Canada. The climate of Detroit is represented by the following chart.

CLIMATE OF DETROIT, MICH.—LATITUDE, 42° 20′; LONGITUDE, 83° 3′
PERIOD OF OBSERVATION, DECEMBER 1ST, 1870, TO DECEMBER 31ST, 1883.

Data.	January.	July.	Year.
Temperature (degrees Fahr.)—			
Average or normal	24.8°	71.6°	47.9°
Average daily range	12.7	18.4	
Mean of warmest	31.3	81.4	
Mean of coldest	18.6	63	
Highest or maximum	65	100	
Lowest or minimum	−15	50	
Humidity—			
Average or relative	78.3%	70.0%	71.6%
Precipitation—			
Average in inches	2.14	4.14	35.41
Wind—			
Prevailing direction	S.W.	S.W.	S.W.
Average hourly velocity in miles	8.2	6.4	7.8
Weather—			
Average number clear days	3.8	9.8	85.9
Average number fair days	9.6	14.9	147.8
Average number of fair and clear days.	13.4	24.7	233.7

E. O. Otis.

DEXTRIN.—"*Artificial Gum.*" ($C_6H_{10}O_5$.)—A polysaccharide, of the same formula as starch, cellulose, inulin, and lichenin. The name is applied to any one or all of the intermediate substances produced in transforming starch or cellulose into glucose. The first member of this series, *amylodextrin*, yields a purple color with iodine, but all the others show no color with that reagent which could even carelessly be mistaken for that of starch. Commercial dextrin is a white or yellowish-white substance, powdery or compacted into lumps, with a specific gravity of 1.088 and soluble in water. It is produced by the action of either diastase or dilute mineral acids, aided by heat, upon starch. Dextrin itself does not admit of fermentation, but upon being converted into *dextrose* by the addition of a molecule of water, it does so and can then pass on into alcohol. Dextrin bears a close relation to gum and its chief use is to substitute that article, much of such use being fraudulent. It can be distinguished by its peculiar odor and by the test given under *Gum*. Alcohol precipitates it. It is highly adhesive but distinctly inferior to gum, its solution growing very dark with age. Dextrin is itself very prone to adulteration, especially with starch. Commercial dextrin often holds an excessive amount of water, as well as of dirt of various kinds. Dextrin has no medicinal properties but, being partly digested starch, it forms a common ingredient of artificial foods for infants. *Henry H. Rusby.*

DIABETES MELLITUS.—DEFINITION.—A diminution of the sugar-consuming power of the body tissues resulting in a more or less permanent glycosuria. Of the cause and nature of saccharine diabetes we are practically ignorant. We distinguish the symptom glycosuria from the disease diabetes, but the distinction is merely one of time, since we cannot refuse the title of diabetes to any long-standing glycosuria, no matter what the other symptoms are. The weakness of this position is obvious; we are making the distinction between a symptom and a disease one wholly dependent upon time.

Temporary glycosuria may be brought about by any one of a number of causes, among which perhaps the commonest are profound narcosis (whether produced by alcohol, ether, or any other drug), profound coma, however produced, poisoning by carbonic oxide, nitrite of amyl, or strychnine, and the active use of diuretics. Such glycosuria must be distinguished from the lactosuria which sometimes occurs toward the end of pregnancy and during lactation, as well as from the dextrosuria produced by large doses of chloral or chloralamide. Less frequent causes of glycosuria are traumatic neuroses, alcoholism, delirium tremens, hysteria, neurasthenia, chlorosis, Graves' disease, and the infectious fevers. I need hardly say that glucose must be distinguished from other copper-reducing substances which are not very infrequently present in the urine when the latter is very concentrated and after the ingestion of certain poisons (see, below, tests for sugar). It must not be forgotten that the capacity of the individual for burning up grape sugar is never an unlimited one. Glycosuria may be produced in any one by the ingestion of a sufficiently large amount of glucose, and is then known as "*alimentary glycosuria*;" it can ordinarily be produced by taking 200 gm. of glucose upon a fasting stomach. In many persons the tolerance for sugar is less than this.

Although diabetes cannot be said to be a disease of any one organ, yet it is indubitably true that in a minority of cases some organic lesion is to be found. Thus a certain proportion of cases occurs in connection with diseases of the liver (especially cirrhosis) and with disease or trauma of the nervous system, especially cerebral tumors. Those pressing upon the floor of the fourth ventricle are not by any means the only tumors which are capable of being associated with diabetes. Other diseases of the brain occasionally associated with diabetes are cerebral hemorrhage, dementia paralytica, and the various forms of meningitis.

Of late years it has been shown that diabetes may occur in connection with any one of the various diseases of the pancreas. This connection is not, however, a very intimate one, since no lesion of the pancreas can be found in the majority of cases of diabetes and it is not at all uncommon to find pancreatic disease without diabetes. Finally, it should be mentioned that gout, obesity, and arteriosclerosis are very frequently present in cases of diabetes, though whether as cause or effect of the diabetes, or as a result of some deeper cause of which diabetes is another manifestation, we do not at present know.

The tendency to diabetes is in all probability capable of being inherited. Sometimes the morbid tendency shows itself in one member of the family as diabetes, as obesity in another, and as gout in a third. The occurrences of cases in husbands and wives are probably accidental. All ages and both sexes are affected.

All the etiological factors hitherto mentioned, except heredity, are concerned only in a minority of cases. For diabetes in a great majority of cases no cause, no associated disease, no inheritance can be assigned. The disease comes, as we say, of itself.

SYMPTOMATOLOGY.—Most of the symptoms of diabetes may be regarded as results of the glycosuria, but it is convenient to divide them into the more *direct* and the more *indirect* results. In the former class are hunger, thirst, polyuria, emaciation, and muscular weakness. The thirst in well-marked cases is so great that the patient goes to bed with a four-quart pitcher of water at his side and empties it before morning. It is related that a diabetic patient was paid to stay away from a hotel conducted on the American plan owing to the disastrous ravages which his hunger made upon the bill of fare. This anecdote, whether true or not, gives some idea of the voraciousness of a diabetic's appetite. Four or five quarts of urine are frequently passed in twenty-four hours and the amount may be much larger. As a result of this drain upon the tissues the patient is apt to emaciate rapidly and to notice great muscular weakness. This is especially the case when the disease occurs in persons under thirty-five years of age and in those whose habit of body is spare. In cases occurring in fat old people there may be little or no weakness or emaciation (see below).

In the presence of these symptoms: *thirst, voracious appetite, emaciation, muscular weakness, and polyuria*, or of any one of them, the examination of the urine for sugar is immediately suggested and imperatively demanded.

The test for sugar is best performed with Fehling's solution, the formula for which is as follows: Dissolve 34.64 gm. of pure $CuSO_4$ in 500 c.c. of water; dissolve 173 gm. Rochelle salts and 60 gm. sodium hydrate each in 200 c.c. of water. Mix and add water up to 500 c.c.

The copper solution must be kept in a separate bottle and not mixed with the alkali until we are ready to make the test. Equal parts of the two solutions are then mixed in a test tube and the mixture is boiled. Should any precipitate appear on boiling, the solution must be rejected and another portion freshly prepared. If no precipitate appears, add an amount of urine equal to the amount of the hot Fehling's mixture in the test tube. If sugar is present in the suspected urine a yellow precipitate will appear—usually within a few seconds, occasionally after the lapse of some hours. This precipitate is due to the reduction of the copper and can be produced in case reducing substances other than sugar are present in the urine; this, however, is very rarely the case. Large amounts of uric acid are capable of reducing copper, but only in a solution more concentrated than often occurs in urine. In any case of doubt the presence of sugar may be verified by the fermentation test (see below). In the vast majority of cases, however, Fehling's test is all sufficient for a qualitative examination for sugar.

Having satisfied ourselves that sugar is present, we proceed to estimate its amount. This is best performed by means of the fermentation test. First take the specific gravity of the urine; then to four or five ounces of urine add one-half cake of Fleischman's yeast in an open beaker, crumbing up the yeast into small pieces while adding it. Set the beaker aside in a warm place for thirty-six hours, then filter its contents and take the specific gravity of the filtrate. If sugar is present the filtrate will be found to be much lighter than before the addition of the yeast. To estimate the percentage of sugar, multiply the number of degrees of specific gravity lost by 0.237 and the resulting figure represents the percentage of sugar. Thus, if the specific gravity of the urine before fermentation were 1.040 and after fermentation 1.020 the resulting loss of specific gravity of 20 degrees multiplied by 0.237 gives us 4.74 per cent. of sugar. If the amount of urine passed in twenty-four hours is previously known, we can easily estimate the twenty-four hours' output of sugar, which is, of course, the essential point to be ascertained. For practical purposes these two tests, the qualitative test with Fehling's solution and the quantitative test by means of fermentation, are all sufficient. The tests for acetone, for diacetic acid, and for beta-oxybutyric acid will be described later.

INDIRECT SYMPTOMS OF DIABETES.—The drain upon the tissues produced by the excretion of large amounts of sugar which ought to be absorbed and utilized in the body is manifested directly in the symptoms already mentioned, viz., hunger, thirst, emaciation, muscular weakness, and polyuria. Indirectly the increased vulnerability of the body tissues manifests itself in some one or more of the following ways:

1. Lesions of the skin and mucous membranes.
2. Lesions of the nervous system.
3. Lesions of the respiratory system.
4. Lesions of the circulatory system. Each of these will now be taken up in detail.

1. *Lesions of the Skin and Mucous Membranes.*

(*a*) An abnormal *dryness* of the skin and mucous membranes is almost invariably present. The skin becomes rough and harsh and its appendages, the hair and nails, show the effects of malnutrition in dryness and brittleness.

(*b*) *Eczema* about the genitals is a very significant symptom and may be the first thing to suggest the diagnosis of diabetes. A red and angry eczema about the vulva should invariably suggest to us to test the urine for sugar. Balanitis and vulvitis are not so common, but they occasionally occur. Generalized eczema and other dermatoses are less common.

(*c*) *Furunculosis* and other staphylococcus affections of the skin manifest the diminished resisting power of the cutaneous tissues.

(*d*) *Carbuncle* is not infrequently associated with diabetes and the presence of such a suppurative process should always suggest a search for sugar in the urine. Diabetic gangrene is considered by some to belong in this category of changes, but it seems to me best to consider it under the lesions of the circulatory system (see below).

2. *Lesions of the Nervous System.*

(*a*) *Diabetic Neuritis; Neuralgia.*—Sciatica, intercostal neuralgia, trigeminal neuralgia, and less frequently brachial neuralgia appear as results or complications of diabetes and may be the first indication of the disease. This is especially true of sciatica. (*b*) Muscular cramps, unusual muscular fatigue on slight exertion, and deep muscular pain are sometimes associated with diabetes. Twice patients have come to me complaining only of cramps in the calves and totally unaware of any underlying disease. (*c*) Loss of knee-jerk characterizes relatively late stages of the disease in the majority of cases and is probably due to a peripheral neuritis. (*d*) Facial paralysis of peripheral origin may be the first symptom which leads the patient to consult a physician. Other peripheral paralyses are less common. (*e*) Anæsthesia and paræsthesia usually affecting relatively small areas are not at all uncommon. The inner and anterior aspects of the thigh are not infrequently affected and the disturbances of sensation may be associated with pain (meralgia paræsthetica). (*f*) Perforating ulcer of the foot (mal perforans) is undoubtedly to be referred to a nervous lesion and is a fairly common manifestation of diabetes.

Lesions of the brain and cord are much less common than those of the peripheral nerves and when present are often to be explained as results of the arteriosclerosis with which diabetes is so frequently associated. In one of my cases there was for many months an intense generalized headache apparently of cerebral origin. Loss of sexual power is an important and sometimes an early symptom.

Lesions affecting the special senses are not frequent, if we except the eye. Among ocular lesions by far the commonest is *cataract*—a disease which may give us the first suggestion of the possibility of diabetes. Retinitis is not very uncommon. Paralysis of the abducens is not infrequent and many diabetics develop at an early age the far-sightedness which is so common in elderly people. Occurrences of hemiplegia, of convulsions, and of coma in cases of diabetes will be discussed later.

3. *Lesions of the Respiratory System.*

(*a*) Pulmonary tuberculosis complicates from seventeen to fifty per cent. of all cases of diabetes. Between these figures the statistics of different writers vary. It hardly ever occurs in elderly or obese diabetics and usually runs a rapid course to the fatal termination. Hæmoptysis is notably rare and there is often but little expectoration. In a young man who died after withstanding the disease for nine years under my observation, there was found at autopsy a pneumonic form of tuberculosis presenting solidification of the whole right lung from top to bottom without cavity formation. During life there were no sputa and practically no cough. As a result of the swallowing of sputa the intestine is not infrequently attacked by tuberculosis. (*b*) Pulmonary gangrene. About five per cent. in all cases of diabetes are attacked by gangrene of the lung which may run a rapid course or drag along for months and even years. (*c*) Croupous pneumonia. Diabetic cases of the severe type often end with an acute pneumonia. In all cases of pneumonia the urine should be examined for sugar; its presence greatly darkens the outlook. (*d*) The acetone odor of the diabetic breath is a very characteristic one and may sometimes be detected as soon as one opens the door of a patient's house; it has been variously compared to the odor of chloroform, of rotten apples, and of new-mown hay.

4. *Lesions in the Circulatory Apparatus.*

Arteriosclerosis with its manifold results includes all the circulatory complications of diabetes. Arteriosclerosis is probably to be regarded as a concomitant or a possible cause of diabetes (Naunyn) rather than as a result. Diabetic gangrene is usually, I think, to be regarded as a result of the arteriosclerosis rather than as a manifestation of simple malnutrition. The gangrene affects the extremities following the distribution

of the smaller arteries as in ordinary non-diabetic gangrene.

The other manifestations of arteriosclerosis, such as myocarditis, chronic interstitial nephritis and cerebral hemorrhage, are not very uncommon, but do not usually thrust themselves into the foreground of the clinical picture. I may mention here a peculiarity of the complexion in diabetics which I have frequently had occasion to observe. In my experience diabetics are very seldom pale and are quite apt to show a beefy red color of the cheeks. This is especially true of the cases occurring in thin, young people.

Clinical Course of the Disease.—Leaving out of account the rare, acute forms of diabetes, we may divide the great majority of all cases into two main types: 1. The thin, young cases. 2. The old, fat cases.

Occasionally one sees a patient who belongs in neither of these categories, but this is rarely the case. Between these two clinical types the difference is so great that it sometimes seems as if we ought to call them different diseases. Diabetes in the elderly and obese may exist for a considerable time undiscovered and when discovered may give rise to so little inconvenience that we hesitate to class it as a disease. Between this condition and that of the young thin cases there is the sharpest possible contrast. In thin, young people polyuria, hunger, thirst, and emaciation are usually from the first intense and disabling and rapidly increase unless aggressive treatment is begun or even in spite of such treatment. The glycosuria may be diminished and for a time abolished, but it almost always returns in a more obstinate form and this time to persist despite any and all therapeutic measures, reducing the patient within a couple of years to a deplorably weak, emaciated, helpless creature, who may at any time be seized with the fatal coma. In fat, old cases, on the other hand, the amount of sugar excreted is usually relatively small, the patient emaciates but little, the hunger and thirst are usually relieved by a moderately strict diet, and the patient often lives out the natural term of his life and dies of some other affection. Between these two main types there are, as has been said, occasional intermediate forms, *i.e.*, severe cases occurring in stout old people, or relatively mild cases in the young and spare, but it is rare for a case in which the disease attacks a patient before the thirtieth year, to last more than three years. The duration of the disease depends to a considerable extent upon the character and circumstances of the patient. If the sufferer be well off and have the pluck and determination necessary to adhere to the tiresome diet, life may be considerably prolonged. I have known such a case which showed itself at the age of twenty-two in a young college athlete and lasted eleven years before the fatal termination.

The presence or absence of complications also determines to a considerable extent the duration of the disease. All the complications above mentioned occur more frequently in the younger and severer cases, but are by no means confined to such, and when they do attack a patient who is suffering from the milder type of the disease, and who would therefore naturally be expected to live many years, they may shorten life very considerably. Thus a diabetic gangrene or pulmonary tuberculosis may attack even the mildest case and prove more serious than the original disease.

Recovery from diabetes does occur. On this point Naunyn, von Noorden, and all the best authorities are agreed, but it is exceedingly rare and takes place almost exclusively in cases which are nipped in the bud as a result of vigorous treatment undertaken very early in the course of the disease. Such early and vigorous treatment it is very seldom our fortune to be able to administer, but occasionally when the disease is suspected in the children of diabetic parents and when regular tests of the urine are made at stated intervals, whether the children be sick or well, the first advent of the disease is noted and its course can then sometimes be checked.

Coma and Sudden Death in Diabetes.—Typical diabetic coma occurs in not more than one-half of all cases. Many authors find it in a still smaller percentage. It is especially apt to occur in the cases of so-called pure diabetes, *i.e.*, those in which no organic lesion can be found as cause. The majority of cases occur in young, thin patients. Out of eighty-seven cases collected by Blau,* only thirteen had passed the fortieth year. Diabetic coma is preceded by an intense dyspnœa of a peculiar type. The air on entering the lungs meets no resistance, but the patient breathes deeply and rapidly. There is no cyanosis. The attack is often preceded by restlessness or apathy, fever, indigestion, vomiting, headache, and subnormal temperature. The amount of sugar in the urine at the time of the occurrence of coma may be either large or small, but most cases occur while the patient is upon a strict diet and especially in those who have suddenly been put upon a strict diet without other treatment. The dyspnœa may cease only to return after some hours or days, but usually a coma gradually develops. Diabetics may become comatose without any of the features which we have been describing as characteristic of the diabetic coma, *i.e.*, without any of the typical dyspnœa, and there may or may not be epileptiform convulsions. Many diabetics die of rapid heart failure, and rarely there is a sudden collapse such as might occur in apoplexy, yet without any such cause discoverable post mortem. It seems to be agreed by all the best writers upon diabetes that death is brought about in a great majority of cases through an acid poisoning of the system (acidosis). Beta-oxybutyric acid is now believed to be responsible for the toxic condition. The occurrence of acid substances such as diacetic acid in the urine is accordingly to be considered a sign of the presence of allied acids in the blood and tissues and so a sign of an unfavorable prognosis. Treatment directed to neutralizing the abnormal acidity of the body fluids is accordingly undertaken whenever the reaction for diacetic acid is strongly marked in the urine (see below). Acetone and diacetic acid do not usually have any direct causative influence in the production of coma. They are present in large quantities in the urine whenever the albumin of the body is being destroyed, whether by reason of starvation or of poisoning of the tissues by ptomaïns. Acetone and diacetic acid may be present in the urine for weeks or months at a time and yet disappear entirely. On the other hand, when beta-oxybutyric acid appears in the urine, it is usually permanent and shows a lasting tendency to increase, and in most cases within a few days or weeks diabetic coma and death ensue.

The test for diacetic acid is as follows: A few drops of a strong aqueous solution of ferric chloride is added to a test tube full of urine. A deep Burgundy red shows the presence of diacetic acid. Normal urine is only slightly tinged by the brownish tint of the ferric chloride.

Acetone is present if, in a sixth of a test tube full of urine to which a crystal of sodium nitro-prusside has been added, a purple color is produced when we add NH_4OH to strong alkalinity and shake.

Treatment.—A year or two ago much hope was felt that through the use of pancreatic extract a specific etiological treatment for diabetes might be attained whereby the cause of the malady could be met and removed. That hope has proved unfounded and the therapeutics for diabetics still consists, as it has for so many years, in careful diet. Briefly stated the diet for diabetics is one as rich as possible in fats, which with proteids are expected to make up for the total exclusion of carbohydrates from the dietary. An intelligent diabetic sometimes asks what the purpose of this diet is. "It seems to me," said one such patient, "it is about as broad as it is long. Without treatment, I get no use out of part of my food, because it is passed out through the urine. But under your diet, I also get no use from this portion of my food, because I am not allowed to eat it at all. Why doesn't it come to the same thing?" For three reasons: 1. Because we hope, through giving a rest to the tissues which have to do with the burning up of the grape sugar, to re-establish

* See Schmidt's Jahrbuch for 1884, p. 88.

in these tissues their normal sugar-consuming power. Patients who have been altogether deprived of carbohydrates for weeks or months sometimes get back their power of absorbing carbohydrates so that their glycosuria ceases. 2. Because the symptoms which are rendering the patient's life miserable can in a great majority of cases be considerably relieved or abolished. The thirst, the torturing dryness of the mouth, the constant drinking and passing of water, the cutaneous infections are almost always relieved for a time and perhaps permanently. 3. We also hope to prevent the occurrence of complications such as phthisis, cataract, or gangrene which might prove fatal if the glycosuria were allowed to persist. Moreover, we cannot insist too strongly that the dietetic treatment of diabetes relies not merely on cutting off certain foods, but on prescribing an increased amount of certain other foods, *i.e.*, of fats. In diabetic diet lists there should be three classes of food: (1st) those that he *must* take, (2d) those that he *may* take, and (3d) those he *may not* take. To begin with, it is best to weigh out for the patient a two-ounce lump of butter; this amount he must eat each day in one form or another. It need not be weighed out each day if its bulk is approximately known. Next, we must insist that the patient must put cream on everything on which it is possible to eat cream. Salad dressing made with olive oil should be used as plentifully as possible with whatever green vegetables are taken, and sauces containing butter and olive oil should be eaten with fish of various kinds. Bacon, because of the large amount of fat which it contains, should form a part of every diabetic's dietary; with eggs it makes a good breakfast dish. Cheese, especially cream cheese, should be insisted upon, and with any meat the patient takes he should be advised to take as much fat as his appetite will allow him. Other foods which contain a large amount of fat are German sausage, mackerel, salmon, eels, and smoked ox tongue.

In the second group—the foods permitted, though not of as great value as the fats—come all the muscular parts of the ox, calf, sheep, pig, deer, wild or domestic birds, together with the tongue, heart, brain, sweetbreads, kidneys, and marrow bones. All of these must be served in their own gravy, or with mayonnaise, or some other non-farinaceous sauce. All kinds of fresh or dried fish, especially canned fish such as sardines and anchovies in oil, are of value. Shell fish such as oysters, crabs, shrimps, and lobster are allowable, although the liver of the oyster contains a small amount of sugar. Among vegetables only those that grow above ground are permissible, for example, lettuce, spinach, asparagus, cauliflower, cabbage, cucumbers, onions, watercress, Brussels sprouts, olives, sourcrout. Clear soups and broths can be thickened with eggs, marrow, or with cream. Among fruits sour oranges and peaches are allowable. The diet just described is what is known as strict diabetic diet, but we must always remember the aphorism of von Noorden: "Under all circumstances the diet in diabetes must be so ordered that the strength of the patient may be thereby maintained and as far as possible increased." If a diabetic diet does not produce this effect it must be modified. As a rule, we have to modify the regimen during some portion of each year, either because the patient cannot be made to adhere to the strict diet, or because he does not do well under it. It is a good rule, however, in all severe cases to subject the patient at least three times a year, and if possible four times a year, to a course of strict diabetic diet for at least four weeks. In the intervals restricted amounts of carbohydrates may be allowed. How much is to be allowed is to be settled by the temperament of the patient and by the effects upon the urine and general nutrition. It is often necessary to allow the patient one or two slices of white bread, or a quart of milk. In the mild forms of the disease, such as often occur in fat old patients, it is not always necessary to modify the diet at all. I have seen patients who got on apparently perfectly well for years, eating the while whatever they chose, but, as a rule, such patients come to grief in a year or two and are led to put themselves again in a physician's hands by the occurrence of thirst, polyuria, and emaciation, or by the presence of furunculosis or gangrene. In such cases, when we have once freed the urine from sugar by a few weeks of strict diet, we may experiment to discover what amount of carbohydrates the patient can tolerate without producing marked glycosuria. Many such cases will do perfectly well if sugar, pastry, rice, preserves, and dishes made from flour or flour preparations are forbidden. The patient may then be allowed to eat all the bread and potatoes he desires. If the amount of sugar excreted under this diet is not more than 10 or 20 gm. in twenty-four hours and if the patient does not emaciate rapidly it is not necessary to put him on any stricter diet. The treatment by exclusive milk diet (not skim milk) is useful in mild cases, but not applicable in severe ones. A manœuvre which is sometimes beneficial in severe cases is entire abstinence from food for a period of twenty-four hours. I have known this procedure to cause a long-standing and obstinate glycosuria to disappear for a time altogether, although strict diet continued for many months had not succeeded in producing this effect. The disappearance so produced, however, is not usually of very long duration.

Diabetic Breads.—The great majority of diabetic breads in the market are frauds and contain as much starch as ordinary wheat bread, or even more. Bread made from almond meal and eggs can be procured, but it is not usually palatable after a short time. The Soja bean flour, judging from the samples analyzed in Boston, is not trustworthy and often contains considerable amounts of starch. The best bread that I have seen used is made as follows: Take four ounces each of Graham flour and fresh bran (the latter should be obtained through a first-class apothecary and as fresh as possible). Mix with two eggs so as to make a thin batter, add a teaspoonful of baking powder, warm some gem pans and pour the batter in while the pans are warm; it will then rise and when baked make a fairly palatable bread containing about twelve per cent. of starch, and enabling a patient to get down much more butter than would otherwise be possible.

Alcoholic Beverages.—All German writers prescribe alcohol as an important part of the dietary of diabetics both for its calory value and as an aid to appetite and digestion. Thus, von Noorden, in his sample bill of fare for moderately severe cases, advises a glass of cognac for breakfast, one-half bottle Moselle for lunch, another glass of cognac for five o'clock tea, one-half bottle Burgundy with dinner, and another glass of cognac at ten o'clock. For those used to drinking wine with their meals and to consuming beer in the quantities habitually used by most Germans, this amount of alcohol is no doubt useful. In this country and among those not accustomed to the habitual use of stimulants, it does not seem to me advisable to prescribe alcohol in this routine way.

Exercise.—There is no question that muscular exercise is of advantage to many diabetics and that glycosuria is in many cases diminished by muscular work. Unfortunately this is not always the case, and it is only by experimenting that we can find out whether it is best to advise muscular exercise. Horseback riding, cycling, and rowing are of especial value. Exercise is best taken in the morning and followed by a long rest.

Care of the Skin.—We have already seen how frequent are cutaneous diseases in diabetes. These may be to some extent warded off by absolute cleanliness. Frequent changes of underclothing are absolutely necessary. A sponge bath morning and night should never be omitted and the genitals should be cleansed with particular care. No rule can be laid down regarding the temperature of the baths. Some diabetics react as well as healthy persons to cold bath; others do not. When a good reaction follows a cold bath, this is doubtless best.

Medicinal Treatment.—In cases in which nervous irritability is associated with the glycosuria, sedative drugs, such as the bromides, antifebrin, or suphonal, are indirectly beneficial through lessening the nervous irritability. I have never seen any good results from the use

of opium or codeine except in the last stages, when they may promote comfort to a certain extent by diminishing the polyuria.

Treatment of Complications.—All operations upon diabetic patients are dangerous, for the wounds heal badly and readily become the starting-point for wide-spreading gangrene. It is rarely well to open a boil, which should be treated, like furunculosis, by a strict diabetic diet. Carbuncles, however, must be operated upon despite the above-mentioned dangers. Ether is here much preferable to chloroform as an anæsthetic.

Should gastro-intestinal catarrh attack a diabetic patient, it may prove very serious if not speedily arrested. Complete starvation for twenty-four hours, and small doses of calomel followed by paregoric are useful. Stimulation with brandy every four hours should be kept up during the period of starvation. The treatment of pulmonary tuberculosis in diabetics is very unsatisfactory. Its occurrence may be a sufficient reason for a change of climate, but diabetics do not bear high altitudes well, and the main point in changing climates is to find one where the patient can be out-of-doors most of the time.

Treatment of Threatened Diabetic Coma.—When we have warning that coma is impending owing to the excretion of large amounts of diacetic acid in the urine, it is well to make some modification of the diet. Von Noorden says that the fact of a change seems to be more important than the direction in which this change is made. If the patient is upon a strict diet, there should be given a certain amount of carbohydrates; on the other hand, if he is taking carbohydrates in considerable quantities a strict diet should be resorted to. If constipation is present, it should be relieved by enemata or mild laxatives. Acting on the now fairly well-established theory that diabetic coma is an acid intoxication, it is worth while to give large doses of alkalies—for example, two drachms of bicarbonate soda every four hours with a bottle or two of Vichy water. If actual coma supervenes and it is desirable to keep the patient alive for a few hours in order that he may make his will, or await the arrival of a friend, the intravenous injection of a litre of three-per-cent. sodium bicarbonate in 0.6-per-cent. salt solution may be followed by a return of consciousness of sufficient duration to accomplish the desired result.

Richard C. Cabot.

DIAMIN, $2[(NH_2)_2H_2SO_4]$.—Hydrazin sulphate diamidogen. This is a powerful antiseptic made by heating diazoacetic acid with sulphuric acid. It forms colorless crystals soluble in hot water. *W. A. Bastedo.*

DIAPEDESIS.—Gould's Medical Dictionary defines it as "The escape of the elements of the blood, especially the white corpuscles, through the vessel wall."

The term is vague and needs modification. When first the phenomena of inflammation were watched under the microscope, and the migration of the white blood corpuscles from the uninjured vessels were followed into the injured tissue, diapedesis seemed a plain and simple process. When additional investigations demonstrated that the same phenomenon takes place in healthy organs, and merely goes on at a faster rate in pathological conditions, the process seemed less simple; and since it has been asserted that the white blood corpuscles are not of one kind, but of several varieties, and that their work is complex and manifold, the term diapedesis at present covers a series of different phenomena. At the outset we have to divide it into a passive and an active form, or into a mere mechanical and a vital process. The escape of plasma and red blood corpuscles through injured vessel walls is always the same, and is determined by the blood pressure and the extent of the injury: it is self-limiting and stops as soon as a clot is formed or as soon as the pressure in the tissues surrounding the injured part equals the blood pressure in the vessels. This is a simple mechanical process. The escape of the white corpuscles, on the other hand, is determined and limited by the work they are required to do, and varies as the conditions vary. Their escape through the vessel wall is not due to blood pressure, for why a certain definite pressure should drive out the white corpuscles when it leaves plasma and red corpuscles undisturbed is a query that waits for an explanation. We call the locomotion of the white corpuscle "amœboid movements," but have not yet fully accepted the theory that the execution of amœboid movements necessitates the other qualities of the amœba, *i.e.*, desire for food, ability to find, digest, and assimilate it, etc. From this point of view the travels of the white corpuscle are not mechanical, but we interpret them rather as an evidence of the vital activity of a series of cells which combine to work for a certain definite purpose, and perform their work or die in the attempt.

It is misleading to speak about physiological and pathological diapedesis. The latter represents merely an accelerated activity of the former; they differ from each other in quantity, but not in quality. In physiological conditions the white cells travel constantly from blood and lymph vessels into the surrounding tissues, but the work of these wandering cells is practically unknown, and what little we know is confined to the alimentary tract, where they aid in carrying fat globules into the circulation, travelling backward and forward until the work is done. Diapedesis becomes more active in many of those conditions which are not quite physiological nor quite pathological, such as the smoothing of sharp bony edges or the absorption of different forms of "lumps." Its activity increases rapidly when pathological conditions arise. In the repair of those wounds which we say 'heal by first intention,' the white cells leave the blood-vessels in large numbers, and aid, first, in the coagulation of the blood which unites the edges of the wound; after that they fill the wound completely, and while some provide the necessary nutriment for the connective tissue which is forming, the others find their way back again into the circulation by way of the lymphatics when their services are no longer required. When, however, bacteria or irritants have entered the wound, diapedesis assumes its most intense form. Masses of white corpuscles leave the vessels and, entering the tissues which surround the infection, they pack themselves so close together that they almost form a membrane which separates the healthy from the unhealthy tissues and prevents the infection from spreading. The white corpuscles which die in this struggle are found in the wound as pus corpuscles.

As long as our knowledge of the function of the white blood corpuscle is vague, our exact understanding of diapedesis will be more so, for the latter is determined by the former. As long as we have not even agreed whether the white cells in all their varieties are distinct histological units or different stages of development of a single type, we shall not be able to demonstrate that their activities outside of the vessel walls can be differentiated; and even after we have admitted that there are different kinds, we have still to find out whether one kind carries fats, another repels bacteria, still another absorbs bony edges, etc., etc. Indeed, careful researches into the life history of the white blood corpuscle in the circulation as well as outside of it will unlock many obscure phases of health, immunity, and disease; and as our knowledge advances, a revision of our nomenclature will accompany it. *Julius Pohlman.*

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DIAPHORETICS are those drugs and therapeutical agencies which promote perspiration. The name *sudorifics* is etymologically equivalent. As a class of remedies they find no place in the classification in various modern works on therapeutics. Their use in medicine is in full analogy with the natural or physiological process of perspiration.

Bearing in mind, then, the physiology of the skin, its thermotaxis and the functions of its sweat-glands, let us turn our attention to the practical utilization of these data in the treatment of disease. The *indications* for diaphoretics are found:

First, in their antipyretic action, especially in the early stages of specific fevers and acute inflammations of a not very severe type; their action being that of a revulsive in bringing the blood to the surface by the enlargement of the superficial blood-vessels and so relieving internal congestion, and possibly at the same time aiding in the elimination of morbific matter that has been retained in the system. Illustrations are found in acute nasal or bronchial catarrh, in muscular rheumatism, and in suppressed menstruation.

Second, to avail of the vicarious function of the skin in promoting absorption in acute or chronic nephritis with uræmia or suppression of urine. When there is dropsy, jaborandi or its alkaloid is the only medicinal diaphoretic of real value.

Third, to favor the passing off of diseases such as remittent malarial fevers which naturally terminate in a sweating stage.

Fourth, to help in the elimination of noxious materials from the blood, for there is evidence that besides urea in cases of renal diseases, sugar may be so removed in saccharine diabetes, lactic acid in rheumatism, and biliary products in obstructive disease of the bile passages (Wood).

Fifth, to relieve some forms of skin diseases, when the activity of the sweat glands is deficient.

The principal diaphoretics, as grouped by the writer of the article in the Edinburgh "Encyclopædia Medica," are warmth, hot drinks, jaborandi (pilocarpine), liquor ammoniæ acetatis or citratis, potassæ citras, potassæ nitras, ipecac (Dover's powder), opium, antimony (pulvis antimonialis or vinum antimonii), alcohol, salicin and the salicylates, various pungent and aromatic substances when taken into the month." Hare says that the only drugs we know to be direct stimulants to the sweat glands are pilocarpus and Warburg's tincture, which latter is, next to pilocarpus, the most powerful sweat producer we have. It might be considered that the group of drugs of which antipyrine and acetanilid are the well-known types, should properly be included among the diaphoretics, but it must be borne in mind that the chief action which they show is as antipyretics, while the promotion of perspiration, though often very noticeable, is a secondary result and may be checked by such drugs as atropine or agaricine, the fall of temperature meantime continuing (Cushny).

Individual Diaphoretics.—Heat applied externally, either dry or moist, is one of the readiest and most efficient means at our disposal, and its effect may be heightened by the use of hot drinks either mildly alcoholic or containing certain aromatics (ginger tea, hot whiskey punch). Many persons resort to the Russian (moist) or Turkish (dry heat) bath for the relief of attacks of muscular rheumatism, while as a domestic remedy the mustard foot-bath is constantly made use of in the onset of "colds," especially when accompanied by some fever. "The dropsy remaining after the earlier stages of acute nephritis," says Osler, "is best treated by hydrotherapy. In children the wet pack is usually satisfactory, and it is applied by wringing a blanket out of hot water, wrapping the child in it, covering this with a dry blanket, and then with a rubber cloth. In this the child may remain for an hour. It may be repeated daily. In the case of adults the hot-air bath or the vapor bath may be conveniently given by allowing the vapor or air to pass from a funnel beneath the bed clothes, which are raised on a low cradle. More efficient, as a rule, is a hot bath (temperature of 100° F., gradually raised to possibly 110° F.), after which the patient is wrapped in blankets. The sweating produced by these measures is usually profuse, rarely exhausting." It may be remarked that profuse sweating is rarely so exhausting as purging.

Jaborandi (pilocarpus), with its preparations and its alkaloid pilocarpine, stimulates the peripheral ends of the secretory nerves. They represent the most valuable drug of this class, for this diaphoretic may be used with advantage not only in the onset of influenza and in subacute rheumatic attacks, but also in both acute and chronic Bright's disease, in which it is found most efficient in removing the dropsical accumulation and with it the urea which has been held in solution. The effusions of recent pleuritis, hydrothorax, and ascites have been quickly removed by the drug. The fluid extract of pilocarpus may be given in doses of from ♏ xv. to xxx., or even ♏ lx., repeated once a day or once a week as required; while the alkaloid, which is less apt to nauseate, may be given hypodermically in doses of gr. $\frac{1}{60}$-$\frac{1}{4}$. The possibility of danger from its depressing action on the heart should always be borne in mind, especially when this drug is used in dropsy due to heart disease. According to H. C. Wood the effects of the drug may set in in five minutes after a hypodermic injection of pilocarpine and the sweat may amount to from nine to fifteen ounces by estimation. He recommends the following method of administration: "Give a dessertspoonful of a mixture containing pilocarpine muriate gr. $\frac{1}{12}$, antipyrine gr. v., Tinct. aconit. rad. ♏ i.–iij. Soak the feet in a hot mustard bath. Then put the patient to bed and give a teaspoonful of the mixture with a tumbler of hot lemonade or whiskey punch and repeat the pilocarpine mixture every twenty minutes till he sweats." Pilocarpine is much used as an ingredient of lotions to promote the growth of the hair, and its favorable effects may be due to the fact that it increases the action of the glands of the scalp. The following is a successful topical application in alopecia: ℞ Ext. fl. pilocarpi, fl. ʒ i.; Tinct. cantharid., fl. ʒ ss.; Lin. saponis fl. ʒ iiss. M. S.: Rub the scalp well daily. (Bartholow.)

Liquor Ammoniæ Acetatis (Spiritus Mindereri) is of very moderate utility and is little used except as a vehicle or in combination with other drugs such as aconite or ipecac. Nor is it necessary to say more of the *citrate of ammonia*, the *citrate of potassa* in the form of the neutral mixture or effervescing, or of *nitrate of potassa*.

Dover's Powder (Pulv. Ipecac. Compositus), representing in combination the two diaphoretics ipecac and opium, was the best-known and most serviceable diaphoretic drug prior to the introduction of pilocarpus. Its action is partly due to both these ingredients, the opium adding to the effects of the ipecac in dilating the vessels of the skin. Its action is gentler than that of pilocarpine. The dose for an adult is gr. x., or doses of two or more grains may be given at one time and repeated at suitable intervals of one hour or more. It has an established repute for the relief of acute catarrh of the respiratory mucous membranes—and it is efficacious in many other conditions in which an opiate is not contraindicated.

Antimony, in the forms of pulvis antimonialis (James' powder) and of vinum antimonii, was formerly much more used as a diaphoretic than it is to-day. Its action is that of a powerful depressant of the arterial circulation. It has a decided action in causing perspiration when given in doses of gr. $\frac{1}{2}$, but for this purpose it has of late years been superseded by pilocarpine.

Alcohol, in its various combinations in wines and beers and spirits, especially when the latter are drunk with hot water, stimulates the circulation of the skin and dilates the blood-vessels, thus leading to free diaphoresis. It may be used in considerable dilution as an adjuvant to other diaphoretic mixtures, as has been specified above. When taken to excess so that its narcotic effect is manifested, the diaphoresis which accompanies it is due, as in the case of opium and other narcotics, to the increased venosity of the blood.

Guaiacum, of which the best preparations are the simple and ammoniated tinctures, has had some rather questionable reputation as a diaphoretic. It is an ingredient of various anti-rheumatic mixtures, and perhaps the utility of some of them may be measurably due to its action on the skin as an aid to the removal of the morbific elements from the affected tissues. The dose is from fl. ʒ ss. to i. of either tincture. *J. Haven Emerson.*

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