ORIGINAL COMMUNICATIONS.

ON THE

NATURAL SOURCE AND PHYSIOLOGICAL ACTION OF THE WOORARA POISON.

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PRIOR to 1852, when I published a series of experiments on the subject in the *Lancet*, only a few scattered instances were known of the power which is possessed by a numerous section of the class of dynamic poisons of exerting a paralyzing influence on the part of the body to which they are immediately applied. Opium and hydrocyanic acid had been observed to cause paralysis of one of the hind legs of the frog; aconite and the viper's poison to produce numbness of the tongue; and ticunas (by Messrs. Morgan and Addison) instantaneously to stop the peristaltic motion of a part of the intestine of a guinea-pig, with which it accidentally came into contact. The propriety of referring the last effect to paralysis seemed to me very questionable; and I was desirous of obtaining some of this poison, for the purpose of satisfying my doubts, as well as of submitting it to the same kind of test as the other substances. Several arrows tipped with woorara, and also some of the poison in a separate state, soon afterwards came into my possession, which enabled me to proceed with the inquiry. Woorara and ticunas, as will be shewn presently, do not differ from one another by any recognised peculiarities, and practically may be regarded as the same substance. The results might have been communicated to the Society in a verbal statement, but it happens that the history of woorara is involved in much confusion, which would probably have required numerous explanations; and, having had some trouble in forming a clear idea of the subject in my own mind, I thought it would be more satisfactory, on the whole, to commit my views to writing in the shape of a formal paper.

That a poison is used by the natives of an extensive district of South America to give a deadly effect to their arrows; that this poison has been found equally fatal to animals, when employed by Europeans; and that a twining plant of the genus *Strychnos* has been pointed out as the source which furnishes its principal ingredient, may be said to comprise the amount of what is distinctly known concerning the remarkable substance which comes under our notice this evening. The poison has a variety of names; but whether, as some suppose, they severally denote the places where it is prepared, or whether any useful object is served by retaining more than one, is a point we shall have to consider. The effects of the poison, as deduced from the experience of the great majority of observers, would lead to the conclusion that it invariably contains some one active principle, which exerts a paralyzing influence on the nervous system; and yet this is the very opposite kind of effect to what we should expect, if a substance were put into our hands which we were told was derived from a *Strychnos*. Professor Christison adopts the generally received opinion concerning the action of the poison, but says "it does not correspond exactly with what would be expected of a plant belonging to that genus". Among the colonists of British Guiana, a chief agent is believed to be the poison of serpents; and Sir R. Schomburgk relates that, notwithstanding the researches which enabled him to identify it as an extract of the bark of the *Strychnos toxiferu*, he was unable to persuade them to the contrary. Moreover, within the last few months, two American experimentalists, Messrs. Brainard and Greene, have contributed a paper to the French Academy of Sciences, in which they maintain the same opinion as that which prevails among the colonists. The symptoms are, indeed, such as would harmonise with this belief, if it were ascertained to be true. But, on the other hand, notwithstanding an agreement in the testimony with regard to the depressing action of the

poison, which is extraordinary under the circumstances, Professor Taylor says there is no doubt that the effects of woorali "are due to the strychnia contained in the extract".

It is evident, therefore, that the subject calls loudly for further investigation. To perform the task efficiently, it would be requisite, in the first place, to learn exactly the difficulties which require to be cleared up; and next, to enjoy full opportunities of pursuing the inquiry practically, such as can hardly be expected to be within the reach of any one remote from the spot where the poison is prepared. What I propose to do at present is, first, to endeavour to remove the obscurity attending the use of so many names; next to examine the evidence with regard to the natural source of the poison; and lastly, to state the results of experiments instituted with a view of elucidating its properties.

I. NAME OF THE POISON.

Omitting several minor variations, which are obviously of no importance, the American poison is severally called urari, curare, woorara or wourali, and ticunas; and the question is, whether these names have any peculiar significance, which renders it desirable to retain more than one of them; or, if not, which deserves the preference. Humboldt, in his personal narrative, informs us that Raleigh had heard the name of urari pronounced as being a vegetable substance with which arrows were envenomed; and after him Sir Robert Schomburgk, apparently partly influenced by this statement, adopts this name in his well known paper, published in the *Annals of Natural History* for 1841. The first English account of the poison occurs in the narrative given by Sir Walter Raleigh of his first voyage to Guiana (*Hackluyt*, A.D. 1600). "In the year 1595, in ascending the Orinoco, he came to a great plain, inhabited by four tribes of Indians, of whom he says "the fourth are called *Aroras*, and are as black as negroes, but have smooth hair; and these are very valiant, or rather desperate people, and have the most strong poyson on their arrowes, and most dangerous to all nations; of which poyson I will speak somewhat, being a digression not unnecessary. There was nothing of which I was more curious than to find out the true remedies of these poysoned arrowes; for, besides the mortalitie of the wound they make, the partie shotte indureth the most insufferable torments in the wound, and abideth a most ugly and lamentable death, sometimes dying starke mad, sometimes their bowels breaking out of their bellies, which are presently discoloured as blacke as pitch, and so unsavoury as no man can endure to cure, or to 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, nor one among thousands; but their soothsayers and priestes, who do conceal it, and only teach it but from the father to the son. Those medicines which are vulgar, and serve (as antidotes) for the ordinary poyson, are made of the juice of a root called tupara". He goes on to speak of garlick as another reputed antidote "in ordinary wounds of the common poysoned arrowes"; from which it would appear that there were poisons of different strength; but I have not succeeded in finding in this "Voyage", as given in Hackluyt's collection, any mention of the word urari. The "Second Voyage to Guiana", so called, was not performed by Raleigh himself, but by Captain Keymis, under his auspices; and there also, in the body of the narrative, the word does not occur. But a list of remarkable names is supplied in an Appendix; and here, under the head of "Names of Poisoned Herbs", we meet with "ourari", but without another word, either to explain its properties, or connect it in any way with the arrow poison. It should be observed, indeed, that Humboldt's authority is Cayley's *Life of Raleigh*, where, however, I am unfortunate enough not to be able to find the passage, either in the first or second edition. Notwithstanding the supposed priority of the great Englishman in giving the name to the poison, Humboldt himself calls it "curare"; and this is a favourite

mode of spelling it on the continent, though on what ground I have not seen any attempt to explain.

The term "Woorara", the most familiar to the English ear (except, perhaps, wourali), from being associated with the physiological researches of Sir Benjamin Brodie, appears to have been in common use in Guiana in 1769; for Mr. Edward Bancroft, in his *Letters* of that date, employs it familiarly, stating that it is the name of a "nibbee", or twining plant, which furnishes the chief ingredient of the poison. It is worthy of notice that Brodie, in his paper in the *Philosophical Transactions*, mentions his being indebted for his supply of woorara to Dr. E. N. Bancroft; but whether connected with the above author does not appear. "Wourali", rendered so current by Mr. Waterton's writings, and particularly his experiment on the ass, which became an object of public interest, from being restored to life by artificial respiration, after nearly succumbing under the effects of the poison, appears to be nothing more than a local variation of "woorara". According to Schomburgk, the Carib tribe of Indians are in the frequent habit of infringing on the customary rule of pronunciation among the other tribes, by substituting the *l* for the *r*; and he supposes that in this way the alteration has crept in. "Ticunas" is the name of a tribe of Indians inhabiting the banks of the Amazon. M. de la Condamine, in descending that great river in 1743, obtained specimens of the arrow poison, which he brought to Europe (*Relation abrégée*, Paris, 1745). The most esteemed kind, he says, is that prepared by the Ticunas; but he does not distinguish it by this name, nor is there anything to show that the substance concerned might not as well be called "woorara". With regard to properties, Brodie says that there appears to be no essential difference between the two poisons; and we may take this opportunity of remarking that Messrs. Morgan and Addison, in criticising Sir Benjamin's experiments, use sometimes one word and sometimes the other, without appearing to recognise any distinction between them.

If this be a fair statement of the literature of the name, so far as is consistent with the necessary restraints of brevity, it would appear that "urari" has not the superior *prestige* of antiquity which it would possess if the historical fact were as stated by the great German philosopher. Whether it most correctly represents the sound of the word as pronounced by the Indians, is another question, which perhaps its advocates may be able to decide in the affirmative. But, in the meantime, we are enabled to conclude that woorara, wourali, urari, and curare, are merely the same word differently spelt; and that consequently their respective peculiarities furnish no clue which can lead to practical discovery. I use the first because it appears to have been known longer than the others, and no satisfactory reason has been given for displacing it. The name of Ticunas there seems to be no more reason for retaining than that of any other Indian tribe which is known to prepare the poison, unless perhaps in a qualifying sense, to indicate a particular manufacture. Thus, we might speak of the Macusi or Wapisiana woorara of the Orinoco, the Lamas or Ticunas woorara of the Amazon, and so on, just as we speak of opium or tobacco generically, and then distinguish the varieties by the addition of proper names.

II. NATURAL SOURCE OF THE POISON.

The Indians guard the secret of their processes with the greatest jealousy; but nevertheless it is generally believed that many materials are employed, and some writers go so far as to specify them in detail. That certain animal substances are introduced, is not a mere recent idea, originating about the time of Waterton, as a remark of Schomburgk would lead us to suppose; for Bancroft notices "the teeth and livers of venomous snakes" as far back as 1769. Waterton mentions the bodies of two kinds of ants, and the pounded fangs of snakes. These last could hardly be expected to add more to the potency of the preparation than the teeth of any other animal; but it is possible that the poison-bag may remain attached to them, for Fontana (*Treatise* i, 185) teaches us expressly that this does occur.

On the side of the belief, then, that the poison owes its efficacy to the animal ingredients, are the circumstances we have just stated, together with the correspondence in its effects with those of the venom of snakes. On the other hand, it is remarkable that nearly all travellers, from Bancroft down to Waterton, refer to a species of twining plant, of the same name as the arrow poison, as furnishing a principal ingredient. Humboldt, judging from an inspection of the wood, believed this to be a *Strychnos*—an opinion which was verified by Schomburgk, who names the plant, as we have said, the *Strychnos toxifera*. Further, in order to complete the evidence in favour of his own view, the latter traveller prepared a concentrated decoction of the bark, and inserted it, by means of arrows, beneath the skin of two fowls. Both the animals died in rather less than half an hour; but no account is given of the symptoms. This is an important omission, as involving the necessity of making further experiments.

It struck me that, by inquiring at some of the great public institutions in London, I might obtain some useful information with regard to this plant. It has not been seen in flower; but specimens of the leaves and fruit, contributed, as I understand, by Schomburgk himself, are preserved in the collections of the British Museum and the Linnean Society; and there is no doubt on the part of the authorities as to the accuracy of the botanical reference. Mr. Kippist, of the Linnean Society, very kindly gave me one or two grains of the powder of one of the seeds, produced by sawing it across. Half a grain, softened with warm water, was put into the mouth of a frog. No effect followed in twenty-four hours. Half a grain of the seed of the *strychnos nux vomica*, prepared in the same way, was then tried. The animal immediately began to breathe quickly, and in less than half an hour was found lying on the back, under the characteristic influence of strychnia. On now introducing a small quantity of woorara, diffused in water, into the mouth, the convulsions speedily ceased, the animal became perfectly quiet, and the muscles passed from their previous state of rigidity into one of relaxation. Half a grain of the seed of the *Strychnos toxifera*, inserted beneath the skin of a frog's leg, likewise produced no effect. From hence we may gather that this part of the plant is either inert, or nearly so: nor is the result so surprising as it might appear if there were no similar instance; but it happens that the seeds of another species, the *Strychnos potatorum*, are so free from any noxious property as to be used for the purpose of clarifying drinking water. It would be more extraordinary if it contained a principle which, like the woorara, might serve as an antidote to the effects of strychnia; which is the difficulty we have to get over in adopting the view of Schomburgk.

At the Royal Botanic Gardens at Kew, I was shown some pieces of wood which had been brought from Antioquia, and presented to the museum, under the name of "curare", which was written on a label attached to one of the pieces. Through the obliging courtesy of Mr. Smith, I gladly obtained possession of a piece about six inches long and an inch thick, although that gentleman was unable to vouch for its authenticity as a genuine example of the *Strychnos toxifera*. However, as the doubt was on the favourable side, it was worth while to put its virtues to the proof. The thin, dry, ash-coloured bark was stripped off, and steeped in water for forty-eight hours; after which the infusion was concentrated over a water-bath to the consistency of an extract. Two grains of the extract, diluted with a little water, were then injected beneath the skin of the thigh of a guinea-pig. No effect followed after many hours; and then twice the quantity was thrown between the skin and muscles of the thorax. The animal, however, did not appear to suffer the smallest inconvenience. An extract of the wood was also prepared in the same manner, and tried on another guinea-pig; but it also failed to produce any effect.

Had there been any physiological phenomena exhibited in these experiments, their peculiar character might have afforded valuable evidence in one way or another; but, as

the case now stands, we have at least attained to a position which better enables us to perceive the want of further information, as well as what kind of information is required. If an undoubted specimen of *Schomburgk's plant* could be procured, for instance, in sufficient quantity to admit of being subjected to any variety of tests, we might then be able to come to some pretty accurate conclusion concerning the truth of the opinion maintained by that distinguished traveller. At present, it is opposed by the fact of the physiological action of woorara being so entirely different from that of strychnia; but, in the event of its being confirmed, we shall not only enjoy the satisfaction of exchanging a state of doubt for one of certainty, but shall further become acquainted with a remarkable instance (opposed to a great law of the vegetable kingdom) in which the active principle of one species of plant possesses properties which qualify it to become the antidote to that of another plant of the same genus.

III. PHYSIOLOGICAL ACTION OF THE POISON.

1. It acts when taken into the stomach.

It seems to be the general impression that the woorara may be swallowed with impunity; and one distinguished author (Sir B. Brodie) refers to Fontana as lending his sanction to this opinion. But there is some mistake here; for at least in the English edition of his treatise in 1787 (page 105), Fontana mentions some experiments in which it proved fatal when given internally, only remarking that a larger dose is required than when applied to a wound—a fact which accords with the most frequent rule with regard to poisons. Under the preceding section, it has been seen that woorara thus administered checked the convulsive paroxysms produced by *nux vomica*; and the following experiment confirms the inference as to its potency when swallowed, which is favoured by that result.

EXPERIMENT. Half a grain of woorara, diffused in water, was put into a frog's mouth. In about half an hour, the efforts of the hinder extremities became ineffectual to propel the body; and the animal, when laid on the back, was unable to turn itself over. In the course of an hour, it quietly passed into a state of apparent stupor, uninterrupted by any spasmodic movements, but attended with complete relaxation of the voluntary muscles. The circulation, examined by the microscope in the web of the feet, was found to be proceeding vigorously. No change took place for the space of four days, except a gradual retardation of the course of the blood; but on the fifth day the eyes were sunken and glazed, and the circulation had altogether ceased. The heart was found filled with dark fluid blood, but no other unusual appearance was observed.

Fontana found that the poison acted much more decidedly if given to animals while fasting than on a full stomach. The following experiment seems to strengthen this opinion.

EXPERIMENT. Four grains of woorara, diffused in water, were given to a guinea-pig which had been well fed previously. No effect ensued in twelve hours. The same quantity was then administered while the stomach was empty. In two minutes, the animal fell on the side struggling, but not convulsed, judging by the absence of muscular rigidity. The attention of Dr. Glover, who was present, was particularly called to this circumstance. Presently, the beating of the heart could no longer be felt through the ribs, though the respiration continued; but in another minute the breathing also ceased.

On examination, the body was free from rigidity. The lungs collapsed, and presented their natural flesh colour. The heart was filled with dark blood, but continued beating, though unable to expel its contents; and so it continued for above two hours. The peristaltic movements of the stomach and bowels were going on actively; and, as the poison had been swallowed, this shows that at least it cannot have the power of instantaneously paralysing the stomach.

It is a question among toxicologists whether the rigidity produced by strychnia continues after death. Dr. Christison thinks not; but, at, all events, it always occurs during

life; and its absence in this instance therefore indicates that strychnia was not the active constituent of the poison.

2. It causes local paralysis.

In my experiments on the local action of poisons, published in the *Lancet*, the usual mode of proceeding was to introduce the substance beneath the skin of one of the hind legs of a frog. By this means it was found that the limb became paralysed under the influence of the mineral acids, alcohol, ether, chloroform, hydrocyanic acid, opium, muriate of morphia, codeia, hyoscyamus, atropia and its sulphate, nicotina, aconita and its muriate, conia, and theine or caffeine. Strychnia, brucia, quina, and some other principles were tried at the same time; but, as they did not produce any decided local effect, no notice was taken of them. Woorara, however, appears to belong to the former category, judging from what follows.

EXPERIMENT. A quarter of a grain of woorara, diluted with water, was injected beneath the skin of the left leg of a frog. In two minutes the animal began to drag the leg, though still active and retaining perfect control over the other leg. In another minute the right leg also became paralysed, and there was simultaneously evidence of dyspnoea. Insensibly the animal passed into a state of entire prostration with flaccidity of the muscles, and in twenty minutes it lay motionless and apparently dead.

The heart being now exposed, was found to be acting fifty-four times in a minute. The longitudinal vein of the abdomen, the internal viscera, and the muscles generally, were congested with dark blood. The action of the heart continued for about nine hours.

It is interesting in these researches to watch the succession of the phenomena, and observe how distinctly the local precede and are distinguishable from the constitutional symptoms. First comes the local paralysis, the animal retaining all, or nearly all its previous vivacity; but soon the general system is implicated, and the whole of the voluntary muscles are brought into a condition similar to that of the part first affected. Can there be a doubt here that the action is for the time limited to this first part, and independent of nervous sympathy? The most reasonable explanation seems to be that the specific effect of the poison is first exerted in the tissues with which it is placed in contact, and that from them it is conveyed in substance to the other organs by the blood. Once arrived at the brain and spinal cord, it can operate through them on the parts which are under their influence; but this is not incompatible with the exercise of a local power independently of any central organ.

3. Its primary action is stimulating.

Of the many poisons which have just been enumerated as having been found to cause local paralysis, it is remarkable that there was not one which failed to excite contractions when first applied to a muscle; nor do I know of any poison the primary action of which is purely sedative. Hence it was particularly interesting to find in Messrs. Morgan and Addison's essay on poisons, a remark that the accidental contact of "a very minute portion of *ticunas* with the bowel of a guinea-pig was followed by a complete and instantaneous suspension of peristaltic motion in that part of the bowel;" and that "on applying the poison to other parts of the bowel, precisely the same local paralysis (as it is called) was produced."

In my experiments on the bowel with poisons of the sedative class, the immediate effect was certainly an interruption to the vermicular movement; but this was accompanied by a local constriction limited to that part of the bowel, and indicating, as it appeared to me, not paralysis, but an increase of activity in the muscular fibres. With conia and nicotina there was first this local constriction, and after some time a bulging out of the part; as if, while the rest of the bowel retained a certain degree of contractility, this portion had become flabby and been reduced to the condition of a piece of dead membrane.

EXPERIMENT. Two grains of woorara, diffused in a few drops of water, were injected between the skin and muscles

of the side of a guinea-pig. In two minutes the animal fell on the side struggling, but without appearing to be convulsed, there being no rigidity of the muscles. In four minutes it ceased to breathe, and showed no outward sign of life, except a slight quivering of the lower lip.

On examination in five minutes from the commencement of the experiment there was no muscular rigidity. The heart was found filled with blood, and pulsating with a quick, feeble motion, chiefly perceptible in the auricle, as if struggling to get rid of its contents. This kind of movement lasted above two hours, and then could be renewed for a short time by some mechanical application. The blood in the heart, when examined the next day, was found to be coagulated. The bowels manifested a considerable degree of vigour in their peristaltic action. A part of the small intestine where the movement was most lively being selected, a drop of the poison remaining from the previous operation was applied, and spread itself over a space of about an inch in length. This portion quickly grew narrower in its diameter, and ceased to move continuously with the rest of the bowel, exhibiting instead a succession of smaller contractions backwards and forwards, which ended in its remaining quiet, and presenting a cord-like appearance as compared with the adjoining portions of the bowel. There was no subsequent bulging as occurs after conia and nicotina, but which I have seen to be produced by any other substance.

From this example I should infer that the primary action of woorara is exciting, however speedily it may be followed by depression or paralysis.

4. Its action does not depend upon strychnia.

The convulsions produced by strychnia are so remarkable and characteristic, that they could hardly fail to be particularly dwelt upon in the various accounts of the effects of woorara, if they were at all a constant phenomenon during the operation of the latter poison. In the experiment on the ox, mentioned by Professor Taylor, they were no doubt very decided, but nevertheless this is an exceptional case compared with the very numerous instances we have of an opposite nature. The occasional occurrence of convulsions in opposition to what seems to be the rule, is exemplified in the history of many other poisons, such as opium, carbonic acid, the poison of serpents, etc. But in directly comparing the effects of woorara with those of strychnia, we obtain some exceedingly well marked differences. Woorara produces extreme relaxation of the muscular system, strychnia a state of extreme rigidity. The former, as we have just seen, occasions local paralysis; the latter has no such effect. In numerous trials which I formerly made with strychnia on the hind legs of frogs, in order to ascertain whether any local effect would be produced, I fancied once or twice that I perceived evidence of increased local excitement, but never witnessed anything approaching to paralysis. On these grounds, it seems unnecessary to lengthen out the argument by entering into further details of experiments.

It was said in commencing, that the desire to obtain some woorara for experiments was occasioned by the statement of Messrs. Morgan and Addison on the effect of the poison when locally applied to the bowels; and also by a wish to ascertain whether it would cause local paralysis. Both these points have been inquired into; and further, an attempt has been made to clear up the obscurity which exists with regard to the name of the poison, its action as compared with strychnia, and the question, whether it can be swallowed with impunity. As to what is here called the primary effect of the sedative poisons, or that brief stage of excitement which precedes their specific action, the point is one of considerable importance in connexion with the general theory of the operation of medicines. In proof of this, we may remark, that the chief remaining argument in favour of the almost exploded "doctrine of sympathy", so called, is founded on the extreme rapidity with which hydrocyanic acid and conia begin to act. Pure hydrocyanic acid, for instance, dropped into the eye is said to prostrate

the animal within a few seconds. But as thus applied, Pereira says that it causes opacity and whiteness of the cornea, with a copious flow of tears; and Dr. Glover informs me, that the vapour of the common medicinal acid held to the eye produces instant redness, disappearing with equal rapidity. These are sufficient proofs to show that its primary action is stimulating, and hence it becomes a question, whether the suddenly fatal effects we find described from applying the acid to the eye do not merely partake of the general nature of a shock. In a communication formerly brought before this Society, I adduced some experimental and other evidence to prove that the specific action of this poison is exerted in the larynx and trachea. Again, Professor Christison, though he admits that conia is a local irritant, nevertheless attaches much importance to an experiment of his own, as proving the doctrine of sympathetic action, in which this alkaloid, injected in the form of muriate into the femoral vein of a dog, produced immediate death. But is not this sufficiently explained as resulting from a sudden violent contraction of the heart, produced by the stimulus applied to it, and the consequent stoppage of the circulation, rather than from any specific action of the poison? Some remarks by the author on this subject will be found in a paper on "the Active Properties of Hemlock" in the *ASSOCIATION JOURNAL* for 1853 (p. 559).

The following general conclusions may be given as a summary of the contents of the paper.

I. The term "woorara" appears to have been longer distinctly employed to designate the Indian arrow poison than any of the other names, except, perhaps, "curare", with the origin of which the author is not acquainted.

II. Woorara has a generic meaning like opium, sarsaparilla, etc., while Ticunas is only the proper name of one of the native tribes which prepare the poison. Ticunas, however, in common with Macusi and other Indian names, may be used specifically to distinguish particular manufactures, according to the practice with other drugs.

III. The physiological action of woorara is opposed to the view that it owes its chief ingredient to a plant of the genus *Strychnos*.

IV. In order to determine the point as to whether or not the poison is derived from the *Strychnos toxifera*, it is necessary to obtain authentic specimens of the bark and wood in sufficient quantity to allow the question to be thoroughly investigated.

V. Woorara is a poison when swallowed, contrary to what is commonly believed on that subject.

VI. It acts primarily as a stimulant.

VII. It acts secondarily, or, as it may be termed, specifically, as a sedative, paralysing the functions of the nervous system; and this both locally where it is immediately applied to the body, and constitutionally after it enters the circulation.

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NOTES ON THE ADMINISTRATION OF GALLIC ACID, ESPECIALLY IN HÆMOPTYSIS AND IN ALBUMINURIA.

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Royal Infirmary.

[Read to the Medico-Chirurgical Society of Edinburgh,
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THE following observations may possibly have for the Medico-Chirurgical Society such an amount of interest as belongs to all facts bearing on the action of remedies whose place in the list of our therapeutic resources is as yet undetermined. I scarcely venture to hope that they will be considered conclusive upon any point of great practical utility; but if they succeed in attracting the attention of the members so far as to lead to further experiments, or to decisive statements of experience already acquired in the course of