified the experiment by removing blood from the heart of a living animal by catheterism through the jugular vein. On doing this, he found that there was scarcely any sugar in the blood; but even then (1854) he was so satisfied of the correctness of Bernard's views, that he attached no importance to the occurrence. Repeating the experiment two years later, with the same result, he determined to make a comparative examination of the blood of the right side of the heart during life and after death. In the former case, no sugar was detected in healthy animals; nor was it present in blood removed from the carotid artery.

The doctrine of Bernard, of the glucogenic function of the liver during life, is then open to grave doubt. The fact is, that the transformation of the amyloid substance into sugar commences so rapidly after death, that physiologists have been in error in supposing that it occurs during life.

There is no evidence of oxidation of sugar in the lungs. Liebig and his followers believed that sugar was oxidised to an acid in the development of animal heat. But, on examining this subject, it is found that sugar is very unsusceptible of oxidation, except under the influence of the strongest chemical reagents. Even oil, if its surface be greatly spread out, undergoes slow oxidation by exposure; but this does not occur with sugar.

FUNERAL OF PROFESSOR GEORGE WILSON. The honours of a public funeral were, on Monday, paid to the remains of the late Dr. George Wilson, Professor of Technology in Edinburgh University. The obsequies were attended by the Lord Provost, magistrates and council in their robes, the professors of the University in their academic gowns, and by the directors and members of nearly all the learned and mercantile societies in the city. The long and mournful procession was witnessed by a large number of spectators, particularly in Princes Street and Waterloo Place, on the way to the Old Calton burying-ground. Almost all the societies in town, whether connected with science, literature, or trade, have had to inscribe on their minutes a sense of the loss individually sustained by them, and to express their gratitude for many services rendered to them by the deceased.

LETTERS AND COMMUNICATIONS.

Letters or communications for the JOURNAL should be addressed to Dr. WYNTER, Coleherne Court, Old Brompton, S.W.

Letters regarding the business department of the JOURNAL, and corrected proofs, should be sent to 37, Great Queen Street, Lincoln's Inn Fields, W.C.

British Medical Journal.

SATURDAY, DECEMBER 3RD, 1859.

THE SPREADING EPIDEMIC OF SMALL-POX.

THE epidemic of small-pox, which rather more than twelve months ago commenced its ravages in this metropolis, has steadily continued its progress, widening the area of its influence, and increasing its tribute of sickness and of death. Beginning in the central and eastern districts, where it still continues, it was at first more slightly, though still decisively, felt in the southern districts, in which it has now established a stronghold; and though the north and west have as yet suffered but little in comparison, there is no doubt but that their time will soon come. The mortality from this disease in London, which, during the quarters ending March, June, and September respectively, was 201, 233, and 287, has, during the last seven weeks, been 198. It is evident, therefore, that the epidemic has not yet reached its culminating point.

Such a state of things has naturally given rise to widespread alarm. It has become a topic of discussion in the daily journals. How, if vaccination be the prophylactic it is vaunted to be, is such mortality possible? A variety of explanations and suggestions, of more or less value, have been offered, most of them inculcating vaccination as it is now performed. Almost every question that has ever been asked and discussed with regard to its practice, has been repeated. Is it no longer a protection? Has the lymph deteriorated by successive transmissions? Is it improperly and imperfectly applied? or do its effects wear out in the system by the lapse of years? Though we venture humbly to think that the consideration of these important questions is more appropriate to the pages of a medical journal than of a newspaper, we unfeignedly rejoice in anything which calls the attention of the public to the great subject of vaccination, and its prophylactic powers; for it is only by the action of public opinion that either the Government or individuals will ever be roused to the exertions necessary to secure the universal diffusion of that inestimable blessing. It is a subject to which we feel bound to call the special attention of our readers; and we propose to pass in brief review the circumstances of this and other epidemics of small-pox in London, with the view of drawing from them such practical conclusions as we think may fairly be deduced.

From the vast population of this metropolis, small-pox is never absent; but there is great difference as to the extent to which it prevails at different periods. The following table, which we have compiled from the Registrar-General's Reports, will show what these fluctuations have been for the last twenty-two years; from the time, indeed, when the causes of death were first properly registered:—