come into general use. Thus far the bromide of potassium remains the medicament the most active and most employed in the treatment of epilepsy.

How shall bromide of potassium be administered? Although it has been attempted to introduce this salt by the hypodermic method and by enema, these tentatives have been promptly abandoned, and for the reason, as I told you when treating of diphtheria, that bromide of potassium has an irritant and even caustic action. We are then restricted to the alimentary canal as the only practical way of introduction, and when given it should be diluted with a considerable quantity of water; the dragees, granules, and compressed pills containing bromide should be discarded. I should add that when you are forced to increase the dose of this salt, as in epilepsy generally, you should require the patient to partake freely of milk, in order to avoid the gastro-intestinal irritation which results from the prolonged use of the bromide in large doses.

The quantity of bromide which ought to be administered daily is variable. From twelve to fifteen grammes a day have been given; the medium dose, in the majority of cases is eight grammes. This dose cannot be given from the first; you must begin with smaller doses, as one gramme morning and evening, and gradually increase the dose till you have obtained complete control of the disease. Voisin thinks that we should regard as the maximum dose that which determines abolition of the reflex sensibility of the pharynx. I believe that this is an excellent rule in the case of hysteria, but not in epilepsy, and that in this disease we must not only attain abolition of the pharyngeal reflex irritability, but we must, if occasion demand, push the administration of the remedy even farther, till we have stopped the attacks. But it is absolutely necessary to have a bromide preparation which is chemically pure, for Voisin has shown that the impurities of this salt considerably modify the therapeutical effects which it produces.[4]

These large doses of bromide, given for therapeutic effect, are not without

lepsy. It is given in pill form (10 centigrammes, from one to two grains), one to ten pills being given a day. It is not a good preparation for hypodermic injection.(*a*)

[4] The purity of the bromide salt is a point of capital importance. It ought especially to be free from the iodide. To determine the presence of iodide of potassium, dissolve the suspected salt in starch water, add a few drops of nitric acid, and if there be any iodide of potassium present you will obtain a blue color from the formation of iodide of amyl. Lambert's method is even more delicate. Dissolve the bromide in a solution of potassium permanganate; if the bromide is pure the solution keeps its violet color, while it takes a yellowish tint if there are any traces of iodine present. According to Adrian a chemically pure solution of potassium bromide when treated by HCl, should evolve a few bubbles of CO_2. Treated by one gramme of benzine, and a few drops of bromine water, it ought not to give a rose color. Treated by HNO_3 and nitrate of baryta, it ought not to turn yellow (Adrian: Researches on the Chemical Composition of Preparations of Bromide of Potassium, Bull. gen. de Ther., t. lxxvii., 1870; Lambert: How to Detect the Presence of KI in Bromide of Potassium, Bull. gen. de Ther., t. lxii., p. 503, 1867).

(*a*) Lawson, on Monobromide of Camphor (Practitioner, April, 1875). Deneffe, on Bromide of Camphor and its Therapeutic Applications (Presse Med. Belge., 1871). Bourneville, Comptes Rend, des Observations Recueilles à la Saltpetrierè (Progres. Med., 1874, Nos. 32, 33, 39, 43). Pathault, on the Physiological Properties of Monobromide of Camphor (Thesè de Paris, 1877).

danger. They determine in certain patients a train of symptoms which in some instances have been grave enough to cause death, and to which the name *bromism* has been given. Besides the inconveniences mentioned in my lecture on hysteria, and which are the acne eruption,[1] the disagreeable odor of the breath, the peculiar unpleasant taste of the saliva, there are certain nervous manifestations of a grave kind, such as I lately observed in one of my patients who had taken in one day thirty grammes (a troyounce) of bromide of potassium. These symptoms consisted in a remarkable depression of the vital forces. The patient could not stand, could not make the least movement without difficulty. Intelligence was impaired, and there was aphasia and amnesia.

This state, in which the patient is plunged into a most deplorable physical and moral brutishness, persists till elimination of the bromide by the various emunctories has taken place.

These inconveniences of the bromide treatment are again and again experienced by the epileptic patient, who finds himself often in a sad dilemma; either he must desist from the use of the remedy and see his fits come back, or persevere in the treatment, notwithstanding the depression of all his faculties and forces. Believe me, he will generally choose the latter as the lesser evil, rather than suffer those terrible attacks which are to the epileptic a menace always suspended over his head.

But it is especially in the delirium of action, which makes the epileptic a criminal without his knowing it, that it is necessary to employ the bromide in massive doses in order to overcome the mania which impels him, unconsciously, to deeds of violence. Nothing, in fact, is more curious than to see in the wards of our lunatic asylums men enjoying their intelligence and their reason who have committed, and would still commit, the most astounding murders, if their maniacal propensities were not kept in check day by day by immense doses of bromide.

How long should you continue the bromide treatment of epilepsy? Often a very long time, and even during the entire life of the patient. When, moreover, you have obtained the full benefit of the drug, and have witnessed complete cessation of the attacks, you must not leave off abruptly the medicine, but must keep on with it for several years, gradually diminishing the dose, as Legrand du Saulle has advised.[2]

[1] Auguste Voisin was one of the first to indicate the bromide rashes; he ascribes four different kinds of eruption to the action of bromide. The most frequent is simple acne. The second kind is characterized by reddish patches, appearing oftenest on the calf of the leg. The third kind resembles erythema nodosum. The fourth is a watery eczema.

Neumann, of Vienna, has studied microscopically portions of skin which were the seat of bromide eruption, and has shown that the bromine in being eliminated by the sebaceous glands, determines in these glands and their vicinity inflammations characterized by hyperplasia of the epithelial elements.

Guttmann has been more successful, and from acne postules, produced by the internal use of bromide of potassium, he has obtained on treating them with chlorine water and chloroform, the manifest reactions indicating the presence of bromine.

[2] His rules are as follows; We will suppose a case apparently cured. During the first year—fifteen days of each month with the bromide every day in the usual dose, and fifteen

Under the influence of bromide medication, thus carried out, we witness mitigation, diminution in frequency, then disappearance—first of nocturnal then of diurnal attacks; then the vertiginous paroxysms and the aura cease, symptoms which most resist the bromide treatment. These favorable results you will, as I said, obtain in one-half your cases. But you can often anticipate what will be the result of the bromide treatment by determining the cause of the epilepsy. Here Voisin (*d*) has given us valuable hints. The epilepsy which results from malformations of the cranium or cerebral tumors is rebellious to the bromide, while the functional and hereditary neurosis is amenable to this treatment. Sex has no influence one way or the other.

Such, gentlemen, are the leading indications and methods of the bromide medication in epilepsy. If not absolutely and certainly curative, this medication, nevertheless, represents a real therapeutic progress when we consider the unsatisfactory nature of the treatment of olden times. I ought to add, as an item of interest in this connection, that experimental physiology has confirmed ordinary clinical results; I allude to the recent curious experiments of Albertoni,(*e*)

days with the bromide every other day. In the second year—fifteen days of every month with the bromide every third day, and fifteen days with the bromide every day. In the third year—fifteen days of every month with the bromide every day, and fifteen days with the bromide every fourth day. In other cases (and this is now his habitual method), after the patient has gone one year without an attack, bromide treatment six days in the week. After fifteen months of freedom from attacks, bromide five days in the week. After eighteen months, bromide four days in the week. At the end of two years from the last attack, bromide only three days in the week, (Traitement et Curabilité de l'Epilepsie, by Legrand du Saulle).

(*d*) Voisin thus formulates the prognosis of bromide treatment, in accordance with the causes of epilepsy, basing his views on ninety-six cases which he has treated:

1. Epilepsy linked to a tuberculous inheritance, or to the presence of cerebral troubles as, for instance, when caused by traumatism, and malformations of the cranium, as well as when resulting from teething, is rebellious to bromide.

2. Epilepsy caused by menstruation, by mental and emotional troubles, or by alcoholism in the parents is difficult of cure.

3. Hereditary epilepsy was cured in four cases out of five. That caused by sudden fright; three cures and nine ameliorations; in three cases there was no improvement. Epilepsy following typhoid fever; four patients out of nine were benefited.

4. Sex has not the least influence on treatment. Masturbation provokes the return of the fits, and all the other accidents, and hinders the action of bromide. The chronicity of the epilepsy has no influence on the bromide medication. (*a*)

(*e*)Albertoni performed an instructive experiment on some animals to which he gave for several successive days large doses of bromide; he was unable in these animals to provoke epileptic fits by irritating the cortex cerebri, although in animals not under bromide influence, convulsions are easily and surely so produced; when he had previously subjected his animals to moderately toxic doses of atropia, there was no protection whatever against fits when the surface of the cerebrum was excited. (*b*)

(*a*) Voisin, on the Employment of Bromide in Nervous Diseases, Paris, 1875. Charles Simon, on Epilepsy, Divers Medications, Action of Bromide of Potassium on the Epilepsy of Insane Persons (Thesè de Paris, 1880).

(*b*) Albertoni, on the Action of Certain Medicaments on the Cerebral Cortex, with reference to the Treatment of Epilepsy (Arch. Exp. Path. et Therap., t. XV, p. 3 and 4).

who, after prolonged administration of the bromide to animals was not able to induce in them experimental epilepsy by irritating the cerebral cortex, although after giving atropine under like circumstances such convulsive attacks could easily be provoked.

Other remedies which act on the medulla oblongata, or on the muscular system, have been prescribed in epilepsy, such as picrotoxine,[16] bromide of gold,[1] curare (*g*), and nitrite of sodium (*f*).

Curare or wourari has been tried hypodermically in epilepsy by Voisin and Liouville; the effects are not sufficiently encouraging to warrant continued use of this medicament, notwithstanding the more recent trials of Edelfsen and Kunze. Picrotoxine,[2] the active principle of cocculus indicus, has been made

[1] Bourneville has given bromide of gold for a period of seven months to a certain number of epileptics; he gives it in the form of pills containing one centigramme (1/6 grain), of these, ten a day; he reports no favorable result from this treatment.

(*g*) Kunze employs curare in the treatment of epilepsy, and makes use of the following solution:

℞ Curare..... 0.50
Distilled water..... 5.00
Hydrochloric acid, one drop.

M. Digest twenty-four hours and filter. One third of this solution is injected every five days. If there is no amelioration at the end of the fifth injection, Kunze would abandon the treatment. Out of thirty-nine cases he has obtained nine cures. (*a*)

(*f*) Law has employed nitrite of sodium in epilepsy. He gave one gramme (15 grains) a day, and under its influence the fits disappeared. Nitrite of sodium acts like nitrite of amyl, and nitro-glycerine.

Henry Ralf has used the same medicament, and has found it useful in cases where bromide is without result, or badly supported. It would seem, however, from the report of the London Medical Society that the effects of sodium nitrite are not to be depended on. (*b*)

[2] Boullay was the first to extract picrotoxine from cocculus indicus. This substance (C^5 H^6 O^2) has been studied from a physiological point of view by Glover, Bonnefin, Brown-Sequard, Vulpian, etc. Glover affirms that this poison has a quite special action on the cerebellum and tubercular quadrigemina. Vulpian has shown that the convulsions which take place in animals poisoned by picrotoxine, are due to the excitant action of this substance on the anterior portions of the cerebro-spinal axis, and particularly on the medulla oblongata and pons. Varolli, Chiroine and Testa have obtained a true artificial epilepsy in employing picrotoxine. Moreover, according to Chirone, picrotoxine is not a pure alkaloid, and is composed of three other substances, which are picrotoxin, properly so-called, which is bitter and toxic; picrotine, which is bitter and not toxic; and anamirtine, which is neither bitter nor toxic. Planat, of Valorville, basing himself on the action of picrotoxine on the bulb, has counselled this substance under two forms; the tincture of cocculus indicus and solution of picrotoxine. The tincture is made thus:

(*a*) Bourneville, on Bromide of Gold in Epilepsy (Progres Medicale, Feb. 3, 1883, p. 87). Kunze, on the Treatment of Epilepsy by Curare (Med. Chir. Revue, Oct., 1881). Edlesfsen, on the Treatment of Epilepsy by Subcutaneous Injections of Curare (Berlin Woch., July 4, 1881).

(*b*) Law, on Nitrite of Sodium in Epilepsy, Practitioner, June, 1882. Reports of Medical Society of London, Nov. 28, 1882, and Bull. Gen. de Ther.. Jan. 30, 1883.

[There is no doubt that many epileptics are temporarily benefited by momentary inhalations of a few drops of nitrite of amyl inhaled from the palm of the hand or from a handkerchief. Taken during the aura it is often successful in averting a fit. Epileptic vertigo is also alleviated by it. It is not, however, a remedy to be much relied on.—Trans.]

the subject of study by Brown-Séquard, Glover, Bonnefin, Vulpian, and others. These researches show that picrotoxine has an elective action on the medulla oblongata, and may even determine a veritable experimental epilepsy. Planat has utilized this special selective action of picrotoxine in the treatment of epilepsy; I have myself experimented with it, but have not obtained favorable results except in alcoholic epilepsy—which will get well of itself if the patient will practice abstinence from alcohol. Vulpian has also tried it without success. Add that picrotoxine is very poisonous, even in small doses, and we ought to conclude that this medicament should have a very humble place in the treatment of epilepsy.

Finally, Huchard has recently advised the association of digitalis with bromide in the treatment of epilepsy, and claims good results from the combination.

Thus far we have been occupied only with the general or pharmaceutical treatment of epilepsy; it remains to speak of the hygienic treatment, and of that of the attacks.

If hygiene has not a preponderant part in the treatment of epilepsy, nevertheless it is not without influence on the production of the attacks. Here, as in hysteria, the question of marriage comes up for consideration. Ought an epileptic to marry? It is well to bear in mind, and to urge upon your clients, when they consult you in reference to the marriage of an epileptic, that epilepsy, with all its gravity, is not necessarily and fatally hereditary, and in giving this opinion you can fortify yourself by the authority of professor Lesègue, than whom no one is more qualified to judge on questions of this kind. In

℞ Cocculus Indicus..... 1 part.
Rectified spirits..... 5 parts.

M. Of this tincture two drops are given the first day, one morning and night, and the dose is increased each successive day till fifteen drops are taken morning and night. The solution has the following formula:

℞ Picrotoxine..... 0.03
Alcohol..... 10.00
Distilled water..... 110.00

M. The dose is one-half teaspoonful morning and night, and at the end of a fortnight the dose is increased to a teaspoonful.

Planat claims to have cured by this means many cases of epilepsy without ever exceeding a quantity of three milligrammes of picrotoxine a day. Dujardin-Beaumetz has obtained no results from it except in alcoholic epilepsy which may get well of itself.

Vulpian considers this kind of treatment as very dangerous, and he has seen no good from it. (*a*)

(*a*) Glover, Monthly Jour. of Med. Sciences, April, 1851. Bonnefin, Thesè de Paris, 1851. Planat, Physiological and Therapeutic Researches on Picrotoxine. Application to the Treatment of Epilepsy (Jour. de Ther., Nos. 10, 11, 12, 1874.) Cayrade, a Study of Convulsivant Poisons, Paris, 1866. Vulpian, Action Physiologique des Substances Toxiques, Paris, 1882, p. 623. Chirone and Testa, Experimental Researches on the Physiological Action of Picrotoxine (Union Med., May 21, 1881). Dujardin-Beaumetz, Soc. de Ther., 1875.

fact, Lesègue[1] denies the hereditary nature of epilepsy. This is a matter of considerable importance, and holding this view we are enabled to tone down somewhat the sombre colors in which such a union would otherwise be invested.

If continence does not play an important part, it is not the same with venereal excesses, which have a most decided influence in the production of attacks. Masturbation is most pernicious to epileptics, and destroys, in a certain measure, the effect of treatment by bromides.

Epileptics should live in the country and avoid crowded assemblies, political gatherings, concerts, shows, and the like. You must often have remarked that theatrical exhibitions are frequently interrupted by attacks of epilepsy, and this for the reason, principally, that the bad air and the heat of the apartments are deleterious to epileptics.

The alimentary regimen has a certain influence on the falling sickness.

[1] The affirmation of Lesègue is so important that we reproduce here the entire paragraph: "Epilepsy, a disease of evolution, is not hereditary. This proposition seems to have excited considerable surprise, which I scarcely comprehend, so little is there that is new about it. I hardly need defend so patent a fact, but perhaps something by way of comment may be appropriate. The formula of hereditary epilepsy, if such existed, would be that of inheritance generally. *Epilepticus autem genuit epilepticum* (the epileptic begets an epileptic). But statistics (and how numerous they are), have sufficiently proved that such direct begetting is the exception. Epilepsy so rarely transmits itself as never to have given rise to a popular saying of this sort (for which there would in fact be no justification), "to an epileptic father belongs an epileptic son." For a stronger reason a medical aphorism of this sort is inadmissible. In this respect epilepsy resembles deaf muteness by vice of development, and there is more here than simple coincidence. Must we conclude, then, that epilepsy, an autochthonous affection, arises by spontaneous generation, borrowing nothing from ascendants? Far from it. It is one of the diseases on whose genesis the health of parents has the most influence, but in an indirect, or as we might say, round-about way, as in the case of deaf muteness just referred to. There are very generally family diseases of a character kindred to epilepsy. The ascendants were neuropathic, at some time in their life manifested mental alienation, or at least were distinguished for eccentricity. There is, perhaps, a history of consanguineous marriages; the parents were given to debaucheries of every kind. The epileptic belongs to a race physically and intellectually degenerated, or he has brought this organic deterioration on himself. He has been given to alcoholic excesses, to low vices, to various degrading pursuits. Parallel with the inheritance of epileptic tendencies, we often find members of such families that are idiots, that are deformed, or otherwise unsound in mind or body. I have often been consulted as to the advisability of an epileptic marrying. The reply is easy enough, considering the incurability of the disease, and the gloomy future before the patient. Such marriages are not to be encouraged, but how is it with the children that may be born of them? What will be likely to be their future fate? Far be from me any denial of the disastrous consequences which may follow such unions. I only reserve for myself the right to deny as an absolute impediment to marriage, the probability of hereditary epilepsy. I cannot affirm with the same confidence that there will be immunity from other grave affections of the nervous system. Just as a neuropathic parent engenders, under certain circumstances, an epileptic child, so also the epileptic father may beget, according to the law of hereditary transformation, a healthy child, an idiot, a confirmed nervous invalid, or a lunatic. You would have to use the term in a sense different from the ordinary sense, to call these modes of transmission, or rather of influence, hereditary epilepsy.

First of all, the alcohols are themselves a cause of epilepsy, and you are not ignorant of the studies of Magnan as to alcoholic epilepsy, and in particular that form of epilepsy which is produced by absinthe;[1] it is proved that these nerve-excitants produce epilepsy in men and animals; you ought then to interdict the use of alcoholic beverages to your patients.

You ought also to advise a diet which shall contain nitrogenous substances in very sparing quantity. It seems, in fact, proven that a vegetable diet diminishes in a marked manner the number of attacks, while an azotized diet considerably increases them; the epileptic, then, should be strictly vegetarian. To sum up the rules of hygiene, the epileptic patient should live much in the open air, be very moderate in sexual indulgences, take a great deal of exercise, abstain from spirituous liquors, and live almost exclusively on vegetable food.

As for the treatment of the attack, it consists in placing the patient in a horizontal position, and loosening any part of his apparel which may cause constriction of the neck or thorax. It is generally customary to place some hard substance (as a clothes-pin) in the mouth of the patient to prevent biting of the tongue, a means which has not been very successful; the foreign body, if too resisting, breaks the teeth of the patient, and if too little resisting, is

[1] When spirit of absinthe is introduced into the stomach or veins, toxic phenomenare observed, which vary in intensity according to the dose. A small dose causes short, quick, convulsive movements, or shocks like battery discharges, affecting principally the neck and the fore limbs; the same dose determines a vertigo very similar to epileptic vertigo, but the resemblance is much more striking when larger doses are used. Then veritable epileptic attacks ensue, characterized at first by tonic succeeded by clonic convulsions; the animal froths at the mouth, the tongue is bitten, and there are involuntary evacuations of urine, of fecal matters, and of sperm. These attacks, which last several minutes, may be renewed at intervals varying from ten to twenty minutes or more. In the intervals of the paroxysms the animal seems dull and listless, and gradually comes completely to himself. Animals deprived of their cerebrum, like those that have not undergone this mutilation, experience epileptiform attacks under the influence of essence of absinthe. If section is made of the cord below the medulla oblongata, the epileptic attack shows two well-marked stages; you note first the tonic and clonic convulsions of the head with froth in the mouth, this may be called the bulbar attack; then ensue general convulsions of all the muscles of the body, with expulsion of urine and fecal matters, this is the spinal attack. In animals poisoned by essence of absinthe, one always finds, even at the commencement of convulsive accidents, a bright injection of the optic disk and dilatation of the pupil. This congestion is not limited to the retina, but affects the whole brain. In fact it is easy to observe when trephining of the cranium has been practiced in the first stage of absinthe poisoning, and in the commencement of the attack, a very intense congestion of the encephalon. In man the prolonged and daily use of absinthe determines a series of symptoms which have been designated and described under the name of absinthism, and which have been studied by Mottet, Magnan, Challaud, Lancereaux, Rodet, Smith, Voisin, etc. (*a*)

(*a*) Magnan: Epilepsie Alcoolique, Action spéciale de l'Absinthe, Compt. Rend, de la Soc. Biol., t xiii, Paris, 1869; Rodet: Troubles Caused by the Abuse of Alcohol and of Absinthe. Gaz. Méd. de Lyon, t xvi, pp. 590–592, 1864; Dujardin-Beaumetz: Art. in Absinthe, in Dict. de Ther., 1882. John Mersin: Influence of Food and Hygiene in Epilepsy, West Riding Lunatic Asylum Med. Reports, 1875; Bourneville et Ollier: Recherches sur l'Action physiologique du Bromure d'Ethyle dans l'Hystérie et l'Epilepsie, Gazette Méd. de Paris, No. 35, 1880; Bourneville: Du Nitrite d'Amyle dans l'Epilepsie, Soc. de Biol., June, 1875.)

liable to be bitten off in the struggle, and to find its way to the throat or windpipe of the patient, causing suffocation.

Certain measures have been advised to prevent the convulsive seizures, such as the energetic flexion of the great toe, compression of the temporal regions, of the infra-occipital hollow, etc. Others have counselled by various compressions to prevent the aura from spreading; Rozier has even devised a special instrument for this purpose. All of these means are only of use in certain exceptional cases where the epileptic has premonition of his attack by sensations of aura which precede the convulsive seizure by a brief interval. It has also been proposed to employ during the paroxysm, hypodermic injections of apomorphia,[1] inhalations of bromide of ethyl, and nitrate of amyl. Bourneville has given us some interesting facts relating to the two last medicaments but these inhalations have not come into general use.

This finishes what I deemed important to say relative to the treatment of epilepsy, and the beneficial influence of therapeutics in this terrible disease. In the next lecture I shall consider chorea and its treatment.

[1] Vallander, of Brauweiler, has in three cases arrested epileptic attacks preceded by an aura, by subcutaneous injections of apomorphine. He is in the habit of injecting subcutaneously, a minute dose (not exceeding a twelfth of a grain) of apomorphia. The injection does not cause vomiting, though it produces a little nausea.(*a*)

(*a*) Vallander, on Cutting Short an Epileptic Fit by Subcutaneous Injections of Apomorphia (Berlin Klin Wochens. No 14, p. 185, 1877).