Original Articles.

THE TREATMENT OF DIABETES MELLITUS.[1]

BY DR. I. SEEGEN, VIENNA, REFEREE.

AFTER a few introductory words the reader remarked that more than thirty years ago he had learned from the evidence of fourteen diabetes cases (reported at that time), that diabetes manifests itself in two forms. These can be differentiated, from the fact that in the first form sugar is excreted only if carbohydrate is taken in the food, and in the second form the excretion of sugar is entirely independent of the food taken. As a result of Pavy's investigations, the belief had prevailed up to this time, that the formation of sugar in the body was a fatal symptom.

It was thought that, in diabetes mellitus, there was developed in the living body a process of fermentation which normally appeared only after death, and which converted the liver-starch into sugar. Why this ferment in one type of the disease only acted upon the starch formed from carbohydrate, while in the other type it attacked the starch formed from albuminous compounds, the pathologist did not understand.

As a result of Seegen's work, it is now known that sugar-production is, in accordance with Bernard's theory, a normal process, and, is indeed one of the most important of the bodily functions. Seegen combined the results of his investigations into the following statements.

(*a*) The liver constantly produces sugar. This is proved by the fact that the liver of every living being contains 0.4–0.5 sugar, and by the fact that the blood leaving the liver (as demonstrated in more than sixty investigations) contains, without exception, more sugar than the blood when it enters the liver.

(*b*) Sugar is not formed from liver-starch, as Bernard believes.

Observation teaches us that the sugar-increase in the liver is most marked in the first hours after death; for the sugar increases from 0.4% to 2–3%, while the liver-starch remains unaltered in its condition. If the liver-cells retain their functions longer, with the aid of arterial blood, they are able to produce other carbohydrates as well as sugar.

(*c*) The materials from which sugar is formed are the albuminous and fatty compounds. In experiments where a diet composed exclusively of meat or exclusively of fat was given, as well as in experiments where starvation was carried to the point of inanition, the blood leaving the liver was always richer in sugar than the blood entering it.

(*d*) The amount of sugar carried into the circulation in twenty-four hours from the liver may be calculated (1) from the difference between the quantity of sugar in the afferent and that in the efferent blood (a difference amounting on the average to 0.1%), and (2) from the way in which the amounts of blood flowing through the liver in a given space of time, approximate each other.

This quantity of sugar amounts, in the case of a dog of 10 kilos., to upwards of 100 gr. in twenty-four hours, and in man (calculating the relation his blood-quantity bears to that of the dog) it amounts to 500–600 gr.

(*e*) The sugar formed in the liver and carried into the blood from there, is constantly being destroyed and consumed in the tissues of the body.

If the liver be cut off from the circulation for only thirty minutes, the quantity of sugar in the blood sinks to one-third of its original amount; and Minkowski found that the sugar in the blood of geese *entirely* disappeared after the liver had been cut off from the circulation for a few hours.

(*f*) Sugar produced in the liver in so great an amount requires, for its production, a considerable amount of carbohydrates. Hence, it naturally results that almost the entire amount of food taken is consumed in the production of sugar.

This production is one of the most important of the bodily functions, as the sugar produced is a source of supply for heat-production and for bodily activity.

(*g*) Liver-starch is formed, to a great extent, from carbohydrates. Under a fat diet, the liver contains almost no starch; with a meat diet it contains 2–3%; while with a diet of sugar and dextrine it contains up to 12%.

What becomes of the liver-starch has not yet been determined experimentally. Probably it is changed to fat, and serves as a reserve material for sugar-production.

In the light of these physiological facts, experimentally proven, both forms of diabetes become far more intelligible to us.

In the one form, the sugar which is excreted is produced only from the carbohydrate ingested; we may then conclude that the liver has lost the power of making starch (glycogen) out of carbohydrate, and can no longer act upon the starch already formed. In this form of the disease the liver-cells are not capable of fully carrying out their functions.

In the other form of the disease sugar is excreted when not an atom of carbohydrate has been consumed in the food. This sugar is produced in the body. It is oxydized in the body and consumed in accomplishing the work of the body. The body of a diabetic patient has lost the ability of disposing of the sugar in the blood. That is to say, the cells of the whole body have become more or less incapable of fully converting the sugar brought to them.

It can now be understood that these two forms of diabetes have a very different significance; for in the first form, a patient may live for a long time, provided carbohydrates be denied him; but in the other form, the patient dies in a very short time.

The fact that in one case the *liver* cells, and in the other case the cells of the *whole body* are functionally incapable, we cannot at present explain. In other words, we are as yet entirely ignorant of the nature of diabetes. We know with certainty that diseases or abnormalties of the nervous system are often accompanied by diabetes, and we also know that all those conditions which have to do especially with the nervous system, for example, extreme mental depression, will readily produce the disease.

The heredity of diabetes is, at present, undisputed; and we also see frequently that diabetes alternates with psychosis in a family.

The reader alluded to the fact that he had determined experimentally, that morphia, chloroform and curare, drugs which affect the nervous system especially, diminish to a marked degree the conversion of blood-sugar.

Undoubtedly other causes are brought to bear in

[1] An abstract of a paper read in the Medical Section of the International Congress at Berlin.

the production of a case of diabetes; and the remarkable discovery of Mering and Minkowski, that an animal whose pancreas has been excised remains permanently diabetic, deserves mention in this connection.

The reader announced that he had studied upwards of one thousand cases of diabetes during the last year, and that he still believed, as he did thirty years ago, that diabetes manifests itself only in the two forms previously mentioned. The cases of the first form, as well as those of the second, vary in severity. In diabetes of the milder type, the degree of tolerance for starch varies greatly. While one case responds to the introduction of small amounts of carbohydrates, by an excretion of sugar, another case will take a far greater amount of carbohydrates with his food without excreting any sugar in the urine.

The tolerance for sugar-excretion, that is to say for abnormal sugar-production, also varies. Many cases begin to lose ground when the urine contains only a moderate amount of sugar, while others have two to three per cent. of sugar in the urine for many years, and continue to feel very well, provided they eat freely of meat and fat.

In general it proves to be true that the tolerance for sugar-excretion gradually increases, and patients who were very ill at the beginning of the disease feel very well under the same conditions later on, in spite of the fact that their urines contain considerable quantities of sugar. Those cases which cannot assimilate even the smallest quantities of carbohydrates, readily give one the impression, both from their general appearance and from all their symptoms, that they are cases of the severe type. Only when these cases are kept for a long time on an exclusively meat-diet, is one convinced that their disease is of the milder form.

Occasionally, diabetes of this milder form may become transformed into the severer kind. Seegen has noticed this especially in *youthful* cases as well as in those who through negligence or poverty, subsist upon a very insufficient diet.

Not infrequently, cases whose urine contains small amounts of sugar, come under observation. They are either very old people (generally between sixty and seventy years) or they are cases whose nervous systems have become greatly exhausted (especially well-marked neurasthenics).

Every sugar-excretion which can be demonstrated by the means at our command (and by Seegen's carbon test, 0.01% can be determined with certainty,) is abnormal. A benign glycosuria does not exist. The importance of a small excretion of sugar varies greatly, however. In old people it is of very little importance, while in young and neurasthenic cases it always indicates a more serious nervous affection.

The course of diabetes varies. Cases of the milder form may keep very well if they can provide for themselves a plentiful and proper diet, and Seegen has seen cases which had remained diabetic for nearly twenty years, and which still felt comparatively well. Cases of the severer type die quickly, especially if they are youthful individuals. The fatal result occurs after from two to three years.

Recovery from diabetes, in the sense that the patient could eat starchy food recklessly, as is normally the case, without any evil effects, the reader had never seen.

In the treatment of diabetes the diet plays the most important part. We cannot attack the real cause of the disease because we do not know it. Our task, then, is to prevent, so far as is possible, sugar-production. This can be done only in the mild form of diabetes. The diet should be regulated as follows: There should be absolute avoidance of carbohydrates, and accordingly a diet composed exclusively of fat and meat. Contani and other physicians have wished to embody this principle in its entirety in their practice, and Contani believes that he has seen a cure following a long-continued diet composed exclusively of meat. The reader has never seen so fortunate a result. Absolute meat diet, if it be long continued, has undoubtedly the advantage that it permits a certain tolerance for starch; but this tolerance is a very limited one, and a diabetic who, after a long-continued life of meat diet, allowed himself to live like a healthy person, would pay heavily for it.

Aside from its great difficulty of accomplishment, a diet composed entirely of meat has this great drawback: cases so treated quickly acquire a catarrhal gastritis and enteritis. Besides this, the less-determined patients generally break through their diet regulations and eat injurious food without stint, because the treatment is so very unpleasant and of such long duration.

The theory that diabetes can be cured has another great disadvantage connected with it. Patients from whose urine the sugar has all disappeared except a trace, consider themselves cured, and think their diet may be varied. In this way relapses occur.

The idea which Seegen follows out in treating his diabetes cases is as follows: there should be ordered for the patient such a diet as can be continued throughout a life-time, with the aid of a strong determination. A diet of meat and fat should prevail. Seegen warns you that the patient must not be allowed to eat meat and eggs in *too great quantities* for the purpose of building himself up. A diabetic patient does not need more meat than any healthy person who lives chiefly on a meat diet. But with this diet the patient should be ordered green vegetables in any quantity desired, and sour (not sweet) fruit in moderate amount. Bread is indispensable for a time, and Seegen orders 40–60 grs. per diem, but speaks most decidedly against fresh bread, because this always contains starch, and if allowed, the control of the diet (over the disease) will be lost. An exclusive meat diet is strenuously to be recommended:

(1.) If it is necessary to decide whether the disease is of the first or second form.

(2.) When wounds do not heal and when gangrene sets in, or a surgical operation is necessary.

Sour (not sweet) red or white wine is allowed in any quantity, and yet it is an error to allow a diabetic patient to drink large quantities of wine with the idea of strengthening him. Beer may be allowed in moderate quantity, (that is, about half a litre).

In diabetes of the severe form abstinence from carbohydrates is important only because, as a result of such abstinence, the excretion of sugar is markedly lessened. To restrict cases of this kind to a meat diet is not indicated, for it makes little difference whether 20–30 grs. (sugar), more or less, are excreted; and the advantage gained is not equivalent to the privation endured.

Next to the diet, the use of alkaline mineral waters in diabetes mellitus is of unquestioned advantage.

(Carlsbad, Vichy and Neurnahr.) Without doubt the use of other well-known waters increases the tolerance for starch; that is to say, the patient can consume a greater quantity of carbohydrate during the use of these waters and for some time thereafter than he could before, without causing the appearance of sugar in the urine. Carlsbad exerts only a passing, symptomatic influence on cases of the severe form of diabetes. Seegen warns us not to send cases of this kind to distant watering-places, for experience teaches that railroad journeys exert a bad influence in cases of diabetes.

The reader has seldom had an opportunity of seeing any lasting benefit derived from other remedies. In children and young people he recommends the steady use of iron waters containing some arsenic. (Roncegno, Levico and Guber.) A trip to the South is of very great benefit.

MUSHROOMS AND MUSHROOM-POISONING.[1]

BY EDWARD J. FORSTER, M.D., OF CHARLESTOWN.

IF any apology were needed for the paper which I offer this morning, I think it will be found in the following extract from a newspaper of last summer:

TOADSTOOLS MISTAKEN FOR MUSHROOMS. — N——, N. Y., August 13th. A sad case of fatal poisoning by eating toadstools mistaken for mushrooms, has occurred at N—— C——, R—— County, the unfortunate victim being Miss M. A. W., a highly respected lady twenty-five years of age. On Thursday last the W. family ate dinner of what they supposed were mushrooms, gathered from the fields near by. Shortly afterward four members of the family were taken ill — two of the daughters, M. and A., being seriously affected. Yesterday M. died at noon, and her sister is still very sick. An investigation revealed the fact that the supposed mushrooms were poisonous toadstools, closely resembling the former in appearance.

This is a fair sample of what I have found each year since I became interested in the study of mushrooms.

"Do you know a mushroom?" "Certainly, I have eaten them often." This answer generally refers to the canned ones, so often served with *filet de bœuf*, and which, by the way, resemble the fresh mushroom in flavor as much as hashed corned beef does a good porter-house steak. "Oh, yes! a mushroom is a kind of toadstool." Such are the replies generally given to my question.

"But do you know a mushroom when you are walking in the fields, and are you sure enough of your knowledge that you dare to take one home, cook, and eat it without fear of being poisoned?" I think not.

It is the purpose of this paper to endeavor to impart that knowledge, and warn you against those whose character is doubtful, and those which are known to be fatally poisonous.

I am quite sure that there are not many of the members who can with certainty distinguish the edible from the poisonous varieties. Some of you know the common meadow mushroom, but here your knowledge generally ends; you cannot distinguish with certainty the poisonous Amanita, the most deadly of all the fungi, one of the most common in our northern woods, as well as one of the handsomest.

If called to a case of mushroom poisoning, I am very much afraid you would treat it upon general principles, forgetting, if you ever knew, that general principles are here of little avail, and that reliance should be placed upon an antidote which is as effectual here as when properly given in other cases of poisoning.

To help you to a knowledge of the common varieties which are edible beyond peradventure, to recognize the deadly Amanita, so that you can give it a wide berth, to treat properly a case of poisoning if you should be so unfortunate as to be called to one, will be my endeavor this morning.

From the dictionaries we derive the following definitions:

Worcester says a mushroom is a "fungous plant of the genus Agaricus. Mushrooms inhabit meadows, rocks, and masses of decaying vegetable matter, in many parts of the temperate regions of the earth. Among them a large proportion are poisonous, a few are wholesome, but, by far the greater number are unknown in regard to their action upon the human constitution. The name is, in popular use, often restricted to the edible species." And he says that "a toadstool is a mushroom."

Webster says of mushroom, "(Fr. mousseron, the white mushroom, from mousse, moss, or the same root bearing the sense of softness or nap). The common name of numerous plants of the natural order of fungi. Some of them are esculent, others poisonous. Mushrooms grow on dunghills, and in moist, rich ground, and often spring up in a short time. The term mushroom is sometimes applied to distinguish the edible fungi from the toadstools which are poisonous." Toadstool he defines, "(toad and stool). A mushroom, a plant which commonly grows in moist and rich grounds."

Such are the definitions of the dictionaries, but I think each person makes the distinction between mushrooms and toadstools, or defines the words according to his knowledge of the subject.

Thus, to the cryptogamic botanists, "mushrooms" include all fungi which have a cap and stem, and resemble the common edible mushroom of the market in their general appearance, and to such "toadstools" would be a synonymous word if they used it.

To the mycophagist who is not a botanist, all fungi that he knows to be edible are mushrooms; all others having the cap and stem, of the qualities of which he is ignorant or which he knows to be poisonous, are very likely to be called toadstools, — the commonly accepted idea being, that known edible varieties are mushrooms, all others toadstools. So it is that education in mycology increases the number of mushrooms and decreases the number of toadstools. To paraphrase an old saw,

"One man's mushroom is another man's toadstool."

As this name "toadstool" is founded upon a popular error, no one ever having seen a toad using a fungus for a stool, is it better to forego the use of the word, particularly as association of ideas plays so great a part in our likes and dislikes; for as toads are to many persons noisome and uncanny creatures, the disuse of the word will perhaps allow many, who otherwise would not, to eat of some of the most delicious of nature's products, upon which they formerly looked with suspicion if not fear, — "products of which" Mr. Julius A. Palmer truly says, "the harvest is spontaneous, it requires no seed-time and asks for no peasant's toil, . . . (a) feast, abundantly provided by nature for the poorest as well as the most epicurean."

I shall only use the term mushroom, prefixing it with edible or poisonous, as the case may be.

[1] Read before the Massachusetts Medical Society, June 11, 1890, and recommended for publication by the Society.