other pharmaceutical agents.[1] The trials which I have made with these medicines on divers of my patients, both in hospital and private practice, have not given me such good results. I have not observed notable diminutions in the sugar, and I have seen, like Kamen, gastric troubles, and I believe there is risk in administering large doses of these phenols to some diabetic patients by reason of the bad state of their kidneys. To these medicaments we must add permanganate of potash, proposed some time ago by Sampson, of London, and which Masoin, of Louvain, has recently brought into vogue.[2] This permanganate of potash may have a good effect on diabetes of hepatic origin. Cantani has asserted the favorable action of lactic acid in the treatment of diabetes. He thinks that this acid favors the digestion of animal food and the organic combustions;[3] it is even, according to him, the unique medicine to give to the diabetic. As I have never advised the exclusive diet of the Italian physician, I have not used his pharmaceutical treatment. I cannot, then, give you any information on the employment of lactic acid. Ogles pretends that this medicament diminishes the quantity of sugar, but at the same time lessens the weight of the patient.

[1] Fürbringer has studied the action of different medicinal substances in diabetes. In the first rank he places salicylate of soda and phenic acid, which diminish notably the quantity of sugar eliminated by the urine.

Quinine, arsenious acid, pilocarpine and benzoate of soda have no influence either on the quantity of sugar or on the production of urea.

[2] Permanganate of potash was introduced into the therapeutics of diabetes by Sampson, of London. Masoin, of Louvain, made trials of it in 1875, and claimed good results. He explains the beneficial effects of permanganate of potash by the action which manganese exercises on the liver, which organ he believes to be the point of departure of saccharine diabetes. (*a*)

[3] Dr. Forster, in his "Contributions to the Therapeutics of Diabetes Mellitus," reports eleven cases of diabetes treated by the following medicaments:

Oxygenated water, ergot of rye, salts of potassa, opium, bromide of potassium, and lactic acid.

The oxygenated water gave no result; ergot of rye, in the form of extract, diminished the quantity of urine without diminishing notably the quantity of sugar; the salts of potassa carbonate and citrate had no effect; opium produced a diminution both in the quantity of urine and sugar; bromide of potassium caused also a diminution, but this was slight; lactic acid, in the dose of three drachms a day, diminished the quantity of sugar, and seemed to give good results along with a diet of skim milk. This is the way that Cantani administers lactic acid:

After each meal, *i. e.*, three times a day, the patient should take in six successive doses, half an hour apart, the following solution:

℞ Acid lactic, 2 grammes (ʒ ss).
Pure water, 120 grammes (℥ iv).

M. Sig.—Take ⅙ part for a dose as above directed.

He directs also to be taken, alternately with the alkaline waters of Vichy or Vals, a lactic acid lemonade, thus prepared:

(*a*) Sampson, Lancet, 1853. Masoin, on the Treatment of Saccharine Diabetes by Permanganate of Potash. Belgium, 1882.

Struck with the action of certain narcotics, such as opium, belladonna, valerian, on the quantity of urine voided each day, it has occurred to physicians to reduce the polyuria of the diabetic by the use of opium,[4] and it is on this principle that Willis, Rollo, and Tomasini have advised this medication. Diabetic patients, in fact, bear opiates well even in large doses, and you may note in some of them a diminution of urine and in the quantity of sugar, but this result is obtained at the sacrifice of the digestive functions and of the appetite. This is an evil which attends the use of a great many pharmaceutical preparations, and is to be avoided. To lessen the sugar in the urine by diminishing the appetite and troubling the digestive functions is to render a very poor service to the diabetic.

Valerian is more applicable to *diabetes insipidus* or polyuria than to saccharine diabetes. Trousseau has shown that under the influence of this medicament there is a diminution in the quantity of urine, on condition always of giving large doses, and he was in the habit of administering as much as an ounce a day of the extract. Ergot of rye acts also against polyuria rather than against glycosuria, and Huchard has recently shown the good effects which may be obtained from the spurred rye in *diabetes insipidus*.

Iodine and the iodides have also been employed in the treatment of glycosuria. Ricord, Berenger-Feraud, Rayer, and Seegen principally have exhibited the tincture of iodine in the dose of from twenty to thirty drops a day, and have seen the sugar disappear from the urine, but it is an irritant

℞ Pure lactic acid, 5 to 20 grammes.
Peppermint water, 20 to 30 grammes.
Spring water, 1 litre.

M. Sig. To be freely used as a drink.

Dr. Ogles has employed lactic acid in diabetes and noted a considerable diminution in the quantity of urine, but the patient lost his strength. (*a*)

[4] Opium has been given in the form of aqueous extract in the dose of 50 centigrammes, as in the practice of Christian, Ormerod, Schutenberger, and Pavy. Monez, Tomasini, and Kratchmer increase the dose to 3 grammes a day. There is not agreement as to the real action of opium in diabetes. Bouchardat thinks that it acts by promoting diaphoresis; Brouardel, by modifying the nervous system; Pecholier and Lecorché regard it as a tissue-sparing medicament, lowering the proportion of urea excreted.

[Codeia is much more generally used at the present day, especially in this country and in England. Dr. Pavy (Guy's hospital, Rep., 1870) was the first to recommend codeia as being signally efficacious in controlling diabetes without exerting the narcotic effect of opium or morphia. The proper commencing dose is gr. ss thrice daily, which may be gradually increased to gr. ij–iij. Dr. A. A Smith, at a seance of the Academy of Medicine, New York, 1882, reported in favor of treatment by codeia, having found it curative, in conjunction with perchloride of iron, in several severe cases. The dose of codeia was the same as that above mentioned. The dose of the tincture of iron was 20 drops three times a day. A laxative aloetic pill was given at bedtime.

In my own practice I have seen glycosuria often disappear under codeia, coupled with an animalized dietary régime.—TRANS]

(*a*) Ogles, Two Cases of Saccharine Diabetes Treated with Lactic Acid. Brit. Med. Journal, March, 1879.

medicament and fatiguing to the stomach. I pass rapidly over the chalybeates, phosphorus, cantharides, pilocarpine,[1] the juice of *cana-agria*,[2] to arrive, at last, to the consideration of the alkalies, arsenic, and bromide of potassium.

The alkalies are the most precious pharmaceutical agents in the treatment of diabetes, although we have no very clear explanation of their therapeutic action. Mihale having pretended that glycæmia depends on want of alkalinity of the blood was one of the first to recognize the utility of alkaline medication, but, as Becquerel and Lapezzuoli have shown, this is a mistake, for the blood of diabetic patients presents no modification in its alkaline reaction.

It is probable that in diabetes the alkalies have a complex action; they regulate the digestive functions, and energize the functions of nutrition (as shown by the researches of Hyades and Martin Damourette), in fine, it is possible that they have, as Coignard thinks, a direct action on the glycogenic functions of the liver.[3]

Many alkaline preparations have been prescribed; some, as Rollo, Willis, Fothergill, and Wat, have counseled lime-water; others, as Dur, Neumann, Barlow, Adamkiewicz, prefer the ammoniacal salts; Bouchardat and Pavy have especially advised the carbonate of ammonia.[4]

Potassa has also been exhibited, and Bouchardat, who cannot be too much cited when diabetes is under consideration, has proposed to substitute for the common salt in the ordinary dietary of the diabetic the potassic tartrate of soda, known as Rochelle salt. This preparation he considers superior to citrates of soda and potassa, which he was formerly in the habit of prescribing. He even advises the use of the Seidlitz salt in the preparation of diabetic bread.

[1] Hoffer has made trials of pilocarpine in diabetes in the form of subcutaneous injections. He noted diminution in the quantity of urine and of sugar.

[2] The juice of *cana-agria* is a popular remedy for diabetes in South America. Botanical data concerning this plant are wanting. Gubler, in doses of three ounces a day of this juice, observed diminution of sugar. (*a*)

[3] Coignard has studied the action of alkalies on the glycogenic function of plants and animals. He shows that when you water vegetables, such as beets and gooseberry bushes, with alkaline solutions you notably diminish the quantity of sugar which they contain.

He pretends to have arrived at complete suppression of the glycogenic functions by means of these waterings. He reasons that the same phenomena may take place in man when alkalies are taken internally. (*b*)

[4] Bouchardat claims good results from carbonate of ammonia, which he administers in large doses (as much as can be borne without vomiting) in rum and water. Dr. J. M. DaCosta's formula (Naphey's Medical Therapeutics, Geo. S. Davis, publisher), is as follows:

℞ Carbonate of Ammonia ʒ ij—ʒ iv.
Aquæ Cinnamoni ℥ vi.

M. Sig. A tablespoonful three or four times a day.

(*a*) Journ. de Ther., 1877.

(*b*) Coignard: "Alkalies may annihilate the glycogenic function in plants and diminish its activity in man." Journ. de Ther. 1880.

But the alkaline salt the most employed in the treatment of diabetes is the bicarbonate of soda, and here we must give the preference to the natural alkaline waters over the artificial waters, which fatigue the stomach, and cannot be borne for any great length of time. You will then order your diabetic patients to drink with their meals waters with but a moderate degree of alkalinity, say two or three grammes per litre, and there is nothing better than the Vals or Vichy waters.

Arsenic has these late years been much extolled in the treatment of glycosuria.[1] It has been supposed that arsenic, in modifying the constitution of the liver, modifies also the glycogenic functions, and the recent experiments of my colleague, Quinquaud, have shown that this medicament always diminishes in animals glycæmia, glycosuria, and glycogenesis. This is a fact of great importance, and shows us the advantages which may be derived from arsenical medication in diabetes. Fowler's solution is the best form to choose; of this you need not fear to give large doses, even twelve to fifteen and twenty drops, according to the tolerance of the digestive tube.

Arsenic is not the only metal or metalloid used in diabetes, iodine has been prescribed, and even copper and mercury, the first by Franck and Berndt, the second by Brera and Scott. Burq has even thought that his process of metallotherapy and metalloscopy has a field of usefulness in these cases.

The attention of the medical world has of late been called to the curative action of bromide of potassium[2] in diabetes by a very interesting communication by Dr. Félizet to the Académie de Médecine. Félizet has shown that in certain cases in following the dietetic régime of Bouchardat and the alkaline medication by bromide of potassium, one may free the urine entirely of the sugar which thus far has persisted in making its presence manifest.

This is a kind of treatment which was counseled by Beghie in 1866,

[1] There has been much discussion as to the value of arsenic in diabetes, good authorities claiming that it is beneficial—and among these Jaccoud, Foville, Lécorché; others, as Fürbringer, that it is wholly without effect.

Quinquaud performed a curious experiment. He gave to animals subcutaneous injections of twelve to fifteen drops of Fowler's solution, then he pricked the floor of the fourth ventricle, and a subsequent examination of the urine, the liver and the blood found a notable diminution in the quantity of sugar; when the dose is sufficiently large to produce poisoning there is complete disappearance.

The same phenomenon takes place in patients to whom twelve to twenty drops of Fowler's solution are daily given medicinally. (*a*)

[2] The treatment by bromide of potassium was first employed by Beghie who published four cases where the employment of bromide effected cure of the diabetes.

Forster, in 1872, repeated the experimentation and obtained equally good results. Bouchardat has also made use of bromide; finally, in 1878, Fürbringer experimented with it and obtained bad results.

In his communication to the Acad. Med , Felizet has called attention to the clinical facts and the facts of experimentation.

As for the clinical facts he has shown that in fifteen cases of diabetes, bromide alone or associated with the dietetic treatment of Bouchardat, and the employment of alkalies caused

(*a*) Lécorché, Treatise on Diabetes, 1877.

but which being tried anew by other physicians, had not given very favorable results. In the trials which I made in my service, and in the report which I presented to the Academy of Medicine on this subject, while recognizing the fact that bromide of potassium in the dose of one to two grammes a day may cause glycosuria to disappear, just as Félizet had announced, I showed that the use of this medicine is not without inconveniences. It depresses considerably the forces, and this depression is sometimes so great that the patient is not able to leave his bed. I think, then, that it is necessary to be very prudent in the administration of medicaments of this character, and reserve them for cases of diabetes of nervous origin, and for patients sufficiently vigorous to support such treatment.

The thermal treatment of diabetes is of preponderating importance, and the results which may be derived from it are based on the physiological effects of alkalies and arsenical salts in glycosuria. It is, then, to the alkaline and arsenical spas that you should send your patients, and you may utilize the alkaline waters of Vichy and of Carlsbad, or those of Royat and Bourboule if you desire especially for your patients the constitutional effects of arsenic.

I shall have finished this long enumeration of the means of treatment of diabetes when I shall have said a few words about the local treatment of diabetes by electricity, hydrotherapy, setons, and cauteries.

It was Semmola who, in 1861, first recommended the employment of constant currents upon the pneumogastric in the treatment of diabetes. Leidel and Prof. Leon Le Fort have obtained good results from galvanism.

Fleury has counseled hydrotherapy. I believe that it is necessary to be very careful in the use of this hygienic remedy, and not to employ it except when your diabetic patients are robust, and capable of vigorous reaction.

The same prudence should be exercised in the use of setons and cauteries. Butura and more recently Boutigny have noted cases of diabetes where complete disappearance of sugar from the urine followed the application of cauteries and setons in the region of the neck. But you should remember the danger of wounds (which do not readily heal) in the case of diabetic patients, and be extremely cautious about attempting treatment of this kind.

Such are the therapeutic rules applicable to the treatment of diabetes. Here the dietetic regimen is far the most important, all other modes of treatment being accessory means whose real value is often more or less debatable. But whatever this value may be, the combination of these means none the less constitutes an efficacious system of therapeutics, and without daring

the disappearance of sugar in diabetic patients. Since then he has observed fourteen new cases where he obtained the same effects. Herard and Dreyfusbrisac noted the same results. Dujardin-Beaumetz made trials of bromide of potash in three grave cases of diabetes without result except a considerable lowering of the vital forces of the patient. He recommends to employ this medicine with extreme caution.(*a*)

(*a*) Beghie, Edinb. Med. Journ., Dec., 1866.—Forster, British and Foreign Med. Clinic Review, 1872, p. 48.—Fürbringer, Deutsche Arch. Klin. Med., p. 469, 1878.—Dujardin-Beaumetz, Sur le traitement du diabete par le bromure de potassium, Acad. de Med, séance du 28 Aug., 1883.

to affirm, as some have done, that diabetes is to-day a disease easily and certainly curable, I believe that in a very great number of cases we can have a useful and real influence on the disease, and this is why I have devoted so much time to the consideration of these details.