Here now is B—, who presents a less marked and less inveterate case of hysteria, but still one belonging to the order of hystero-epilepsy. She has been hemianæsthetic and subject to major attacks for three years. This patient was affected with right hemianæsthesia, and, at the same time, as is the rule, with right *ovarie*. She presented in a marked degree all the classic phases of the attack—epileptoid period, contortions, “passional” attitudes, final delirium. The patient was submitted to the internal use of copper in July last. Under its influence the anæsthesia and the fits have quite disappeared. The external applications of copper, which formerly threw the patient into that particular state which I have described to you, are now without any action on her. Is the cure complete, definitive? From all that precedes, I am inclined to think it is. Has it been produced by the action of copper? I leave it to you to decide.

Here is another patient sensitive to gold. I have known her to be hemianæsthetic in the left side for the last six years. As usual, she had left *ovarie*, and very marked hystero-epileptic fits. She was subjected to treatment with gold at the same date and in the same manner as our first patient. At present she has but very rare attacks. Hemianæsthesia never manifests itself but temporarily, for a few hours, and only after the attacks. The application of gold on the left side of the body causes a recurrence of what I call the phenomena of “metallic anæsthesia.”

The patient I now show you is B—, in whom you have been able to study a most striking example of hysteric contracture. She has been diseased the last eleven years. She is affected with two distinct diseases, hystero-epilepsy (hysteria major) and real epilepsy. It is the combination which is usually called “hystero-epilepsy with distinct attacks.” The internal administration of gold has produced no modification in her epilepsy. But it is not so with the symptoms of hystero-epilepsy. After the administration of gold, exhibited in the same manner as in the preceding cases, hemianæsthesia, which for the last eleven years had persisted, has disappeared, and the hystero-epileptic fits, which were very frequent and complete, have now become very rare. Yet they exist, and have survived anæsthesia; consequently the patient is still, in a somewhat marked degree, under the influence of the diathesis. The other day she had a fit, after which supervened contracture. But the contracture lasted only seven or eight days, whereas before the treatment it generally lasted one or two months. I will add that the anæsthesia, which formerly occupied the whole of the right side of the body, has shown itself after this attack only in the right lower limb, where the contracture had first developed itself.

These are the four patients that I had to show you. I leave these facts to your own appreciation. As to myself, I shall content myself with briefly drawing this conclusion, that the question is deserving of careful investigation.

Before concluding I must state that you may meet with cases, though rarely, in which hysteric patients are not sensitive to any known metal. I must also add that in the patients I have presented to you, and in whom a metallic idiosyncrasy has been found, the application of the suitable metal is without any effect when it is made at the time of the great attacks, or, if the word can be used, of the hysteric tides. You must choose a period of calm, in order that the action of the metals may be brought out in full relief.

Such are the principal phenomena of metalloscopy and metallo-therapy which I wished to bring before you. I am desirous, however, to acquaint you with an episode which is not wholly irrelevant to the principal subject of this lecture, though it is not connected with hysteria.

Hysteric hemianæsthesia is not the only form of hemianæsthesia which may be modified by appropriate metallic applications, contrary to what Trousseau may have believed formerly, and to what Dr. Burq himself believed even quite recently. This has been shown by the results obtained in two of our patients affected with cerebral hemianæsthesia (I mean with involvement of the superior senses—vision and smell), consequent upon an organic lesion of the brain, which had produced simultaneously post-hemiplegic hemichorea. In those two patients the insensibility was absolute, and dated eleven years in one (R—), and in the other from her infancy, or about fifteen years (P—). A metallic application of iron in R—, and of gold in P—, has had the result of rapid and complete re-establishment of general and special sensibility. This result has not been altered for fifteen months, when the applications were commenced. I

may just remark that in neither of these patients there exists the slightest trace of an hysteric diathesis. One is a woman of fifty-five, very calm, almost apathetic. The other is aged twenty-four, and is much more docile than the majority of patients of her age in my wards.

One word more before concluding. I wish to refer to the attempts made to elucidate the *physical* fact which must be the condition of the *physiological* action of metals. In the first place, M. Regnard has shown the important fact that extremely weak currents of electricity produce exactly the same effects as metallic applications. However, it would be, perhaps, inaccurate to draw the conclusion that metallic applications exert an action by determining currents. Such is the opinion of M. Romain Vigouroux, who has conducted a series of experiments upon the subject, and has deduced therefrom quite a regular theory of metallo-therapeutic phenomena. But I have no time to dwell longer upon a subject in connexion with which, besides, nothing definite has been yet done.

ON THE MYDRIATIC PROPERTIES OF DUBOISIA MYOPOROIDES.

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WITH AN ACCOUNT OF ITS GENERAL PHYSIOLOGICAL ACTION.

By SYDNEY RINGER, M.D.,

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IN the early part of December last I received from my friend, Dr. G. Fortescue, of Sydney, a small quantity of extract of *Duboisia myoporoides*, an indigenous tall shrub, growing plentifully in the forest lands of Eastern Australia, and supposed to belong to the order Scrophulariaceæ. Dr. Fortescue having learnt first from Dr. Joseph Bancroft, of Brisbane, and, subsequently, from his own observation, that the extract, when locally applied to the eye, is a powerful and rapid pupil-dilator and paralysed of the accommodation, was kind enough to suggest that I should make some experiments, similar to those which I recorded in THE LANCET of June 9th, 1877, on Gelsemina. Without delay, therefore, I began the experiments upon the eye, but as I was told that the physiological properties of *duboisia* were unknown, I was glad to share the extract I had received with Dr. Sydney Ringer, who undertook to discover these properties by means of physiological experimentation upon the lower animals, and then upon man. I shall first give Dr. Ringer's report, and then add an account of my own observations.

I may here remark that last week I had the pleasure of making the acquaintance of Dr. Joseph Bancroft, at present on a visit to this country, who told me that he had related the circumstances under which he came to discover the mydriatic properties of *duboisia*, in a paper read before the Queensland Philosophical Society last October. I have thought it proper to append a brief summary of Dr. Bancroft's interesting paper.

REPORT ON THE PHYSIOLOGICAL ACTION OF DUBOISIA MYOPOROIDES, BY DR. SYDNEY RINGER.

Wishing to know something of the botanical relations of *duboisia*, I wrote to Professor Oliver, of Kew, who informed me that “*Duboisia* belongs to the group of Salpiglossideæ, which occupy a position intermediate between Solanaceæ and Scrophulariaceæ. Now, however, it is definitively referred to Solanaceæ, notwithstanding its (*duboisia*'s) didynamous stamens. It is indigenous in New South Wales, Queensland, and New Caledonia.”

This information naturally suggested that its alkaloid is probably similar, if not identical, with atropia. My investigations confirm this surmise. Thus I find that, like atropia, *duboisia* dilates the pupil, dries the mouth, arrests the secretion of the skin, produces headache and drowsiness. It also antagonises the effect of muscarin on the heart, and after

some days excites tetanus in frogs. As the drug came with an established reputation as a pupil dilator, I was content to make only two or three confirmatory observations.

I next tested its action on a large Cyprus cat, injecting six minims of an aqueous solution of the extract (1 in 5) under the skin of the back. In fifteen minutes the pupils began to dilate, and in twenty minutes they were very widely dilated and quite unaffected by light. The mouth also began to get dry in fifteen minutes, and in twenty minutes it became quite dry, so that the cat's cry was very feeble. This was the only effect of the drug, with the exception perhaps of slight general weakness. Forty-one hours after the injection the mouth was still rather dry and the pupils still dilated, though less widely.

I then tested its action on two men, injecting subcutaneously half a grain and one grain respectively, and obtained marked physiological effects, most marked with the larger dose. In both the pupils became widely dilated and the mouth dry. After the larger dose the man's throat became so dry that he could scarcely speak. The dryness lasted five hours. Both men became rather sleepy in about fifteen minutes after the injection, the drowsiness lasting about two hours. The man with the larger dose complained of some general weakness, and both men suffered from headache, lasting about three hours. After the larger dose the pulse rose from 66 to 120 per minute.

These observations therefore proved that, whether topically applied or administered internally, duboisia dilates the pupil. Given internally, it also greatly dries the mouth, quickens the pulse, causes some muscular weakness, drowsiness, and headache—the same symptoms that follow atropia.

The next point to determine was whether duboisia, like atropia, would check perspiration. Accordingly I injected one-third of a grain of nitrate of pilocarpine (jaborandi) under the skin of a patient with non-febrile phthisis. In three minutes his face flushed, and perspiration and salivation began. In four minutes the perspiration was so free that beads of sweat stood upon the face. Nine minutes after the pilocarpine I injected three minims of the solution of extract of duboisia (1 in 4)—i.e., three-quarters of a grain. Seven minutes after this injection the skin was quite dry, and the mouth less moist. In ten minutes the man complained of dryness of the mouth, and the pupils began to dilate. In twenty-five minutes the tongue was quite dry at the end. At this time he was sleepy. Next morning—that is, nineteen hours after the experiment—the mouth was still a little dry and the pupils dilated. This experiment, therefore, proved that duboisia checks perspiration, and it confirms the previous conclusion that it dries the mouth and dilates the pupils.

I next tested whether, like atropia, duboisia antagonises the action of muscarin on the frog's heart. I divided the spinal cord of three frogs opposite the occipito-atlantal membrane, and passed a peg into the cavity of the skull, destroying the brain, and at the same time preventing hæmorrhage. I then exposed the heart of these brainless frogs, and applied to the auricles and sinus venosus a small quantity of an alcoholic extract of amanita muscaria (muscarin), given me by Dr. Michael Foster. In the first experiment, in four minutes after the application of muscarin, the heart beats fell from 31 to 6 per minute. I then applied a minute quantity of extract of duboisia (1 in 2). In thirty seconds the beats rose to 28 per minute, and greatly increased in force. Ten hours after the heart still beat well at 40 per minute.

In the second experiment, the effects of the muscarin were different. As is sometimes the case, instead of slowing the heart, it affected the frequency very slightly, but weakened the strength of the contractions very considerably. Thus, after the application of muscarin the heart's beats fell from 34 to 26, and at last beat so feebly that the pulsations could only just be seen by careful examination with an oblique light. At this time I applied to the auricles and sinus a small quantity of extract of duboisia. In one minute the beats were stronger, and in four the heart beat excellently at 30 per minute. Five hours afterwards it still contracted vigorously at 24.

In the third experiment, the muscarin reduced the beats from 32 to 14, and made them so weak that only the slightest detectable movement remained. I then added a small quantity of extract of duboisia, and at first all contraction ceased; but in two minutes the heart was very distinctly beating, and in three minutes it was contracting normally at 30 per minute. In five hours' time it beat feebly at 26.

These experiments show that, like atropia, extract of duboisia antidotes the action of muscarin on the frog's heart.

In still another respect duboisia acts like atropia. On Jan. 15th I injected hypodermically four minims of a solution of the extract (1 in 2) into a frog weighing thirty grammes. This produced some general weakness, from which the animal recovered. In forty-eight hours I found the animal slightly tetanic—that is to say, its movements were rather stiff, and when tapped in the back all the limbs were slightly jerked and then became stiff, and the toes were widely expanded. To prevent the tetanus becoming painful, I then divided the cord and destroyed the brain. I injected two other frogs with the same proportionate dose, but produced no tetanus. It is interesting to observe that whilst duboisia is, as it were, on the outskirts of the order Solanaceæ, and has many affinities with scrophulariaceous plants, its active principle, if not identical with, is very similar to, atropia.

It will be seen from Dr. Ringer's elaborate report that the physiological action of the extract of duboisia is apparently identical with that of atropia. The same remark applies to the effects of the local application to the eye. If there be any difference, it is that duboisia is more prompt and energetic than atropia, and certainly very much more so than the strongest extract of belladonna. Wishing to observe the effect of the undiluted extract, I placed a small portion of it on the conjunctiva of the lower lid of a damaged eye (Dec. 14th). Severe smarting and profuse lachrymation immediately followed, but scarcely any congestion of the conjunctival vessels. The smarting passed off in two or three minutes, but the lachrymation continued for about a quarter of an hour. In ten minutes the pupil was dilated, but not fully, although it did not get larger afterwards. The accommodation was also greatly impaired, but to what extent I could not determine.

After this the extract was diluted with twenty parts of distilled water. This solution seemed to produce more rapid and complete dilatation than the undiluted extract, and did not cause smarting and but little watering of the eyes. The resulting dilatation of the pupil usually lasted from six to ten days, and the concomitant paralysis of accommodation, which in every instance became rapidly complete, about three or four days; it then gradually subsided, so that about five to seven days after the application the accommodation was as strong and active as before. The pupil in all cases was affected sooner and recovered later than the accommodation.

Having satisfied myself that the extract is a quick and powerful pupil-dilator, I wished to ascertain more clearly the rate and amount of its action upon the accommodation, and for this purpose I determined to use my own eye. I first carefully tested the state of vision, and found that I could read No. 1½ of Snellen's type distinctly from 4 in. (nearest point) to 21 in. (farthest point) and $V = \frac{2}{3}\%$. I then placed a single drop of a solution of the extract (1 in 20) within the lids of the tested eye. A little lachrymation followed, but no smarting. Exactly ten minutes afterwards the pupil began to dilate, and the sight became rather misty for near objects. When once started, dilatation proceeded very rapidly, so that fifteen minutes after instillation the pupil was widely dilated, and the nearest point had receded to 10 in. In twenty-five minutes 1½ Snellen could not be read at any distance by the unaided eye, and the accommodation was therefore, for all practical purposes, completely paralysed. By more elaborate tests I discovered that the effect of the extract went on increasing for four hours, when it attained its maximum. Twenty-four hours afterwards there was no appreciable amelioration, either in the pupil or in the accommodation, but within the next twenty-four hours the effects began to pass rapidly off, so that forty-eight hours after the instillation I could see 1½ Snellen from 5½ in. to 21 in., although the pupil was not much smaller. In seventy-two hours, by an effort of accommodation, 1½ Snellen could be seen at 4½ in., and the pupil was rather smaller, and reacted slightly to light. From this time the accommodation became stronger and more active every hour, and the pupil gradually diminished until it reached its natural size. Four days after the application the accommodation was restored, and three days later the pupil was active, and of its normal size.

I could not at any time detect any change in the actual or relative strength of the extra-ocular muscles.

Experience having shown that the application of the