On "Diabetes Mellitus"...
Its Cause and Treatment.

William Wilson Oslerworth.
On Diabetes Mellitus; its Causes & Treatment.

The history of diabetes mellitus furnishes a good exemplification of the advances which physiology and pathology have made during the last few years, yet, despite all new discoveries, the subject admits of so much further elucidation & speculation as to render it a most suitable subject for an essay. It must be admitted that, even now, our knowledge of facts is too limited to form a perfect theory, and evidently the treatment is far from satisfactory. Still, recent discoveries, especially those of M. Bernard, have enabled us to reduce the number of hypotheses as to the causes of the disease, and their modus operandi.

Under the term "diabetes," prior to 1684, was included all diseases in which the characteristic symptom was an excessive discharge of urine; but, in the limited space of my thesis, I cannot extend my remarks upon so wide a subject, but shall limit them to a consideration of those diseases in which a pecu- liar condition of the urine forms a prominent symptom.

It was in 1684 that Willis first pointed out
to the physicians of his day that the urine of diabetes contained a sweet principle resembling sugar. He says: "Subject affected with this disease make more urine than they take of fluid. It is not true that what is taken as drink passes through the system without undergoing any alteration; for, in all the patients whom I have seen, (and I think the same thing will always be observed) not only did the urine differ from the liquids drank, and from all the other liquids of the body, but it had besides a very remarkable sweet taste, as if it had been mixed with honey or sugar." This, although the first step in a series of discoveries which has in later years added so much to our knowledge of this subject, did not at the time attract great attention.

Dr. Morton corroborated the statement of Willis, and, in 1786, Dobson & Home proved by chemical experiment the presence of a certain form of sugar in the urine. In 1836 Schwabian found sugar in diabetic blood, & Dr. McGregor in the urine following confirmed the discovery by an application of the fermentation test. It had previously been looked for in vain by Wollaston, Henry,
Name & others. It McGray also at the same time showed its presence in several other secretions, the saliva, gastric juice & feces.

The diabetic patient is generally first led to direct attention to his disease by observing unusual diminution of thirst, accompanied in most cases by lassitude, and inaptitude for prolonged exertion. To this is soon joined lumbago pains, constipation, and dryness of the mouth, which last becomes rough and chily.

The digestive functions suffer, the appetite is deprived of its former relish, the digestion is difficult, with tenderness of gums, foul or putrid breath, frothy and viscid saliva, which reddens litmus paper, disagreeable taste in the mouth, acid eructations, and painful or peevish sensations in the stomach after meals. The extremities are cold, the hair bulbs seem to lack nutriment, and the hair comes off in large quantities. The appetite becomes depraved and voracious though, in many cases, the patient seems to lose all desire for food. The nervous symptoms are well marked; the sleep short and pure; free-tingling, cephalgia, failure of vision, & even blindness. Defective hearing, impatience and irritability. Towards the end, the emaciation becomes great, the
the weakness increases, and adema or anasarca follow. Death is generally accompanied by coma or delirium.

Such being a general outline of the symptoms, I will now proceed to a more minute examination of each; and first with regard to the quality and quantity of the urine.

The character of diabetic urine are not always the same. Generally it is limpid, greenish, or pale colored, and having a sweet taste with a peculiar aromatic odour; the density generally 1025 to 1030; sometimes, however, so low as 1015, according to Priest, or so high as 1075, according to Dr. Garrod. The peculiar urine matter may exist in as great proportion as one per cent.

Formerly it was believed that the urine secreted was less in quantity than in healthy urine, but Dr. Henry has pointed out that the experiment of his predecessor were fallacious, inasmuch as the sugar present, prevented the action of the nitric acid on the urine. Later experiments have established the fact that urine is secreted in somewhat greater abundance in this disease, and that the presence of sugar is in no way
picaious of the presence of urine. When left to itself diabetic sugar undergoes true animal
fermentation, the ferment in this case no doubt consisting of the nitrogenized animal
extractives. Abundantia sometimes co-exists; Dr. Priest
considers cases with this complication as the
most hopeless of any. The quantity of urine pro-
crcted varies much; seven to forty pints have
been known to have been passed in this Country,
while in Italy, Susea has affirmed that he
had met with a case in which two hundred
pints were excreted in twenty-four hours. In
a case related by Dr. Watt no diuresis was present
although the urine was loaded with sugar so as
to form a clear syrup. Some other such cases
have been observed, but they are extremely rare.
And, in the absence of better explanation, we may
think put them down to idiosyncrasy. Sugar in
the circulation acts as a diuretic, and the now
susceptibility of such persons to its effects may
be placed in the same category as the recorded
cases of immunity enjoyed by certain indi-
viduals from the action of various drugs.
With regard to the comparative amount of
the sugar passed in the several portions of the day, it has been observed that the largest quan-
tity is passed about three hours after the prin-
cipal meal, even though that meal consisted
of animal matter only, a fact that goes to
support M. Bernard's theory that the liver is
able to form sugar from fat equally well as
from starch granules. The density of the urine
is, in the great majority of cases, in direct pro-
portion to its quantity, so that on those days on
which, through thirst, greater than usual quan-
tities of water have been swallowed and re-
creted, the urine has been found to be of a
higher than usual specific gravity. This refers
to a comparison of the urines on different days,
in the same patient, and is irrespective of the
quantity of food. The cause of this thirst is the drain-
away of the water from the blood by the kidneys, a
proportion exists between the thirst and the amount
passed out of the intestines. But the urine evacuated
is occasionally greater in amount than the solids
and liquids food taken. And it is a curious but
as yet inexplicable fact, that this excess of secretion
over the ingesta has not had the effect, in some
well authenticated cases, of diminishing the weight. Whence the purplus has been derived has not been determined: Dr. Watow relates the following case, in which he attributes it to cutaneous imbibition.

Immediately after he had emptied his bladder, he was found to weigh 3 pt. 8 lb. 0 oz. 3 dr. Three hours subsequently, having taken nothing in the interim, he weighed 3 pt. 9 lb. 0 oz. 2 dr. Then he voided 16 oz. of urine; after which his weight was again 3 pt. 8 lb. 0 oz. 3 dr. So that he must have imbibed about a pound of liquid in that brief space of time.

The next group of symptoms to be considered is evidently connected with faulty digestion. We have in fact every sign of profound dyspepsia present, in the tongue, foul mouth, acid fluctuations, gastric uneasiness, and depression of spirits. Are these a cause of the diabetic condition or an effect? or, are they both? I shall endeavour to show that, whether, or no, the diabetes may be induced by dyspepsia, it is highly probable that the effect of glucose in the gastric secretion would be to increase any pre-
pious symptoms of dyspepsia, or create the latter disorder in the otherwise healthy. I submit that certain of these effects may, in part, at least, be attributed to the occurrence of fermentation in the stomach and duodenum. The secretions of these organs have a noticeable amount of sugar, which, fermenting, would produce lactic and carbonic acids, in this way accounting both for the bad perversity and abundance of the flatulence. This view seems also to me to be strengthened by another fact, namely, the presence in the breath of a peculiar odour, which has variously been described as resembling apple, hay, or violets. The same odour is also present in certain obscure pulmonary affections occurring in persons of the arthritic diathesis, (alternating with a horribly fatid stench) in which cases it has been found to be due to a secretion of butyrates. Chemistry teaches that the butyric fermentation is only a higher degree of lactic fermentation, and if, as W. Paul suggests, lactic acid be the materia præpara
tionis in Arthritis, we have an intimate connexion be
tween the odour of the breath and its probable source in both diseases. The same odour is also observed in the breath of patients affected with
pyemia, a disease in which we observe, as in diabetes, nature striving her utmost to get rid of noxious matters from the blood.

The marks of nervous lesion are often amongst the most prominent of the symptoms; certain cases undoubtedly depend on such lesion, such as those cases in which diabetes is consequent on injuries to the head: in the same class, too, may probably be included most of those forms in which we have an aseptic complication, or where there is a persistent cephalalgia, loss, or impairment of vision, deafness etc. There is one sign of nervous decay which is so frequent as to be almost universal, a certain irritability of temper, querulousness, and listlessness. There is want of moral self control, the childishness, & petty deceit, so often observed in diabetics, point out a failure in the intellectual functions though suggestive of organic change.

There are certain disease conditions, often associated with diabetes, which depend on the presence of one predisposing cause. I refer to the frequent occurrence of boils, carbuncles, skin diseases and gangrene: the last named is
so far dependent on a puerulous state of the bowel secretion as to disappear on the disappearance of the sugar in the urine, and reappear on the recurrence of the diabetes. The causes of both the boils, skin diseases, and gangrene have been ascribed by M. Marchal to the irritation and inflammation induced by the sugar in the lining membranes of the blood vessels, especially the capillaries, combined with debility of the general system, inducing low vitality of all the structures of the body. For are these lining membranes of the blood vessel the only porous surfaces attacked; the peritoneum is often affected, and peritonitis met with. The reason of the peculiar obnoxiousness of glucose in the circulation to these porous surfaces has not been explained, tho' probably akin to the same cause that renders the fibrous tissue liable to be affected by the presence of lactic acid in the blood.

M. Bernard's discovery of the glycogenic function of the liver, since it has cast considerable light on this disease, demands next a share of our consideration. His experiment
have shown that in all animals from pinnipeds to the simplest mollusc, the liver contains glucose, generated here, and independent of glucose or other pectin substances assimilated from the food. Dogs were fed exclusively on flesh, others on an amyloceous and pectinaceous diet, and a third on a mixture of the two; these were killed, and their livers on examination, showed that the quantity of the sugar did not depend on the nature of the food. The blood in the portal vein of a fasting animal contains no sugar, but in the hepatic vein, after it has circulated through the liver, it is found to contain a noticeable amount which may be traced on to the right side of the heart and thence to the lungs where it disappears, being burnt off in the pulmonary combustion. During the absorption of a full meal, however, more sugar gets into the circulation than can be burnt off in the lungs, and this is not altogether produced by the liver, but a portion of it has passed into the blood circulation as a result of the primary digestion. He also maintains that the pectin is formed from the oxygen, hydrogen and
how of a portion of the nitrogenous articles of food, and that the nitrogen in this case is used in the formation of the azotised principles of the bile; that the amylaceous and pancharine portions of the digested aliment are converted into an insensible; and, so that, when the liver is performing its healthy function, a certain portion of the albuminous and gelatinous principles of the food, being first changed in chemical constitution in the lungs, are burnt off in the respiration, whilst the remainder goes to furnish nourishment to the solid tissues of the body. It is not known in what way this amount is regulated; there, however, seem strong reasons to believe that it is an excitatory nutritive action, and that the activity of the glycogenic function is regulated by the irritative presence of carbonic acid in the lungs. Under this view we consider the nervous influence to be generated in the lungs by the aforesaid irritative presence of the carbonic acid, conveyed through the pneumogastric and medulla, thence transmitted along the spinal cord and sympathetic to the liver, giving rise to the glycogenic function of that
organ. M. Bernard has also demonstrated that ir-
ritation of the floor of the fourth ventricle causes an
artificial diabetes, whilst section of the pneumoga-
tric, if above the divergence of the pulmonary branches,
totally suspends the formation of sugar in the
liver. In this way it shows that anything tending
to increase the nervous influence, in this way trans-
mitted to the liver, in any part of its course, would
cause increased formation of sugar, and the bal-
ance between the eliminative power of the lungs,
and the formative power of the liver, being upset,
an excess of sugar in the blood, and its re-
moval by the kidneys is the result. — The dia-
betic patient forms large quantities of sugar at
the expense of the nitrogenous portion of his food
so that, in spite of a voracious appetite, he con-
tinues to grow thin, and exhibit all the signs of
improvement in blood, and defective nutrition.
The use of sugar, taken therapeutically as
an article of diet is based on this view of the sub-
ject, although M. Bouchadat, the physician who
first suggested its employment, did so on other
considerations. It would not, perhaps, be
out of place here to give the grounds on which.
be founded this treatment. They are as follows:—
1st. That the stomach digested all albuminous and gelatinous articles of food which are thus absorbed by that organ; this he calls the stomachic digestion. 2nd. That it is the function of the bile to emulsify all the fatty articles of food which are then absorbed by the lacteals in the intestines: this is the intestinal digestion. 3rd. The solution of fecula is effected by means of a principle secreted by the pancreas which acts on it like diastase. This solution is commenced within the stomach, but is specially accomplished in the intestines; the liquid product is then absorbed by the vessels of the stomach, and by the minute ramifications of the portal vein, not by the lactiferous tubes; and this he calls the mixed digestion. He would seem to attribute the presence of sugar in the urine to the formation by the liver of a kind of sugar not easy of combustion in the lungs. This would, according to his theory, be produced from fecula, so the rationale of giving sugar is to supply a form of non-nitrogenous food more easily converted by the liver into a principle readily eliminated by the
Having now, in a cursory way, given the chief facts known with regard to this disease, and examined some of the theories formerly entertained, I shall proceed to a consideration of the opinions generally held at the present time. In the first place, then, I would endeavour to shew the probability that there are several distinct origins of diabetes; I believe that on no other grounds can we overcome the difficulties and discrepancies so abundantly met with both in symptoms and treatment. It is on the following reasons, then, that I base my conclusions with regard to the plurality of forms of diabetes.

1. That several plausible theories have been advanced, able to account for the disease; and, that these theories are perfectly consistent with each other.

2. The opposite methods of treatment adopted, and the variety of results obtained, render it extremely likely that the disease has not always been dependent on the same functional or organic derangement; and, indeed, the only satisfactory solution of this difficulty is to refer the glycosuria
to several distinct causes.

3. The sugar in several cases of diabetes examined by Dr. Owen Rees and Dr. Pagey was found to differ from that artificial form of the disease brought on by violently stimulating the respiration; it was more prone to partial decomposition, and was of a higher molecular form. The fact of there being two varieties of sugar in diabetes was also pointed out by Chefarand and Dupuytren in 1839. These chemists found a certain diabetical sugar completely devoid of taste, although possessing all the other properties of glucose, into which it could be readily converted by boiling with a tenth part of sulphuric acid.

4. Deschambert made the observation, since corroborated by Dr. Bennet Jones, that in aged people there exists a form of natural diabetes, characterized by the presence of sugar in the urine, yet in almost no way affecting the health, and, certainly, not producing the grave symptoms of diabetes proper.

5. There are two varieties of histories in the disease, one in which the urine becomes loaded with sugar suddenly, and the characteristic symptoms are
produced in even so short a period as one day after some exposure to cold, or indulgence in incum-
beption. In another class of cases, the condition of saccharine urine may have existed for years without having either attracted much attention or given great inconvenience.

It is from the foregoing general reasons that I arrive at the conclusion of the probable existence of several sources of the sugar in the urine; the particular reasons I shall endeavour to give as I take up the consideration of each cause. The theory of Rolls and Prout locates the "source of urine malt" in the digestive function, and attempts to shew that the sugar, in place of being assimilated by the economy, and used in the formation of tissue, is absorbed into the blood, there act as an
obnoxious matter, and is finally got rid of by the kidneys. The faulty physiology of this view is ren-
dered obvious by recent research & discovery, for we know that glucose is normally present in the liver and a portion of the circulation; we also know that the liver is able to form glucose from nitrogenuous articles of food, and in health does so, and that the lungs are the great erroneo
ories of sugar and the other principles into which it may be transformed. Yet must we not overlook one way in which the direction might possibly, in certain cases, be the cause of the disease. M. Bernard has shown, as before stated, that irritation prolonged up the pneumogastric nerve to the floor of the fourth ventricle may cause diabetes. It is possible to imagine that an irritation, conveyed in this manner from the disturbed stomach of a confirmed dyspeptic might be a cause of the malady; at all events it is certain that the old physicians set down the use of indigestible food, and also indigestion itself as causes of diabetes. Irritation of the pneumogastric has been satisfactorily shown to increase the glycogenic function of the liver; we must bear in mind that it may act in another way, namely, by diminishing the secretory powers of the lungs; and I think it may be shown that this mode of action is not only is not improbable but in many cases very likely.

Other reasons may be given for belief in a variety of diabetes solely dependent on imperfect discharge of the pulmonary function.
Irritation of carbonic acid in the lungs is the probable source of excitation in the excitatory-pri
nervous influence governing the secretion of pepsin in the liver.

Section of the vasa at a point farther from the medulla than the divergence of its pulmonary branches has not the effect of arresting the glycogenic function of the liver; but if the vasa be divided at a point more central than the divergence of these branches that formation of glucose is stopped.

This proves the essentiality of the pulmonary irritation to a due discharge of the hepatic function. As a corollary to this, we should expect that increased pulmonary irritation would augment the hepatic glucose secretion, and that such irritation would then constitute a distinct cause of the disease diabetes.

2. Chilliness of the surface of the diabetic patient's body, and the icy coldness of his extremities; point to imperfect combustion in the lungs.

3. The remarkably large percentage in the co
occurrence of phthisis & diabetes. This amounts to nearly forty in the hundred.

4. When the respiratory function is violently stimulated, so that the blood is imperfectly aer
did an artificial diabetes may be produced.

This was pointed out by Reynard; M. Dechambre has further shown that sugar is a normal and habitual ingredient in the urine of the aged; and he accounts for this from the fact that the respiration in such people is less active than in the young or middle aged.

5. The inhalation of ether and chloroform is followed by sugar in the urine; they, in all probability, act by preventing the oxygenation of the blood.

I have now mentioned two cases in which the cause may be put down as affecting respectively the gastric and pulmonary extremities of the vagus nerve; these remain to be considered the central forms in which lesions within the cranium are the cause of the morbid manifestations. Injuries to the head have, in many cases on record, been followed by diabetes. In a case related by Dr. Todd, such occurred in a woman after a fall down a flight of stairs; it was accompanied by hemiplegia. Another example is furnished in a patient of Dr. Gooden; he was
a railway porter who was struck on the head with the handle of a crane, he became diabetic during his consequent illness, although, as in the last case, there was not the slightest reason to suspect that diabetes had been present prior to the injury. Apoplexy too has been remarked to be frequently an accompaniment to diabetes, as also blindness, deafness, and persistent cephalalgia, leading us to regard such instances as examples of diabetes from central lesion. In all these cases I think nature points out the importance of treating the central signs carefully, as they most likely lead to ultimate benefit to the patient.

Believing, as I do, the existence of these several forms of the disease, it appears not difficult to explain the reason why certain methods of treatment, and I allude more particularly to the saccharine, should have met with such varying results, not only in the hands of different practitioners, but even in the hands of the same practitioner at different times. If several forms of diabetes really exist, it must be evident that the same remedies would
just be appropriate in all cases; for instance, we would think of loading the system with sugar, if it were in consequence of the difficulty of getting rid of the sugar by the lungs, that the disease was caused. And, being impressed with the importance of recognizing these several varieties, in order to apply a correct method of treatment to each, I have been led to expand my remarks somewhat on this part of the subject.

I have now endeavoured to show that diabetes mellitus may be referred to one of four varieties, namely—

1. That due to pulmonary irritation, causing an increased excito-secretory action in the liver.

2. That due to impairment of the pulmonary function, without irritation, in this case the sugar is secreted by the pancreas in the normal amount, but the lungs are unable to get rid of the whole of it.

3. That due to gastric irritation, causing an increased excito-secretory action in the liver, in the same manner as in the case of the
first mentioned pulmonary variety.

4. That form I have called centric, depending upon direct irritation of these nervous centres in the floor of the fourth ventricle, which must be considered as governing the glycopinic function of the liver.

In addition to the above, there are certain subdivisions, or rather modifications, which are hardly worthy of being classified as separate varieties, but which differ in some respect from the above. This is the form of diabetes, noticed by Dr. Gibbe, and Johnston, of Birmingham, accompanying infantile peristasis. As this latter disease is now known to depend upon some peculiar poison, affecting and irritating the pneumogastric nerve, we can easily see its connexion with diabetes. This I would propose to call the toxic form.

The physicians just mentioned have also called attention to the presence of sugar in the urine of young hysterical females. Whether this be due to the hurried respiration at the periods of the hysteriac paroxysm, or to some obscure diastatic influence, arising from disordered uterine action,
I cannot determine. The globus hystericus, and the evident affection of the pneumogastric, as phrenic by the respiratory disturbance, however, would seem to indicate the diastatic impression as, if not the, at least, one of the causes. Can we on this ground account also for the increased flow of limpid urine which is generally observed after the hysteric fit?

That there is some intimate, though very obscure, relation between diabetes and rheumatism seems highly probable; indeed some circumstances would almost indicate a rheumatic variety. Sugar has been found in the urine in cases of albumenuria following on an attack of acute rheumatism. Dr. H. Bence Jones considers that sugar in the healthy economy is changed into lactic acid previous to its removal by the lungs, and, if lactic acid be the maternus morbi in rheumatism, as Dr. Prout alleges, we find the latter disease in mid-position between health and diabetes.

Dr. Bence Jones has also observed an increase acidity of the urine to precede a state of glucosuria, if even it do not in some cases...
alternate with it. If there be any vital action able to arrest the transformation of lactic acid into carbonic acid, so producing rheumatism, we cannot but admit that the same vital force may be able also to prevent the change of sugar into lactic acid, and, in like manner, produce diabetes. It may thus be put in a tabular form.

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<tr>
<th>Health</th>
<th>Rheumatism</th>
<th>Diabetes</th>
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<td>Starch</td>
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<tr>
<td>Sugar</td>
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<td>Lactic Acid</td>
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<td>Carbonic &quot;</td>
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With regard to the treatment of this disorder, I think that the foregoing remarks will shew that in all cases it should not be the same.

In those depending on hysteria, or whooping cough the renal secretion of sugar will subsist on the disappearance of those affections, and needs no special treatment. The importance of regulation of diet as a curative agent has long been recognised, and two very dissimilar systems have been employed corresponding to two theories as to the cause of the disease.
Dr. Rollo, whose theory I have already made mention of, thought that, if, by nourishing his patient on an animal diet and such substances as were incapable of being transformed into sugar, he could cut off the external supply, he would cure the disease. He therefore gave meat, game, poultry, with fish, eggs, and certain green vegetables containing but little sugar or starch, such as, spinach, cabbage, lettuce etc. Gluten bread is also allowed in such cases; it is made by washing dough of wheaten flour on a piece, in a small stream of running water, till the mass is reduced to one fourth; by this means the starch is washed out of it.

There can be no question but that this method of treatment does diminish the quantity in the urine, it does not however entirely get rid of it. It only cuts off from the circulation that portion of sugar which, as M. Bernard admits, passes into the system by the lac-
teals. We find M. Thouard, however, stating that this diet is as cure a specific cure for diabetes, as ever quinine is for the ague. Its value will be more seen in cases of diabetes.
from defective respiration, when the liver has not been excited into an increased action.

Most physicians however find that after a short period of improvement this plan of dietary fails; the patient, in many cases reduced to a state of great emaciation & weakness, can no longer resist the temptations of indulging in the forbidden food, & falls a victim to his want of self-control, or his constitution being shattered he sinks under the onset of phthisis.

The researches and theories of M. Bernard with regard to the formation of sugar led to another system of dietetic treatment, conformable to those theories, and, in many respects, diametrically opposite to the above mentioned. I allude to the saccharine treatment, in which the diet contains the ordinary amount, if, even, not an excess of glucose. Since sugar, if taken with the food and passed by the circulation through the liver, is changed into an emulsive substance capable of fattening the patient, it should be freely introduced into the diet in a malady, one of whose most fatal symptoms is the rapid emaciation of the patient.
Certain rules must be observed in the administration of sugar. Glucose, or grape sugar, as in honey, or fruits, should be employed in place of cane sugar, which, although usually converted into glucose in the alimentary canal, if by chance it fail to be so converted, cannot be burnt off in the lungs, but will be eliminated by the kidneys; thus it would tend to increase the disorder. When glucose is employed, it should be given in frequent, repeated small quantities, in place of a large dose at one time; this is to allow the liver time to emulsify the whole, otherwise a portion escapes into the general circulation. This mode of treatment has been tried with various success. In the case of one patient in the Edinburgh Infirmary there was an evident abatement of the diabetic symptoms, unfortunately he was discharged before a full conclusion could be drawn with regard to his case. The first physician in this country who adopted this treatment was Dr. Budd, who had every reason to be satisfied with his success. During five months under the saccharine treatment his patient gained twenty pounds, the urine diminished in quantity, and the specific gravity fell four degrees.
Drs. Corfe, of the Middlesex Hospital, Drs. Brittan, of Bristol, and Dr. T. Inman, of Liverpool, have all had similar experiences of its palatine effect; but Drs. Williams, of Swansea, and Dr. Burd of the Salt Infirmary have found it injurious. The probable cause of this discrepancy I have already elsewhere intimated.

In the treatment of diabetes, when we have reason to believe that the case before us depends on pulmonary insability, unconbined with irritation of the liver, the use of means to promote free perspiration seems to be indicated. In a case related by Dr. Watson, which I believe would be one of the above class, the hot air bath was employed till few and violent sweating ensued, this was repeated daily with the following result: viz.

The urine, (these are the patient's words), is reduced more than one half, and does not contain much sweetness, but sometimes tastes salt with a mixture of bitter, * * * * the unpleasant acheing of my Kidneys, of which I spoke little, lest I should be accused in the lowns, is now removed, only I feel weak there. I am cured of the pain in my stomach, and the circuitous working of
the wind in my bowels, which formed lumps in my belly as it passed, resembling those of cramp. I have likewise got rid of the palpitations at my breast which was accompanied with a port of dread. My breathing is much improved, perspiration in a great measure restored, and my skin which was dry is now become moist. I sleep well at night, whereas I could not sleep more than two or three hours out of the twenty-four. My thirst, which was excessive, has ceased to be troublesome. Dr. Watson remarks on the above:—"In about half a year afterwards he went to Hyde Park to see some fireworks, got wet feet, and began to cough; the diabetic symptom returned more violently than ever, and he soon died. I found his lungs stuffed with tubercles."

In this case I conclude the benefit would arise from the skin taking on an action in some degeneracy of both lung and kidney; for carbonic acid gas is given off constantly by the skin, Dr. Dalton estimating it at about half an ounce in twenty-four hours, but Sequins fixing it as high as one ounce and a half in the same space of time. This is in the healthy body with the lungs performing
their healthy function. Now it may be shown that
the skin and lungs have, in a remarkable degree,
a function vicarious of one another, in the secretion
of aqueous vapour and carbon, by the fact that, du-
ing violent exercise, if the skin be dry, but the
circulation and respiration hurried, the lungs
become congested, and the subject soon physi-
ologic signs of distress; suddenly perspiration breaks
out with immediate relief to the laboured brea-
th ing, and then the fatigu ing exercise may be
kept up for a considerable time longer. This is the
true explanation of the phenomenon so well known
to runners as "second wind." — The remarks I have
heretofore made, regarding the skin and lungs in relation
to the elimination of carbon, are confirmed by some
recent observations of Bernard. He states that he
has found that, during the intrauterine life of the
fetus, its skin, and the surfaces of its mucous mem-
branes are abundantly endowed with glycogenic
cells: sugar he found in no glandular organ ex-
cpt the liver, even then, only during the sixth,
seventh, eighth, and ninth months. So all the
external liminary membranes of the fetus, saving
skin and mucous membrane, possess, during the
intrauterine life of the fetus, a glycosogenic evolution; or, in other words, during the first five months of fetal life, the skin and mucous membranes possess a function afterwards gradually assumed by the liver.

Opium has long been administered with the greatest relief to the symptoms of diabetes, and it is quite natural to expect this result from its use in those forms of the disease dependent on nervous irritation; in such cases the renal secretion is decreased, the harshness of the skin diminished, and the general state of the patient improved. Opium, in addition to its calming influence on the nervous system, is said to have the power of checking the bile-producing function of the liver; we may conclude it will also have the power of retarding the activity of the glycosogenic function of that organ. To correct the effect of opium, a purgative is in most cases required occasionally, and when the treatment is kept up for any length of time, a grain or two of quinine may be advantageously added: this has the effect of keeping the digestion unimpaired, a very important point to attend to when we consider the amount of nutriment required to be assimilated.
by diabetics. Dr. T. Remain's prescription is, a grain of opium or two grains of quinine every four hours. He has published two cases in which this treatment was adopted, in both of which he found that the head was unaffected by the drug, which, also, did not prevent the bowels from being "habitually regular."

Mr. S. J. Stoff, of London, has recommended the administration of a soluble sulphuret of arsenic in diabetes, with a view of arresting saccharine fermentation. In one case, published by him in the "hazard," it seemed to have the effect of checking the diabetic symptoms; but, as it was tried conjointly with the adoption of a diet containing very little amylaceous matter, it is impossible to state how far the improvement was due to the arsenic: death, at all events, took place in a few weeks from phthisis. Mr. Stoff obtained a soluble sulphuret by combining the hydrosulphuret of ammonia with bi-queor arsenicalis. Permanganate of Potash has been used, with somewhat similar results. In a case, which came under my notice, this improvement promised to be somewhat permanent, but the patient, preserving on his newly acquired strength, threw off restraint, got drunk, and the dia-
labetic state returned worse than before: the permanganate, tried during the relapse, appeared to have no effect whatever.

In conclusion, the only other drug, I think, needing any mention is creasote; it was first recommended by Dr. Watson. In his hands it did not appear to have been very successful, and other physicians have not seen any benefit derived from its use.

In proportion as our knowledge of the etiology of this disease advances, so the apparent discrepancies in the results of opposite modes of treatment will disappear; and, as we gain further experience in the application of these methods, we may hope to be successful in the treatment of a disease which has so long baffled the efforts of the physician.