ON THE WOORARA OR WOORALI POISON (CURARE), AND ITS EMPLOYMENT AS A REMEDY IN TETANUS.

This extraordinary poison has of late attracted the attention of medical men with a view to its being rendered serviceable in some classes of nervous disease. M. Vella, the surgeon in charge of one of the divisions of wounded troops in the Hospital of Turin, founding upon the peculiar influence of the woorara or woorali poison (curare) on the motor system of nerves (Cf. Bernard and others), and on the fact of this substance and strychnia not merely producing symptoms of a diametrically opposite character, but of these two poisons being mutually capable of rendering each other inactive, assumes that its use might be attended with considerable advantage in cases of tetanus; and the results of his experiments he has published as having already gone far to confirm his views on this matter. Again, Drs William A. Hammond, of the U.S. army, and S. Weir Mitchell, lecturer on physiology in the Philadelphia Medical Association, have published, in connection with the same subject, "Experimental Researches relative to Corroval and Vao—Two New Varieties of the South American Arrow Poison." This paper has been published in the American Journal of the Medical Sciences; and from the information and details afforded in both of these articles, the subject appears to be one of so great interest, and the benefits suggested as derivable from a better acquaintance with it than at present generally exists, so important, that in our present number we devote a somewhat greater space than ordinary to its perisopic discussion.

The earliest introduction of woorara or woorali to the notice of scientific men of civilized countries seems to date from Sir Walter Raleigh's return from the discovery of Guiana. In the Discoverie of Guiana, printed for the Hakluyt Society, the following statement is to be found:

"There was nothing whereof I was more curious, than to finde out the true remedies of these poisonous arrows; for besides the mortalitie of the wound they make, the partie shot indureth the most insufferable torment in the world, and abideth a most ugle and lamentable death, sometimes dying starke mad, sometimes their bowels breaking out of their bellies, and are presently discoloured as blacke as pitch, and so unsavoury as no man can endure to cure or attend them, and it is more strange to know that in all this time there was never Spaniard, either by gift or torment, that could attaine to the true knowledge of the cure, although they have martyred and put to invented torture I know not how many of them. But every one of these Indians know it not, no, not one among thousands, but their soothsaiers and priests who do conceale it and only teache it but from the father to the sonne."

The precise source of this poison, here no doubt somewhat exaggerated in its effects, appears to have been all along, as it still continues to be, very doubtful. That it is a vegetable poison, seems almost certain, although, according to some authorities, its constituents include decomposing animal matters; and among such ingredients, one writer speaks in high terms of the virulent properties possessed by the flesh of red-haired Spaniards. (De la Vega, History of Peru.) It would, however, be neither profitable nor instructive to enter upon the various receipts given for its preparation—some of them being evidently erroneous; while the mode of preparation, as well as the composition and ma-
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terials of such hell-broths as we find frequently alluded to, are absurd and often unintelligible. The warracobba corra, the coranapi baketi, hatchybal, labarri and corra-conchi snake-fangs, leaf funnels, Indian pots, poisonous ants, and strong peppers, are only a few of the items necessary for their correct preparation, and any accurate knowledge of such materials it is difficult to obtain. Indeed, it is probable that the poison known as woorara differs to a considerable extent among different tribes of Indians; nor does it seem to be any impossibility that even entirely dissimilar substances may under this name produce death, if that is all that is wanted, with similar symptoms and equal rapidity. And this forms one strong argument against the proposed use of substances merely denominated by this name, or their being rashly or indiscriminately admitted as remedial agents; the varied symptoms and effects produced in poisoning by different specimens of woorara being, almost of itself, a fact sufficient to indicate its non-uniformity of composition. Among later writers, Schomburgk states, that the principal ingredient in this poison is the bark of the *strychnos toxifera*, and that the concentrated extract of this bark alone is capable of speedily proving fatal. (Reisen in Britisch Guiana, Leipzig 1847.) This opinion is derived apparently from observation in Guiana. But, on the other hand, we find Tschudi, in his work (Travels in Peru, London 1847), asserting, that among the Indians of Peru, *animal poisons* enter into the composition of woorara; so that, taking such facts into consideration, we cannot avoid seeing the great uncertainty, if not total ignorance, prevailing in regard to the true nature of woorara poison, properly so called; and before we should be justified in admitting it as a remedy for general employment in tetanus, even should the limited experience and success of M. Vella and others demonstrate its efficacy there, we would require to be much more conversant with the substance itself, and the different varieties of it which exist.

Regarding the physical and chemical properties of woorara, Bancroft, in his *Natural History of Guiana*, Heintz in Schomburgk's work, Dr Brainard of Chicago, and Dr Green of New York, have afforded much interesting information. Dr Brainard supposes that the venom of some reptile or reptiles enters into its composition; but Dr Green doubts this; and, as the authors of the article before us in the *American Monthly Journal of the Medical Sciences* remarks, it seems highly improbable, after the process undergone by woorara in its manufacture, that its activity could be due to any animal poison, as it is scarcely possible for such a substance not to be materially altered in its properties by the mode of preparation.

One of the best analyses of this substance is that of MM. Roulin and Boussingault, who in the *Annales de Chimie et de Physique*, tome xxxix., 1828, p. 24, give an account of their chemical examination of a specimen of woorara obtained from the Rio Negro:—It was a solid extract, black, of a resinous appearance, of a brown colour when reduced to powder, and of an intensely bitter taste. This bitterness was unaccompanied by acridity or sharpness. It burned with difficulty, and in consuming gave off no odour of organic nitrogenous substances.

It was but slightly soluble in sulphuric ether, more so in alcohol, forming a beautiful red and very bitter tincture. In water it was soluble to a considerable extent, forming an intensely bitter infusion, of slight acid reaction to litmus paper.

By further investigation, MM. Roulin and Boussingault arrived at the conclusion that no strychnia was present. They, however, obtained an alkaline principle soluble in water, for which the name of *curarin* has been proposed. This substance they obtained by the following procedure:—

The woorara was reduced to powder, and treated repeatedly with boiling alcohol. The alcoholic extract was evaporated, and the residue treated with water, which dissolved the active principle, leaving nothing but a little resinous matter. The aqueous solution was then decolorised by animal charcoal, and treated with infusion of galls. A beautiful whitish-yellow flaky precipitate was thrown down.
The precipitate thus obtained was well washed, heated to ebullition in water, and dissolved by the addition of oxalic acid. The acid liquor was then supersaturated by magnesia and filtered. It was again evaporated to dryness, and the residue dissolved in alcohol. This solution was concentrated and spontaneously evaporated to a syrupy consistence. In was then further concentrated by evaporation in vacuo.

Thus obtained, the curarin was a solid transparent mass, of an excessively bitter taste, and possessed in an eminent degree of all the virulence of the woorara. It was not crystallizable, was of a pale-yellow colour, and strongly attractive of moisture from the atmosphere. It formed salts with sulphuric, nitric, hydrochloric, and acetic acids, none of which were crystallizable.

MM. Roulin and Boussingault are of the opinion that the normal acid of the woorara is the acetic.

The results of their examination were subsequently confirmed by MM. Pelletier and Petroz.1

The experience of all the earlier writers on this poison, along with that of many subsequent observers, tends to show, that death occurs not so much from any direct effect of the substance itself, as from the cessation of the respiratory functions induced by the paralysis consequent upon its absorption, as not a few instances are on record of life being prolonged, or even restored, by perseverance in keeping up artificial respiration. Whether this depended altogether on an annihilation of mere muscular irritability, or on effects confined to the nervous system, seems doubtful. Vulpian, along with MM. Bernard and Pelouze, believe that the nerves very soon lose their irritability, while that of the muscles remains for a considerable time. Kolliker ("Physiologische Untersuchungen über die Wirkung einiger Gifte." Virchow's Archiv, Zehnter Band, 1856, S. 83 et seq.), in regard to this investigation, comes to the following conclusions:

He found that the woorara acting through the blood destroyed the excitability of the motor nerves, the terminal branches losing their excitability in a few minutes, whilst their trunks did not become affected for an hour or two later. He is of the opinion that the sensory nerves are little if at all affected.

When introduced into the system through the mucous membrane of the intestinal canal, Kolliker found the woorara to act more slowly than through a wound, and that a larger dose was required. When applied to the skin of frogs, he found it altogether inoperative.

With reference to its effect upon the heart, it was determined that in amphibia this organ was but little influenced, as it continued to pulsate for many hours after poisoning was established. Owing to paralysis of the pneumogastric nerves, it was somewhat quickened in its action. He concludes, therefore, that the ganglia remain unaffected. The lymph hearts soon ceased to move.

When applied locally to nerves, woorara in concentrated solution was found to extinguish their excitability, but only after a considerable time. Applied directly to the brain and spinal cord, it was altogether without effect.

The conclusions in regard to the effect of woorara upon the sensory and motor nerves, though published before those of Bernard2 on the same point, are similar to those which the latter had previously announced in his lectures.

Bernard (Comptes Rendus, tom. xxxi., 1850, p. 4 et seq.) seems to have concluded—

1st. That all reflex movements cease a few minutes after poisoning. The heart continuing to beat for a considerable time.

2d. That woorara is not absorbed from the mucous membrane of the stomach during digestion, bladder, or from the conjunctiva of mammals, but is readily taken up from the pulmonary and rectal mucous membranes of these animals.

1 "Examen Chimique de Curare," Annales de Chimie et de Physique, tom. xl. 1829, p. 213.

2 Leçons sur les Effets des Substances Toxiques et Médicamenteuses.
When introduced into the oesophagus or gizzard of birds, it is speedily fatal. Applied to the dry skin of frogs, it acts slowly but surely. In contact with the wet skin of these animals, it is not absorbed.

3d. Woorara abolishes the function of the motor nerves, but does not affect that of the sensory nerves. Muscular irritability is rather augmented than diminished.

4th. That woorara kills the nerves from the periphery to the centre, acting in this respect conversely to strychnia.

5th. That it causes death by arresting the process of respiration, thus inducing asphyxia.

These observations, along with those of Prof. E. Pelikan of St Petersburg (Comptes Rendus, t. xliv., 1857, p. 507), bring up the researches in the composition and effects of the wooral poison to the period of the newer observations of the authors under notice.

The woorara recently investigated by Drs Hammond and Mitchell is of two kinds:—one, the "Woorara, variety Corroval;" the other and less powerful, the "Woorara, variety Vao." Both these varieties are new to inquirers in this matter, and seem to be dissimilar in their nature to any yet described. The corroval, when in lumps, is of a brownish-black colour, and similar in appearance to vegetable extracts of the same colour. Experiments on animals show that it is equal in virulence and rapidity of action to the strongest woorara as yet known; but it differs from other kinds, inasmuch as, while we have seen that the heart's action is not destroyed at the first in the cases already described, the corroval acts at once and primarily upon this organ. From this and other circumstances it is therefore inferred, that the ganglia are powerfully influenced through the action of this poison, and that paralysis of the sympathetic nerve occurs. Muscular irritability is ultimately lost, and cessation of the capillary circulation also takes place even before the ventricles cease to act. The woorara experimented on by Bernard and Kolliker was found immediately to destroy the excitability of nerves, while that of the heart and muscles was for a time unaffected. The corroval, to be brief, may be described as differing from any hitherto known variety of woorara in the following particulars, namely:—

1st. It differs essentially from any variety of woorara hitherto described, both in its chemical constitution and physiological effects.

2d. It acts primarily upon the heart, through the medium of the blood, producing an arrest of the action of this organ.

3d. The annihilation of voluntary and reflex movements is a secondary result of its action, depending primarily upon the discontinuance of the function of the heart.

4th. It acts upon the nerves from the periphery to the centre, and abolishes both the sensory and motor functions.

5th. It destroys muscular irritability.

6th. It paralyzes the sympathetic nerve, this being one of its primary effects.

7th. It is absorbed both from the intestinal canal and skin of frogs.

8th. Its poisonous qualities are due to an alkaloid hitherto undescribed.

Vao, or Bao, the second variety of woorara experimented on by Drs Hammond and Mitchell, resembles in appearance the corroval, and seems to be merely a weaker variety of that substance; and any apparent difference in effects may also be due to this difference in strength. Both these poisons are more deadly agents than any woorara hitherto known to us, inasmuch as no antidote to their effects is believed to exist. De la Condamine, M. Hériassant, Schomburgk, Bancroft, Osculati, and others, have reported that sugar, or a mixture of sugar and salt, is used by the Indians to counteract the effects of woorara; Drs Brainard and Green were led to consider a mixture of iodine and potassium as an antidote; and we have seen that in Kolliker and Bernard's experiments, as well as those of Waterton (Wanderings in South America), artificial respiration maintained for some time might save from the fatal effects of the poison. But in the case of neither corroval nor vao will these avail, since, so far as has been as yet ascertained, no antidote exists for either poison.
And another point of difference between them and other varieties seems to be, that while M. Bernard found that the motor or efferent nerves were the first affected by ordinary woorara—the animal being in the same condition as if the motor roots were cut—vao and corroval apparently act, first upon the sensory, and then upon the motor function of the nerves; and last of all, upon the independent irritability of muscles. M. Bernard, having investigated the woorara recently introduced, considers that this new variety may owe its peculiar properties to a species of upas employed in its preparation.

Having thus given an account of these extraordinary poisons in their chemical and physiological constitution and action, and in all their better known varieties, we may be better prepared to consider the probability of their advantageous employment in medicine. So far as can be judged, it appears a somewhat critical matter to prescribe a remedy so powerful without knowing what it consists of, or that its composition is uniform in every case, or even that its ingredients are at all the same; not to speak of the discrepancy of opinion regarding, or rather our ignorance of, the exact manner in which its fatal effects are produced.

M. le docteur Vella, however, relying upon the researches and observations of M. Claude Bernard on the Woorara or Curare, has not hesitated in its application as a remedial agent.

Previous to Drs Hammond and Mitchell's investigations, the opinion of those who had examined this substance on the Continent, and elsewhere, as well as that of M. Claude Bernard, was, as we have said, that in all instances the action of this poison, the woorara, was due to its leading to paralysis of the motor nerves; and that in its energy it resembled strychnia or even prussic acid, although not on this account deserving to be excluded from the materia medica. Starting on such a theory, M. Vella thought of employing it as a remedy in cases of individuals attacked by tetanus. His position as surgeon to the French military hospital at Turin, enabled him to do so; and of one case the following account is given:—A sergeant in the 41st regiment of the line, wounded at the battle of Magenta, June 4th, was admitted to the hospital on the 10th of the same month; his injury being fracture of the first metatarsal bone, with laceration of the tendons and adjoining soft tissues. The ball by which he had been struck was still lodged in the parts; on the 13th it was extracted, with much relief to the patient. On the 18th he was so well as to be allowed nearly full diet; but on the 16th he was attacked with stiffness about the neck, difficulty of moving the jaw, and some transient convulsive symptoms. On the 17th matters were somewhat worse, and on the 18th general tetanus had supervened. After opening up the wound, M. Vella resolved to wash it with a solution of curare in the proportion of eight centigrams to forty grammes of water. Three-quarters of an hour after the first application the symptoms had disappeared, and the patient was able to sit up in bed. Again, however, the tetanic spasms made their appearance, and again in from half to three-quarters of an hour after applying the solution of woorara they were abated. These alternate attacks, and their cure by the woorara, continued to go on for some days; each time the remedy was employed being succeeded by immediate muscular relaxation. Wishing to obtain a larger absorbing surface, M. Vella applied successively two blisters to the internal surface of the thighs; this was at a later period of the cure. On the 10th of July the patient rose for the first time, and experienced no tendency to convulsions; and a few days later he was completely cured, and preparing to return to France.

M. Velpeau, in referring to this case, remarks that it might possibly be merely one of those spontaneous cures of tetanus which are occasionally met with, and which have led to much disappointment in reference to so-called remedies for this disease; and that before concluding that the use of so dangerous a substance was judicious even if serviceable, more than one solitary example of its employment would require to be brought forward.

M. Bernard thinks otherwise: he is disposed to believe that the cure was
here due to the woorara; and as for any danger in the proper use of that material greater than attached to atrophine or strychnine, he does not consider such to be the case.

MM. Serres, Cloquet, Rayer et Jobert de Lamballe, agree with M. Bernard, and think that in a case so desperate as tetanus they would be justified in attempting a cure with woorara. The fact that the disease had been recovered from in the manner it was, seemed to warrant further trial of the treatment.—cautions as such trial no doubt would require to be.

Since the occurrence of this case, two others have afforded opportunities for testing the powers of this remedy. M. Manec, at the hospital of La Charité in Paris, has employed the curare unsuccessfully, while M. Chassaignac has reported to the Société de la Chirurgie its successful employment by him in a case of emprosthotonos. M. Manec’s case was that of a man who, on the 6th of September last, sustained an injury of the shoulder by collision with a carriage. On the 9th tetanus commenced, and on the 10th had assumed a very violent form. M. Manec, assisted by M. Vulpian, whose investigations in the subject we already noticed, decided upon trying this new remedy, and about 2 o’clock made a slight incision in the left arm of the patient, and applied to the wound two drops of a solution of woorara, in the proportion of half a millegramme to the drop; shortly afterwards, a drop containing one centigramme of the woorara was introduced in a similar manner. This was repeated, and about 4 o’clock a granule of pure woorara, about two centigrammes, was introduced, and repeated about 5 o’clock; some minutes later, five drops of a solution of woorara, twenty centigrammes to the gramme of water, was injected into the cellular tissue near the muscles most affected. The patient had thus absorbed about five centigrammes of the poison, yet no apparent effect had been produced. About 6 o’clock another injection of the same kind was made, and about 8 o’clock a third, representing more than five centigrammes exhibited; not the slightest remission of the symptoms, however, was produced, and the patient died, slightly delirious, between 10 and 11 at night.

M. Chassaignac’s case was that of a young man 24 years of age, who had, on the 1st September last, sustained a gunshot wound of the foot. It was not for fifteen days afterwards that tetanic symptoms appeared. On the 19th September, however, these had gone on, till the accession of severe emprosthotonos induced M. Chassaignac to try the effects of curare. A table-spoonful of a mixture of ten centigrammes of woorara in 100 grammes of julep was ordered to be taken every hour, and the wound to be washed every two hours with a solution of twenty centigrammes of the woorara in 200 grammes of distilled water. The first spoonful was given at 7 in the evening of the 19th, and the wound washed as directed at the same time. Eight hours afterwards the symptoms began to be ameliorated; and although they recurred once or twice during the course of cure, this patient, after all the while being assiduously kept on the woorara in greater or less doses, had completely recovered by the 7th of October.

This case again M. Velpeau suspects to have been a spontaneous cure. He along with MM. Legouest and Verneuil, doubts whether after all that had been shown regarding the inactivity of woorara when administered by the stomach, any effect could have been produced by the exhibition of it in this way, as had been adopted by M. Chassaignac. It also seemed to them difficult to ascertain how far the recovery could be attributed to absorption of the woorara when only applied to a wound already advanced in cicatrisation, still secreting pus, and gradually diminishing in extent,—the only method of adequately testing the power of the remedy being, in their opinion, its injection into the subcutaneous cellular tissue.

MM. Bouvier, Broca, and Martín Magron, consider that the curare is not inactive when introduced into the stomach, especially during fasting; but that it is less energetic than when introduced into the subcutaneous cellular tissue. At a recent meeting of the Société de Chirurgie, the conclusions come to regard-
ON THE IODIDE OF THE CHLORIDE OF MERCURY IN THE TREATMENT OF SKIN DISEASES, AND ESPECIALLY OF CUPEROSE AND ACNE. BY M. AL. DÉVERGIE.

This preparation, which possesses very powerful properties, was introduced by M. Boutigny, about fifteen years ago, for the treatment of cuperose, acne, and other skin diseases which are very obstinate, and often irremediable by ordinary means. In these cases, it is looked upon by many as a specific; but its chemical composition and therapeutic effects have not been studied with sufficient accuracy. The action of iodine on protochloride of mercury was first investigated by Planche and Soubeiran (Journal de Pharmacie, t. xii., p. 651); the product which they obtained presented powerful escharotic properties. By varying the proportions of iodine and of protochloride, however, different compounds may be formed; and chemists have now ascertained that the so-called iodide of the chloride of mercury is not a definite chemical substance, but is a mixture of the chlorides and iodides of mercury, and generally consists of the bichloride and biniodide of mercury along with the protochloride. Such appears to be the composition of the substance manufactured by M. Boutigny, who, however, keeps his process secret. M. Dévergie recommends the process of M. Danneey, as yielding a product similar to that of M. Boutigny. Equal equivalents of iodine and bichloride of mercury are employed, dissolved in alcohol, which retains a great part of the bichloride in solution, and the salt which separates (iodide of the chloride) in this case consists of a large proportion of biniodide, and a very small quantity of the bichloride, mixed with an excess of calomel. Prepared in this way, the iodide of the chloride, like that furnished by M. Boutigny, is much less violent in its action than either the biniodide or the bichloride alone would be in the same dose.

M. Boutigny employs his preparations externally in the form of ointment, internally in the form of pills or syrup. The formula of the pommaide de Boutigny is, Axunge 51., iodide of the chloride of mercury 12 grains—but more recently he has increased the proportion of the iodide of the chloride to 16 grains—and the ointment, of this strength, is now usually employed. The pills contain about 1-5th grain in four pills.

When applied to the skin, this ointment usually produces, after the second or
third application, a feeling of heat and smarting, which lasts during most of the night if the pommade is used in the evening. Next day, if the pain has not been severe, the skin is merely reddened; but if the irritant action has been fully developed, the red surface is covered by an immense number of minute serous vesicles, which quickly dry up, leaving an epidermic crust. In most cases, the inflammation which is excited subsides rapidly, so that the application of lard or cold cream, for four or five days, allows the skin to return to its natural condition. Such are the usual results, but the effects, of course, vary with the strength of the preparation and the degree of sensibility of the skin; circumstances which must be attended to in the treatment of different cases. M. Devergie's mode of application is to spread the pommade, in very thin layers, uniformly over the skin by means of gentle inunction with the point of the finger for about one minute; this is repeated every twenty-four hours for two, three, rarely four days, and then stopped; the inflamed surface is next covered with lard or starch powder for three or four days, till the excited action subsides, and the application of the ointment is then renewed as before. This treatment is continued for five, six, or eight months, or even one or two years in case of relapse. It is the general opinion, that to obtain a complete cure, the application must be repeated till the strong ointment, containing 16 grains of the iodide of the chloride, ceases to exert any action on the skin; but M. Devergie considers the cure established when the skin is clear of eruption, and the ointment produces only a third or a fourth of its previous effects. It is especially in couperose, a disease always difficult and sometimes impossible to remedy by ordinary means, that the iodochloride ointment exhibits the most remarkable effects. When the disease has not reached the tuberculated stage, it frequently cures it, without requiring so long as six or eight months of treatment. M. Devergie relates a striking example of this in the case of an actor, who, in consequence of intemperance, had his face so blotched and disfigured, that even with the assistance of paint, he could not venture to appear upon the stage, and had to give up his engagements. In a few months he was completely cured. Although the cases are not always so satisfactory, M. Devergie strongly recommends the use of the iodide of the chloride in pommade as generally a very successful means for the treatment of couperose. In acne, generally, it does not always suit. It succeeds least in A. sebacea and punctata, A. indurata yields most easily, and next to it A. miliaris. The acne rosacea does not usually require this treatment at all. In all these forms of acne, sulphurous baths and other measures are requisite. In mentagra and chronic lichen, it is not more successful than other analogous remedies; in lupus and eczema, it does not appear to do any good. With regard to the mode of action of the iodide of the chloride, M. Devergie holds very decided views. He denies entirely its specific action, and maintains that it cures by its topical effects only, and not by any influence on the constitution. He strongly disapproves, therefore, of the internal use of the remedy as quite unnecessary, and as likely to give rise to salvation, and to injure the general health. According to his view, the cure is effected locally, by a process of substitution. The iodide of the chloride, being a powerful irritant, induces an acute inflammatory condition, which takes the place of, and, as it were, substitutes itself for, the chronic subinflammatory action of the disease; and by changing the mode of vitality of the tissue, promotes a return to the healthy state. The application of blisters in chronic inflammations of the skin is a common example of the same principle of treatment. Whatever may be the value of this theory, the general view is important, that it is merely in virtue of its stimulant or irritant properties, exerted locally, and not by any specific action, that the cure is accomplished. Finally, M. Devergie expresses the wish that in pharmacy some uniform method should be adopted of preparing the iodide of the chloridc of mercury, so that it may be procured always of the same strength, and may be introduced into the therapeutics of legitimate medicine.—Bull. Gén. de Thérap., June 1859.
INJECTION BY THE HYPO-DERMIC METHOD.

Dr Behier read before the Society of Medicine at Paris, at its meeting on the 11th July ult., a paper relative to this method of introducing remedies into the system, and alluded to its introduction by Dr Alexander Wood of Edinburgh. The author stated that the syringe and canula employed by him was that of M. Pravaz, intended for the injection of perchloride of iron in cases of nevus. Each of these syringes is provided with two trocars of different lengths; when one of these is introduced into any part of the body, and, upon withdrawing the stylet, the canula left, the syringe is attached, by which, at each quarter of a turn of the piston, one drop of the solution is injected. This solution has, in 38 cases, been one of the sulphate of atropine, at first in the proportion of 0, 20 centigrammes to 30 grammes of distilled water (nearly four grains to the ounce). M. Behier thus, at each quarter turn of the piston, injected 3-20ths of a milligramme of sulphate of atropine—six drops containing about a milligramme of that substance. The proportions latterly adopted by M. Behier give exactly 1-5th of a milligramme of the salt for each drop, or one milligramme of sulphate of atropine in every five drops of solution. About sixty patients have been submitted to this mode of treatment. The following statement shows their diseases:

| Disease                                | Cases |
|----------------------------------------|-------|
| Sciatica                               | 18    |
| Intercostal neuralgia (uncomplicated)  | 9     |
| — in tuberculous cases                 | 2     |
| — with anomalous symptoms              | 1     |
| Brachial neuralgia                     | 1     |
| Facial                                 | 1     |
| Pleurodynia                            | 4     |
| Muscular Rheumatism                    | 11    |
| Contusions                             | 2     |
| Sympathetic pain from uterine cancer   | 1     |

These were treated with sulphate of atropine. The following cases were treated with sulphate of strychnine in the same proportions:

| Disease                              | Cases |
|--------------------------------------|-------|
| Paraplegia consequent upon angine couenneuse | 2     |
| — cause unknown, and of long standing | 1     |
| Paralysis of left leg, probably an affection of a neuralgic nature | 1     |
| Hemiplegia, from cerebral hemorrhage  | 2     |
| Paralysis of the arm from pressure    | 1     |
| Solution of hydro-chlorate of morphia in a mild case of painter's colic | 1     |

In all these cases the advantages of this method of treatment were uniformly and well marked; the effects being distinct and characteristic in the one set of cases, although somewhat less obvious in the others, treated on consultation, and which have not recurred. M. Behier read in detail his observations on each of these cases, giving the exact number of injections and of drops for each injection in every individual case; he then remarked: “If we combine the examples furnished in both lists, we see 50 cases where the local injection of sulphate of atropine has been universally successful in allaying nervous pain, and that in such as have had it repeated sufficiently often, a permanent cure has been effected, that is, in 31 of these cases. In the remainder the cure may indeed have been effected, as the patients did not return. In two patients the injection of hydrochlorate of morphia, repeated for several days in so large a dose as 24 or 30 drops afforded less satisfactory results, and the sulphate of atropine had to be repeated.”

In all the patients the symptoms of intoxication from the atropine (Intoxication atropique) were combated with success by opium,—a fact which confirms the opinions of Giacomini, MM. Cazin and Bayle, on the antagonistic qualities of opium and belladonna.
While injection thus acted more certainly and more rapidly than any other method—even than the endemic method—it was much less painful than blisters or cauteries, and offered none of their inconvenience. In 227 cases M. Behier had not met with a single bad symptom from the wound. M. Bequerel had injected 21 cases,—20 with complete success, and only one attended with local swelling or suppuration. M. Herard had had similar success in his experience. M. Behier had attempted, on several occasions, to verify the opinion of Dr Hunter, to practise the injection in a spot remote from the pain, but had not observed any result follow such attempts. To be effectual, the injection ought to be employed at the seat of pain itself. In conclusion, he stated that, from his experience, he was convinced that, besides the advantages offered by this method in the treatment of neuralgia and paralysis, it would be found very serviceable in all other affections where it was desirable to obtain the rapid and certain absorption of medicines intended to act generally on the system. Such motives, he thought, should lead to the practice of this style of treatment being more generally introduced, especially as it had as yet led to no bad consequences.—Gazette des Hôpitaux, July 1859.

PHYSIOLOGY.

M. BROWN SÉQUARD'S EXPERIMENTS AS TO THE PRODUCTION OF EPILEPSY IN GUINEA-PIGS.

One of the most interesting facts discovered by M. Brown Séquard, is that relative to the production in mammals, and particularly in guinea-pigs, of an epileptiform condition, the result of various injuries inflicted upon the spinal cord.

M. Brown Séquard has often repeated these experiments with the same results, and has shown them to different learned societies. At the last meeting of the Society of Biology (29th October 1859), he announced that for some years past he has had an opportunity of observing a considerable number of young guinea-pigs born of parents which he had rendered epileptic. But in some of these young animals he has recognised a distinct epileptiform affection, with paroxysms well characterised, yet differing somewhat from that observed in the parents. In the case of the parents, there are not only spontaneous paroxysms, but in addition, a fit can be brought on at any time by pinching the skin of the face. In those guinea-pigs which appear to inherit the convulsive affection from their parents, the occurrence of paroxysms cannot in this way be determined, neither are the symptoms of the fit in the young animals quite the same; at the commencement of the attack the animal is seized with trembling, then it falls upon its side and agitates its limbs convulsively.

The guinea-pigs so affected, which M. Brown Séquard has in his possession at present, are of two kinds, which are nearly equal in number,—one set being the offspring of a mother rendered epileptic by an injury of the spinal cord, the others of a father placed in the same condition.

It may further be observed, that parents rendered epileptic by injury of the spinal column give birth to young ones, none of which may suffer from the affection, or of which some may be free from, while others may suffer from convulsive attacks. M. Brown Séquard has had under observation a very large number of guinea-pigs, and although he does not deny the possibility of the fact, he has never seen one of them suffer from a similar spasmodic affection, unless it had previously received an injury of the spinal cord, or were the offspring of a parent rendered epileptic by such a proceeding.

These observations of M. Brown Séquard are of great value; for they add a new point of resemblance to those which already assimilated epilepsy in man.