Staining
Thesis
on
Diabetes Mellitus
by
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1868
Diabetes Mellitus — from διαβόλος to pass through, and μελίτος sweet herd — is the name applied to an affection which has been defined as a constitutional disease produced by errors in the process of assimilation either in the stomach, the solid organs, or the blood. It is chiefly characterized by an excessive secretion of a few or less saccharine urine, by great thirst, with brown deepness of the skin, and by much and increasing general debility and asceticism. In the vocabulary of medicine the disease is classed with the syphilitic and aseptic affections, in that of St. Mark Good it is placed amongst the diseases of the secreting function afflicting external surfaces, and in that lately issued by the College of Physicians of London it is included under the general constitutional disorders.

Numerous, and varied in significance are the names by which the disease has at different times been known: diabetes, diarrhoea, diabetus, diabetes, Diabeteis, Diabeteis, Diabeteis, Diabetes, Plegia, Jubei, urinaria, urocyturb, urinaria saccharina.
saccharina, Hydrops et splenum, are a few of the terms used by the older writers. Diabetes and Glycosuria have been applied by more recent authorities.

Of the old authors in medicine, Hippocrates seems to have been altogether ignorant of the disease for he has left us no record of it. Alcmaeon, Callippus, and Galen have each given a tolerably clear account of the symptoms.

The term Diabetes has been variously applied to three different and distinct affections: (1) to that in which the urine is excreted in greater quantity than natural, its constitution being altered by the presence in it of albumen or of an excessive quantity of urea; (2) to that which is now generally known as Diabetes insipidus, characterized by a greatly increased flow of urine without particular reference being had to its specific gravity or its content being little above the normal standard; and (3) to the disease which is commonly understood by the term—a passage of an abnormally large quantity of urine which contains a saccharine matter, either superadded to the normal ingredients or partially replacing
Diabetes occurs in early as well as in advanced life, although Aubertin affirmed that it was confined to the aged and feeble. Local cases are on record in which the disease was observed in neo-born children in whom it must have begun in utero, and a few instances of infantile diabetes have been seen and recorded, though such cases are rare. For the most part in the course of his extensive experience of the diseases of childhood he met with but two such under the age of two, and Dr. Boyd in our recent hundred cases of diabetes had only one under five years, and twelve between eight and twenty years of age. According to some authorities such cases occur between the age of thirty and forty-five, the most marked and most rapid progress being seen in those apparently in the prime of life and full vigor of constitution.

The symptoms of the disease may be considered under two heads: A. Those relating to the organs and B. Those relating to the general condition of the patient.

A. The leading symptom, and that which first marks the appearance, is the existence of an unusual quantity of
of wine. Not infrequently, however, the symptom申诉s for some time without exciting any particular notice, being mostly regarded as the natural consequence of the greater quantity of fluid which the patient drinks for the satisfaction of his excessive thirst. Sometimes, too, they have felt the suspicions excited in regard to the nature of their urine by observing the great number of floes which seem to be attracted by it.

The sensible properties of the urine, in addition to its excessive quantity, are, a very pale, pale greenish or slightly straw-coloured, translucent appearance, sweet taste, and an odour which has been variously described as sweet, vanilla-like, or resembling that of new-mown hay, or an apple chamber. Another character which it possesses but which is also present in all urine, is the tendency to become frothy when agitated, the bubble of which having more tenacity and persistency than those similarly produced in a healthy specimen.

The reaction is always invariably acid, the difficulty in restoring it alkaline being a peculiarity which has attracted the attention of Dr. Bayliss. It was not until 1660 that the sweet taste of diabetic urine was known, or if known, rather as a notion of, about that time attention was first directed to it in a treatise.
the disease by Dr. Wells, who was extraordinary with
lymphatic in whose otherwise accurate and practical
account of its affection the peculiarity seems to have
been overlooked either in existence or importance.
On standing for a few days, the wine begins to
ferment, the sugar being transformed into Lactic,
Acetic, Citric, or Formic acid, and a white or a
corn-like sap on the surface of the fluid, owing to the
development in it of the Sugar Fumar-Porteurian
Glaucum. The diabetic sugar which is chemically
identical with grape sugar or glucose sometimes
disperse from the wine in its place being taken by Lactic
a near allied substance, normally obtainable from milk.
The quantity of wine erected in twenty-four
hours is very variable, having in some instances
amounted to 52 te. 70 pints, or, as there is
been a case recorded in which the almost
incredible quantity of 2400 fluid ounces or 15 gallons
of wine was passed in one day. Speaking generally
it may be said that the quantity ranges from five
to fifteen pints.

The presence of sugar may be determined by
I. Chemical test. II. Fermentation. III. The Moro
and its amount as well as its mode may be
asserted.
assisted by means of IV. Specific Gravity, V. the Saccharimeter, and VI. Chemical Analysis.

Some observers assert that traces of sugar may be detected in healthy urine, (Brüche and Bruce Jones) and others that it is always present in the urine during such affections of the respiratory organs as Pneumonia, Bronchitis, Asthma, etc., during pregnancy, and in old age. (Raynou, Blot, Dechambre) but subsequent investigation so far from being confirmatory of these assertions have led to conclusions directly opposed to them.

I. Chemical tests for the detection mainly depend upon the reducing power which that substance exercises upon the salts of copper and bismuth. The methods most commonly practiced are known as Frommer's, Moore, Caprylic, Prussian, Pettenkofer, Brüche and Rottger's tests.

Frommer's test consists in adding to the suspected urine a solution of sulphate of copper which if sugar be present, produces a blue precipitate soluble in ethyl of Prussian Blue, the further addition of heat causing the reduction of the hydrated oxide of copper to the state of suboxide, the change being characterized by the disappearance of the blue colour and the
formation of a reddish brown precipitate. The presence of muriatic acid or of a considerable amount of albumin may also cause the formation of a brown ppt., but with
of these render the ppt. formed by the copper solution
scarcely noticeable. There are several modifications of
Kromer's test, the chief of which are the substitution of
Borax or Kahl's solution for the sulphate of copper
and Rochelle salt solutions, the formation of a precipitate
proportion of Sulphate of Copper, Potassium of Rochelle, and
vapour of soda dissolved in distilled water.
Moore's test— which ought properly to be called
Roth's test, having been originated by Alcide of
Birmingham, —consists in the production of a brown
chroma on boiling the saccharine wine with about
half its bulk of Cane sugar. The change in
colour, which increases in intensity on the boiling
progresses, is due to the formation of a saccharinic
or mellitiac acid. The addition of nitric acid
causes the solution to become pale, and liberates a
strong odour of burnt sugar.
Caperonelli's test is the gradual reduction of an
alkaline solution of the hydrated oxide of Copper when
added to the wine. The change being indicated by the
production of a yellow colour which darkens to a brown.
Hauyren's test is applied by dipping a piece of barley<br>ạch into a solution of Bioclorde of tin, and then into<br>the wine. The color it becomes shows if sugar has<br>been present.

Pittenger's test consists in the formation of a color<br>on adding bire and sulphuric acid to the<br>pascernine wine.

Briech's test is applicable when there are only<br>traces of sugar present. Neutral and basic nitrate<br>of lead are added to the wine which is then filtered.<br>Ammonia is added, and the lead caused by it decomposed<br>by acetic acid. The filtered solution contains the<br>sugar, which may be tested for by any of the<br>preceding tests, everything being removed which was not<br>likely to interfere with their most delicate reaction

By this means a part of sugar may be detected<br>in 20,000 of water.

Pittenger's test is one more recent introduction, and is<br>advantageous inasmuch, instead of bireunath being<br>substituted for the bireunath of copper, solution of bireunath<br>being present, boiling reduces the oxide to the metallic<br>bireunath, which is precipitated as a black oxide.

He has been held to be more delicate than the<br>Copper test.
Chapter, that contains in the production of a green-brown
solution equal parts of the neutral chromate of
potash and a solution of caustic potash with the chloride
of zinc. The change in color is due to the formation of
trichloride of chromium.

The Yeast or Fermentation test is one of
the most satisfactory of all the tests that are used
for the detection of sugar, and depends upon the
resolution of grape sugar into alcohol and carbonic
acid, when yeast is added to its solution, one
atom of oxygen being evolved into two of alcohol
and four of carbonic acid. \( \frac{C_2H_12O_6}{2} + \frac{3}{2} \cdot O = 2C_2H_50 + 4\)
\( \frac{CO_2}{2} \). The test may be applied thus: two vases
are filled, one containing the suspected wine, the other
water and to each is added a small quantity of yeast.
Two test tubes, one filled from the contents of each vase,
are inverted over their respective fluids and the whole is
shaken for a few hours at a temperature of about 90°.
If sugar be present in the wine, the test
tube containing it will be found to have more
or less carbonic acid collected in it with part
thereof in that containing the water. There will be but
a bubble or two of air which has been escaped
from the yeast with which it was seet.
The Carbonic Acid is known by its being absorbed by a small piece of Caustic Potash, introduced into the test tube containing it, and the alcohol may be got by distillation. This test affords positive evidence of the presence of sugar in the wine, though it may not necessarily be diabetic sugar.

III. The Microscopic test. When diabetic wine has been allowed to evaporate spontaneously or at a temperature under 100°F, small rounded masses of sugar are got, which on being carefully packed with cold water, dried, and recrystallized repeatedly from a solution in distilled water, present beautiful crystals of grape sugar when examined under the microscope. These are recorded by Gobe, in which these crystals were obtained from the tears of the patient.

IV. Contrary to what we might be led to expect from the opaque quality and diluted appearance of the wine, and the reverse of what obtains in regard to other cases of galvanic, we find that the specific gravity of diabetic wine is very much increased, for whilst the density of the normal wine averages about 1030, a Diabetes it ranges from 1050 to 1060, and in some cases rises to
high as 1074. This fact of increased density was first pointed out by Dr. Henry, having recently actually escaped the observation of the previous eminent centres on the chemical history of the disease. A series of careful and elaborate experiments which that gentleman conducted resulted in the construction of a table by means of which the amount of solid matter contained in diabetic or other urine of known density may be calculated. The quantity and average specific gravity of the urine passed in twenty-four hours having been ascertained, the total amount of its solid contents may be computed either by reference to Dr. Henry's tables, or by means of a very simple and easy method devised by Professor Chrichton. The most accurate way of obtaining the average figure is to take that of a portion of urine taken from a mixture of the entire quantity passed during twenty-four hours, as that passed at different periods of the day is liable to very considerable variation. Professor Chrichton's rule is, multiply the last two figures of the specific gravity — uto, being taken as 1000 — by 2.33, and the product will give a figure practically the solid contents of 1000 grains or ounces of urine, from which is the known quantity of
of wine in the same case, the total amount of the solid matter may be easily calculated. The result obtained by this method is considerably higher than that got by the use of the hydrometer, but it is not at all to have any reason to believe, in proof of that obtained by quantitative analysis.

As the quantitative results got by these two methods include in addition to the sugar, the other chlorides and other elements naturally secreted by the kidneys, they enable us to form but a very approximate idea of the total quantity of sugar which the wine contains. On the whole, however, they are quite sufficient to enable us to form a fairly correct opinion of the degree of motion action which exists.

V. One of the special means for obtaining an accurate knowledge of the quantity of sugar contained in sweet wine, the **Saccharimeter**, is the most ready and quick. This is an instrument invented by Stoll and since considerably modified by Dubosq, the constructor of which, is based on the principle that a saccharine solution possesses the power of rotating a ray of polarized light to the right hand, the angle of rotation being greater in direct proportion to the amount of sugar contained in the fluid than
which the ray passes.

VI. Volumetric Analysis constitutes the most direct means by which we can ascertain the extent to which sugar exists in the wine. As usually practiced it is founded upon the before-mentioned reducing power which grape sugar possesses upon a call of copper when bored with nitric acid of it. It is commonly effected by adding gradually to a portion of diluted wine kept at a boiling temperature, a solution of tartaric of copper, ten cubic centimeters of which are exactly reduced by 0.5 grams of sugar, the reduction being indicated by the formation of a rusty brown precipitate and the total disappearance of the blue colour. From the quantity of the solution reduced by a known quantity of sugar may be calculated the total amount of sugar in the wine passed in any given time. The quantity exercised in twenty-four hours may amount to several pounds. As frequently when present in the extent of 60 grains in the ounce of arum it ten or twelve parts of which have been passed in the course of the day. The proportion of starch in alcoholic wines varies greatly. It is often said that considerable excess of
the quantity of sugar is affected by a decrease in that of the water, and vice versa, and a few cases have been recorded in which during an attack of diabetes both these substances entirely disappeared from the urine.

If this can be and may have been may be an abnormal deposit of ethac acid, the presence of which Knott regarded as a favourable sign. Hippuric acid (Kleemann) and Sulphocyanogen (Schütte) have been detected, and according to Neller the Warantheme becomes increased in diabetic urine.

In the present of his cases, Dr. Garrod has determined the presence of albumen in the urine, and thus Langleyton and Théneal considered it to be a symptom of favourable issue.

The fixed salts are generally much diminished in quantity, the chloride of soda being sometimes entirely absent. Deposits are not often met with those of most frequent occurrence being composed of phosphates and urate of acid.

The extractive matter are generally diminished.
in quantity, though in some cases they exist in considerable proportion.

B. General Symptoms

Along with the constant desire to seek water, and especially troublesome and distressing during the night, there is a most intractable thirst. The appearance of this symptom is frequently alleged by the patient to have preceded the increase in the quantity of urine; the reason of this probably being that the thirst is more likely to cause pain troublesome and thus attract the attention more readily. It has been observed in many cases that the amount of urine passed has considerably exceeded the quantity of fluid taken into the body during the same time, and in some few cases it has exceeded a weight the total amount of both solid and liquid ingesta whilst in more than one such instance the patient has actually gained weight. It has been endeavored to account for this fact by assuming that there is an increase in the cutaneous and pulmonary absorption, and a decrease in the pulmonary excretion. The mouth is generally dry and parched, the face dry, and the teeth loose; the mucus becomes thick and frothy, the fauces are covered with tough viscid phlegm.
Pallor, the heart is frequently presented, and the tongue at first fleshy and shallow is apt to become flabby, puckered and devoid of the appearance of papillae, especially at the edges. The appetite, particularly in the early stages, is keen, sometimes voracious, and the digestion is rapid, but sooner or later both become capricious or fail, and there is sharpened flatulence with a feeling of distension and epigastric heat or pain, and frequently vomiting of acid undigested matter. The bowels are generally constipated, and any motion is followed by pain and constant aching across the brow. Alternately flushing or chill of the palmar of the hands and soles of the feet are of not uncommon occurrence. The skin is harsh, rough and dry, and but little amenable to the influence of dissipating the heat becomes thin, dry, shrill, and a feeling of itching of the prepuce in males, and about the prepuce in females is frequently experienced. Weakness and exhaustion gradually increase, especially in the limbs so that the patient come to have a peculiar gait in walking and is tormented with these demented crampy pains in the legs. Other symptoms of debility such as giddiness, dizziness, loss of vitality, edema of the legs, low and depressed spirits, are generally superimposed.
The loss of so much vital matter accounts for the great weakness, and the thirst and dryness of skin are explained by the excessive discharge of fluid from the body.

The pulse at first unaltered or none frequent than usual, becomes in the late stage weak, small, and compressible. The blood has been found to be deficient in fibrin, its clot being weaker and harder than usual, and attention has been directed to a hematocrit condition of the serum which however is not by any means a constant appearance, and may be dependent on the stage at which ignition has arrived at the time when the blood is examined.

The breath has an odour resembling that of the urine.

Respirations are short, sometimes oppressed, and there is a short, tickling cough with occasionally shortening pains in the chest and expectation of mucopurulent matter. Should phthisis supervene, the pulmonary symptoms will be more marked according to the severity of that complication. The general symptoms gradually increase in severity, and the blood fails to appear even pulmonary affected with hectic fever, under which the patient rapidly sinks a helpless, hopeless, victim.

Of all the terminations to which the disease is prone...
from, it is the most frequent occurrence. It does not seem necessary to account for the frequent association of Diabetes and Affluence by assuming any community of immediate causation, for the diabetic patient's circumstances are in many instances those which are sure to be favourable to the production of affluence in other cases, and the disease itself before its exhausting and debilitating effects forms a powerful predisposing cause towards the production of affluence. Among the other complications and terminations of Diabetes, may be enumerated such as organic affections of the kidneys, atrophy of the lips with dyspepsia, inflammatory fever, exanthemous eruptions, and suspension of the stomach. Moreover, the fatal termination occurs suddenly; the patient becoming comatose, and dying in a few hours. The sugar having previously disappeared from the urine. Cataract has not unfrequently been observed to occur in the course of Diabetes, the one mirror between the two diseases having been first pointed out by Franz in 1839. The cataract is always double and equally and symmetrically developed. Not it is a result of the diabetic state, but has been shown by Dr. Mitchell (U.S.) who produced a
kind of tubular opium, a cataract or cip, by injecting a strong solution of sugar, or by keeping the skin in a strong saccharine solution. Operative interferences with diabetic cataract should be avoided as experience has failed to show that it can be productive of any benefit, and wounds made during the course of the disease are but little liable to heal readily.

The duration of the disease is very indefinite, and depends on a great extent upon the accentuation of the attacks, the previous state of the patient's health, the cause, complications, and means of treatment employed. Generally, death occurs within one to four years after the first manifestation of the symptoms.

The morbid changes observed in those who have died of Diabetes are by no means constant or uniform. The kidneys have been found enlarged, excessively affected by degeneration of a crepuscular nature, but much more frequent, they are quite fatal. The alcoholic glands generally, as those of the mesentery in particular, have been found enlarged, obstructed, and softened. The liver is not infrequently diseased, but the stomach, spleen,
and pancreas seldom present any appearance which we should not be warranted to expect from the debilitated condition of the body. The lungs in numerous cases present evidence of tubercular disease in a more or less advanced state, even although almost no pulmonary symptoms were manifested during life. With no definite aetiology it can scarcely be expected that the treatment of this disease should be otherwise than vague and to a great extent empirical.

The diagnosis of Diabetes can rarely present any difficulty if attention be paid to the symptoms already described, more particularly to those relating to the urine.

The prognosis is always very unfavourable though a cure may sometimes be effected when the case has been seen and proper treatment adopted at an early period of the disease, a great deal depending hereon upon the constitution of the patient and the absence of organic complications. We may be encouraged to entertain some hopes of a favourable nature if we can succeed in reducing the quantity and specific gravity of the urine, if there is a tendency for the deposition of albuminous matter in it, and to a return to the natural colour of the urine if the appetite becomes less capricious, the thirst more
Cadaver, the skin moist, and if the patient gains in
weight and exhibits no physical signs of tubercular disease.

It should carefully and repeatedly ascertain the state of
the lung, for in many cases phthisis and diabetes
seem to have been intimately connected with each
other, there being a suspension of the symptoms of
the former affection during the progress of the latter
any alleviation of which was followed by an exacerbation
of the pulmonary disease.

Diabetes is fortunately not of very common
occurrence; it has probably been made, the subject of more careful
and elaborate investigation than almost any other disease
within the domain of medicine, and yet we must still
confess ourselves to be in comparative ignorance of the
exact nature of the affection and of the cause or causes
from which it commonly arises. Glucosuria seems
to occur in any condition in which the functions
animal life are suspended, the purely organic function
remaining intact. Blows on the skin producing an
apoplectic state, the action of morave poison, the inhalation
of flour or dust of amyle, and local irritation of
the lung, are all liable to be followed by a diabetic
state of the urine. Most diseases which have been considered to be predisposing

Cancer, and male are found to be more liable to the disease than are females. It has been found to exist in persons who have died from starvation and exposure, and in those who have been subjected to fast dieting and anxiety of mind. In many cases pointed out the fact that chronic diseases may frequently exist in a mild form especially in old people, in many cases sleeping patient because the quantity of urine passed is very little increased.

Excessive and Chatarrity discharge, absence of fwmnal lepers, suppression of habitual menstruations, purpurations, or the discharge, chronic abscesses, and carbuncles, and the drying up of chronic skin diseases, have all been ranked among the exciting causes of diabetes.

To show the diversity of opinion which has existed regarding the nature and origin of the disease, a few of the theories which have at different times been proposed regarding it by eminent men may be mentioned. The Greek writer generally accused debility to be the result of a relaxation and irritability of the kidneys. Archibalds thought that the post evacuation and excessive discharge of urine was to be accounted for by a colliquation of the system, especially those of the bladder, and the gonads, into water; but Galen was of opinion that the effector body
The same relation to the kidney and bladder that disorders the liver and stomach and intestines, Cullen, Home, and Bell thought it was due to some defect in the digestive and assimilating functions. Dr. Shaw agreed, and thought that all the symptoms that occur in the course of the disease might be sufficiently accounted for by a morbid unstable state of the kidneys. Dr. Wollaston, Dr. Baillie attributed the disease to the obstructions of the kidneys. Dr. Wollaston thought it resulted from some change in the animal electricity of these organs; and Dr. Mead referred to the liver as the chief agent. March and Mead attributed it to the excessive heat. Desault and Latham advanced the theory of a morbid state of the blood arising from a diseased state of the assimilating organs, and the various effects and constitution of the disease in the constitution of Meares and Sydenham. Cullen supposed that the malady was owing to some deficiency in the supply of nervous influence to the assimilating viscera, by which the rectified state in which the blood became charged with imperfectly elaborated material of which produced a decrease in all the organs except that of the kidneys. These organs stimulated by the presence in the blood of the morbid

unidentified text
As a result of some unaccounted and indefinable ideal action exercised by the kidney upon the constituents of the blood, some of the patients suffering from diabetes were found to have sugar in their urine. Dr. J. McCloud was the first to prove satisfactorily that sugar is present in the blood of diabetic patients, a fact which Nicolaus, Wolfrast, and other as well as Proust had unsuccessfully endeavored to establish. He also from a series of experiments, an account of which was published in the Medical Journal in 1834, drew the conclusion that the fault in question was the kidneys, the tissues being in the defective organs. It was led to form this opinion from observing abundant evidence of the presence of sugar in the urine and stools of the patients of a diabetic man who for the day—after preparation by purgation and enemas—has been fed on nothing but meat, beef, and water. Unfortunately he was for the stability of this theory, as he had overlooked the natural influence that if the blood contains no sugar, it must all the vessels which are from that fluid, and thus the mechanism state of the limited matters would be quite sufficient to account for by the two or precise state of the gastric juice, the absorption of the gastric portions being quite unnecessary.
The results of the elaborate researches of Bernard on the function of the liver in regard to the production of sugar have within the last ten years completely overturned all the former theories sustained upon the subject, but they have failed to elucidate the cause of diabetes. By his most important investigations he satisfied himself that sugar is present in large quantity in the lives of all animals, that it is a result of a change effected in a glucogenic or autoclaved material elaborated by the liver, and that the amounts of the material into sugar is influenced by certain changes in the nervous system, such as irritation of the fourth ventricle of the brain, etc. He is of opinion that the sugar thus formed undergoes oxidation in the lungs, being probably resolved into ordinary circumstances into Carbonic acid and water. Under certain altered condition of nervous action, he considers that the decomposition of all the sugar is not affected either from an excessive formation of it, or from some absence or deficiency of the destructive process, so that a large quantity remains in the blood from which it is separated by the kidneys upon which eliminating organs it acts as a stimulant. He found that division of the pneumogastric suspended the sugar forming function.
function which could be noticed by irritating the eye, but not the lens at its distance from the nerve, hence he supposes that the nervous force which acts on the cataract does not proceed along the plexus arteries from the brain for the eye, but that the stimulus is by them transmitted from the brain and by a thoracic sympathetic to the iris. Further investigation led him to believe that this reflex action in the stimulus given by the air we breathe to the plexus branch of the plexus arteries, and support of the theory he found that after the inhalation of chloroform or other substances that stimulate the plexus branch of the nerves sugar appears temporarily in the urine. Those who believe diabetes to result from imperfect function of the lungs producing complete oxidation of the glucose in the blood attribute the diabetic state which follows the inhalation of chloroform to the fact that it causes the retention of air from the lungs as much as shaking of the head, or a deep shee, which is also followed by the appearance of sugar in the urine. The diabetic state of the urine in old debilitated persons who have been debilitated for a long time may account for by defective peristalsis of the respiratory
In connection with this theory it would be interesting to
mention that the breathing capacity of the lungs becomes
diminished in diabetes, and if the inhalation of air
containing an artificially large quantity of oxygen could
be facilitated the impaired oxidation be followed by
any diminution of the quantity of sugar contained in the urine.

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function. As was to be expected, however, Bernard's opinions did not long go unchallenged. Dr. Parry con-ducting his experiments after the means indicated by
Bernard himself, found that section of the medulla oblongata
artificial respiration being maintained, the division of the
sympathetic in the thorax or neck, followed by death.
Had he inferred that the medulla through the sympathetic
dystem must reach some influence upon the change taking
place in the liver as in some way to prevent the con-
version of the acetylated arterial, which called it hepatic
into sugar. He asserts, directly the removal of what
Bernard maintains to be the case—that sugar does
not normally in life exist in the blood of the hepatic
liver, the formation being either a part urinary stream
or the result of some interference with the proper imbibition
of the liver. Sugar absorbed from the intestine comes as
increased in the formation of hepatic, as this he says
proves that the liver is far from forming sugar...}

I do not presume to question the opinion that
the increased quantity of acetylated arterial this process
is afterwards before leaving the liver inverted into sugar,
affirming it may be somewhat in nature for that
absorbed.
absorbed. Besides, Bernard found sugar present in the blood of the hepatic vein when none could be detected in the portal vessels, and from this he argues that the liver is capable of producing sugar as well as fat out of purely protein compounds. Dr. Parry, supported by Dr. Owen Rees, says that diabetic sugar differs slightly from the sugar formed in the liver after death, and from that of artificial diabetes, these two latter varieties being seemingly identical. Dr. Rees gives it as his opinion that there can be little doubt that diabetes sugar is "a high quality of the saccharine principle," and that it can therefore be treated as a compound with much greater force than the hepatic variety. The same authority attributes the main error in diabetes to the hepatic function, and thinks that the liver by reason of some inherent action in itself produces a sugar differing far from that of health—"a sugar which cannot be destroyed by the change naturally taking place in the blood, thereby rapidly affecting and destroying healthy hepatic sugar." Dr. Hadley on the other hand, denies Parry's assertion that the formation of sugar in a post-mortem phenomenon, and confirms Bernard's results as to the presence of sugar in the liver during health—and in this he is supported by Dr. Keddieham, Dr. Leake, and others.
Dr. Harley knew doubts the accuracy of Bernardo's conclusion that respiration is in the animal state the origin of the circulatory function. He rather seems to state that the stimulant or junction in the liver itself as a result of the stimulating effect of the portal blood upon the hepatic branches of the pneumogastric, and in support of this opinion he addsuce the fact that the injection into the portal vein of stimulants such as chloroform, alcohol, or sugar followed by the injection of an ounce of sugar, the urine proving for a true diabetic. He also adds the conclusion that the sugar normally formed is dispersed in its passage through the lung, inducing to adopt the opinion of M. Charriere that the change takes place in the ultimate capillaries of the different tissues. For investigation with which we are at present concerned we are rather inclined to believe that the stimulant arises rather in the lungs or in the liver, but in some part of the central nervous system, probably the medulla oblongata, in consequence of the effect produced upon it by the circulation in the blood of some peculiar morbid material.

The sugar which is normally found in the hepatic vein is supposed to be converted into lactic acid, the equivalent number of which (C4H8O4) is exactly half that of grape (C2H12O11), and the change has been...
supposed by many eminent physiological chemists to take place in connection with the function of respiration. An opinion has been put forth to the effect that diabetes probably results from some arrest of this change which takes place in the healthy state. Virchow has found that an acid state of the blood causes the metamorphosis which he believes to be excited by the changing or decaying particles of albumin in the blood which act as poisons.

Ehrlich conducted in 1864 a series of interesting experiments the results of which have increased our knowledge of the parts of the nervous system concerned in the production of artificial diabetes. Irritation of the floor of the fourth ventricle of the brain produces diabetes, but when both vagi and the cervical sympathetic are divided thus showing that it is at through the nerves that the influence which prevents the function of the brain is conveyed. Ehrlich discovered that diabetes could never be produced by puncturing the floor of the fourth ventricle, whereas he had previously divided the splanchic nerves, through which it would then seem, the influence must pass. This shows that Schüffe's opinion that the disease is due to a dilated state of the hepatic vessels is incorrect, since division of the splanchic, the most important
pericardiac orifice in the abdomen—absolutely present in occurrence. Irritation of the diaphragm and of the third and fourth ventricles is not followed by diabetes, and from the fact it is apparent that some apparatus, though which the previous influence cannot pass or upon which it must act, intervenes between the floor of the fourth ventricle and the splanchnic trunks. Following up the discovery of Helmholtz, that section of the inferior cervical ganglia of the sympathetic was also followed by marked diabetes, and section of the first two thoracic ganglia was followed by a similar though less well marked state. From the result of his researches as far as they have gone he thinks it probable that these three ganglia form the apparatus through which irritation of the fourth ventricle produces diabetes; at any rate he considers it proved that irritation of some part of the central nervous system is necessary for the production of artificial diabetes.

By some authorities the disease is ascribed to a pathological remnant of that part of the forebrain and cerebellum which is connected with the function of climate. For this purpose the remnant of recent destruction by the most trustworthy authorities on the subject we can hardly feel warranted in alluding more than that
that diabetes results from a provision of one of the functions of the liver, whereby there is produced an excessive quantity of the carbohydrate material which that organ naturally forms as exerted into sugar, the provision being the immediate effect of irritation central or peripheral of the neurovegetative nerves; the influence of which irritation is conveyed to the liver through the glands with the integrity of the inferior cervical and inferior thoracic ganglia of the sympathetic system being necessary for the production of its effect. The origin of the irritation is yet obscure, but it is probably to be sought for in a disturbed state of the blood produced by its imperfect depuration through defective action of the liver. A diminution of one of its natural constituents is the cause of the imperfect depuration being in all probability connected with some disturbance of the normal relations existing between the blood and the alternate tissue of the body.
In regard to the treatment in general, it may at the present be stated that we are still ignorant of any remedy or means by which the cure of diabetes may be certainly effected. The indications for the treatment of the disease are I. to diminish as much as possible the supply to the system of sugar and of material readily convertible into sugar: II. to improve, and as far as possible correct errors in the digestive system: III. to diminish the secretion of urine; and IV. to relieve and palliate whatever urgent symptoms may appear.

I have within the last twenty years in the practice of many men of high standing in the profession, the treatment of diabetes was initiated by small diaphoresis and Enemas evacuation of the bowel. It seems noble to remark on the impolicy of the indiscriminate employment of such measures in treating a disease one of the most important features of which is a great tendency to debility and perturbation of the vital powers. Removal of any amount of vitiated blood will not improve the quality of what is left, so long as the cause of vitiation remains uncertainty. It is not to be denied however that the judicious local abstraction of a little blood by means of cupping...
Or by the application of a few leeches may assis-
t to relieving congestion occurring in an internal organ.
During the course of the disease, dry cupping or
the leech is frequently of great service in relieving
the lasting pain so often experienced as that region.
The plan of treatment proposed by Halle is still
that which is most in favour, though it was based
on the theory that the disease resulted from the
in-omission of the sugar formed in the stomach or
intestinal canal from the amylase and saccharine
principle of the food into other compounds, even to
the idea of yeast. It consists in withholding from
the patient such articles of food as admits of being
converted into sugar, the diet being limited as
much as possible to albumen and oleaginous con-
stituents, though even complete limitation in
this respect cannot cure the disease, as will
be readily understood from the fact previously men-
tioned that sugar is formed in the liver, where
it can be detected in the portal vein. The
diet should consist of plenty of animal food,
e.g., with, or mutton, butter, such vegetables as
cabbage, French beans, lettuce, &c, and bread which
contains little or no starch. Potatoes,amma, chestn
Great, fruits, dried and fresh, and asparagus should be carefully avoided as they contain a considerable amount of starch, namely 18%, which, vegetable according to Dr. W. M. A., is capable of producing a state of temporary diabetes when taken in large quantities.

If the substitute for wheat bread that contains flour is the ordinary gluten loaf which often soon acquires a dry taste and destroys the patient's appetite, then any mouthful of it seems to stick in his throat.

If the more elegant but expensive preparations known as sponge cake, or Levy's almond cake, and similarly expensive sponge cake, soda water, lemon water, and the various artificial imitations of such continental alkaline springs as Vicki, Castlehead, etc., may be freely allowed for the satisfaction of the subject's thirst, a little wine, preferably stores, being added, should there be much debility. The patient shall be encouraged to maintain as much as possible from gratifying his desire for fluids; but sudden alternations from all liquids should be avoided as it has been followed by great depression. Perry was the first to show that the administration of sugar to a diabetic patient for at least 34 drinking was attended by beneficial results.
Dr. Bache's, Dr. Rush and others have frequently found this plan of administering sugar and eau-glycerine to be productive of a decrease in the amount and saccharinicity of the urine, an increase in weight, and an improvement in the general health; and these in cases which has seemed to obtain the science of benefit from the non-saccharin treatment. The theory under which this treatment is based is, that by allowing a supply of a substance readily convertible into more of the albuminious materials of the food, more of the albuminious materials of the food may be saved from undergoing a similar conversion, and thus though the urine may not be lowered in quantity, an improved in quality, the general health will be better supported. Upon a review of the evidence in favour of the practice herein, it does not appear to possess such great advantages as have been claimed for it, although it appears that there is no necessity for total abstinence from sugar, the want of which as relieving effect sometimes contributes very much to the patient's death in phthisis and repulsive to his palate.

Thus the digestive function begins to fail th
Treatment must be — according to the indications presented — the same as that to be observed in ordinary diptheria. We should avoid using Cinchona as a tonic in diabetes, for though the opium it tends to diminish the flow of urine, cases are recorded in which its administration was followed by a comatose condition of the patient, resulting in death, the ventricle of the brain being found filled with an effusion of serum loaded with sugar.

For diminishing the secretion of urine, aremiphur, mineral and vegetable, or tonics, have been much employed. Sulfuric acid, carbon of lead, saltpetre of zinc, and the preparations of iron, having each enjoyed considerable utility. It is known very questionable judicious to attempt merely to lessen the flow of urine since the diuresis is a means by which nature endeavors to eliminate from the blood the various products with which it is laden. Diaphoretics and purgatives have been much recommended. The former cannot fail to be of some benefit by restoring the function of the skin, but it is apparent that the latter when used should be of the mildest kind, and should be instituted only with such frequency as may be necessary to prevent obviat accumulation in the intestines, and to
which as much as possible that persistent irritation to which is so often associated with the disease. Castor oil and the various purgatives may be employed, but the saline should be avoided on account of their diuretic properties. The use of Opium has been highly lauded, and by many this drug is considered to produce a almost specific effect upon the disease. It is valuable as a check of the cutaneous function, and as an astringent it prevents to a certain extent wastage of tissue, but above all it is a powerful check of nervous irritability, passing according to Headland "the fons of allaying increased susceptibility of the nervous system to morbid impressions." This latter property is probably the most beneficial effect as follow its administration in diabetes, by lessening nervous irritability it to a certain extent counteracts the influence derived by the turbid material, the presence of which in the blood adds to the disease by unduly stimulating special portions of the nervous system. The remedy is best administered in the form of Johns Spearmint in Opium, beginning with one grain, dosage then a few times a day, and gradually increasing to a dose of 4 grains. Should the Ureaemic picture...
disappears symptoms it may be omitted. Many
important authorities disapprove of the use of Opium,
disgusting that its beneficial effects are but temporary,
and are obtained at the ultimate expense of the
patient's nervous and digestive systems. New
blisters and friction of the skin have been found to be
advantageous by promoting secretion by the external surface.
The patient should always be warmly dressed, wearing
flannel next his skin, and he should be very careful
avoid all exposure to damp or chills.

IV. Complications must be treated according as they
arise. The most urgent symptom — excessive thirst — is best
relieved by districts water, accustoming with any of the dilute mineral
acids — the Thymol being a favorite — and diluted to taste
with ginger. Cloth as it contains carminative forms when
diluted a very agreeable beverage for those who can afford it.
As Dr. Edward Smith has shown that Coffee in the first stage
of its digestion increases the activity of the skin, while tea produces
an opposite effect, it follows that the latter beverage should
be used in preference to the former. Tea is also an antiseptic
that endures beyond its immediate effect on the skin; it stimulates
the nervous system, and powerfully increases the respiratory
powers. The crampy pains which are so apt to annoy
the patient during the night are very often much relieved.
if not entirely prevented by having the legs well rubbed or 
setting and covered with an extra blanket, a hot water bag 
being applied to the feet. When there is great inner fermentation, 
the administration of saline frequently proves very beneficial. 
When the tongue gets raw and fissured and there is a tendency 
	to the formation of boils, the secretions being highly acid, alkaline 
medicines are indicated, but otherwise they should not be used 
as they tend to impoverish the blood. Phosphorus as a 
rule should be avoided, unless some hepatic complication 
renders this medicine desirable;—though even then they will 
be unnecessary if acetobrines are used. Arsenic is just as a 
stimulant of the hepatic functions. In the Leeds for 
January 1868 Mr. John Day recorded a case of Bailey's child 
for three years had resisted ordinary treatment, but was 
then rapidly improving under the influence of the arsenic of 
Hydrocyanic acid, an external solution of which was given in half 
drachm doses in one ounce of distilled water three 
days, one tablet when its use is not attended by any 
impaired of digestion is said to produce results more 
beneficial than ought be expected from its purely nutritive 
qualities.
It was intended to append to the foregoing a history of three cases of diabetes, a quantitative analysis of the urine of which we made for several months whilst acting as Clinical Clerk to the late Professor of the Royal Infirmary, Edinburgh, Dr. S. W. R. Reid, to whose kindness we are indebted for permission to use the same; but our intention has been unfortunately frustrated by present inability to obtain the time necessary for properly tabulating the results and comparing them with the progressive history of the cases. The general results obtained were, a diminution of the quantity of urine and of the sugar contained in it, alleviation of urgent symptoms, and improvement of the general health, under diabetes and general treatment similar to that which we have just described. Opium and general medicines were avoided except when their use was necessary for the relief of special symptoms and complications.

The treatment of diabetes should at present seem to be founded on the most rational basis so that which consists in limiting the diet to non-sugary and non-catheorine articles, and in administering opium. Observations are still needed to establish the exact situation of the part of the nervous system which is primarily vitiated in this disease.
when that has been discovered, clinical and therapeutic investigation must be directed towards the discovery of means calculated to prevent the perversion of the hepatic function by correcting the errors which are productive of the irritation to which the perversion is due. Then, but not till then, will the apparatus of hypotension cease to be applicable for the treatment of diabetes.