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THE

NEW TREATMENT

OF

SNAKE-BITE,

WITH

PLAIN DIRECTIONS FOR INJECTING.

BY

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PROFESSOR OF ANATOMY, PHYSIOLOGY, AND PATHOLOGY IN THE UNIVERSITY OF MELBOURNE. FORMERLY HOUSE SURGEON TO THE WESTMINSTER HOSPITAL, LONDON, AND SENIOR HOUSE SURGEON TO THE ROYAL INFIRMARY AND LUNATIC ASYLUM, LIVERPOOL. LATELY LECTURER ON ANATOMY AT THE SCHOOL OF MEDICINE, ADJOINING ST. GEORGE'S HOSPITAL, AND PHYSICIAN TO THE ROYAL HOSPITAL FOR DISEASES OF THE CHEST, LONDON.

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THE NEW TREATMENT OF SNAKE-BITE.

The time has now arrived when much of a hopeful nature may be written on this subject. To see any one die with the physician standing empty of all resource is a sorry sight, and he that has ever witnessed a being in the height of manhood crumble, as it were, to pieces from the prick of a serpent's fang, has beheld that which is at once sickening and appalling. Let us hope the day is fast coming when some of the terrible evils to which mankind is liable will be things of the past. But for that blessed result there needs the will of the people themselves. It is curious to see with what patience and perseverance, and at what cost, the condition of distant worlds is sought after; how, in quest of gold and diamonds, the bowels of the earth are anatomised, and how, even lately, a man-of-war has been equipped to bucket-up the bottom of the sea in search of protozoa. All this is right and good, but what is the colour, what the weight of the money spent by the public to discover and destroy those secret enemies that rob us of our health, our life, and with them the hopes of many. Only the other day one might read of four children snatched by diphtheria from one desolated home. The head is bowed, the heart is broken, and that is all. But if in so many weeks as many silver spoons had disappeared from the plate-basket of that home, what a stir would there have been among the detectives of this city. The spoon is looked after, the thief is dodged, lawyers are set to work, judges are awake, and gaolers happy; whatever expenditure is incurred by departments is at once paid; but the child is gone, the unknown thief of that mysterious family of fevers is left alone; the only detectives being a few health-officers paid barely sufficient to use their noses when some stench more powerful than another displaces the pure air of heaven. So far, then, as tracing the origin and destroying the effects of disease this is mere farce and waste of time. We should look to these matters in earnest, and appoint a proper scientific staff, with funds at its disposal, to grapple with these secret but no less potent enemies to our happiness.

But what has all this to do with snake-poisoning? Much, for fever-poisons currupt the blood, and a like agency is at work in snake-poisoning. The successful treatment of snake-bite must be the key to the successful treatment of many other diseased conditions. These latter I will leave for the present, and seizing upon the subject of Snake-poisoning, commence with the reasons for my treatment, examine and comment upon its results, and, lastly, throw out some suggestions, by following which, the practice may be made available to people in most, if not all, localities.

A very few words will suffice to say that previous to the commencement of the experiments I am about to detail, nearly every possible and supposed or vaunted remedy had been tried by me and found useless. The same had happened to Dr. Weir Mitchell, of Philadelphia, whose labours, although unsuccessful as to remedies, are in the highest degree valuable as to the nature and action of the poison of the rattlesnake. This eminent American physiologist's writings are in the library of the Royal Society, and should be read by those desiring knowledge on this most interesting subject. His later papers, also, in the *New York Medical Journal* for January, 1868, abound with curious and important facts, and make one smile to see the European and Indian doctors going over the same ground as that travelled by him years ago, for, with the exception of some local differences, the action of the poison of the Indian, American, and Australian snakes, is pretty much alike.

To proceed. I soon discovered that all bites of snakes are not effective upon dogs. Thus only the hair may be caught, and although the animal may be well shaken, the poison is spilt outside the skin. Again, the fang or fangs may pass obliquely, and the poison not be injected below the skin. If, however, a bite be really executed, then the effects are not long in coming to the surface. But it is not always easy to get a snake to bite a dog; frequently, most commonly indeed, it is afraid of the quadruped, and would slink away if it could, so that in order to save time, and in the end to be more certain of results, I have more usually inoculated with the poison than trusted to the bite of the reptile; and I may state that only in one instance out of numbers have I failed to kill a dog by placing the poison beneath the skin. Let no one think lightly of snake poison; it matters not at what season of the year it is obtained, whether thick or thin, whether dried up into a powder by the sun or converted into a hard gum, it will, if once introduced into the blood, show its vitality as surely, aye, even more surely, than the dried seed placed in the ground and watered. It will even, according to Weir Mitchell, exert its effects through the thinner walls of the minute vessels of the body, presently destroying them, and entering the circulation; but it will not affect the body if swallowed. It has, however, been stated by a Paris *savant*, that the inner lining of the cheeks do not oppose its passage into the blood. I will examine this when my unseen (at least by me) friend, Dr. Gummow, of Swan-hill, sends me down another colony of tiger snakes. That gentleman has always supplied me at his own expense with as many snakes as I have desired.

Remembering, then, that only one dog had recovered from the effects of inoculation, let us apply this to the results of the experiments I will presently detail. It will be useful to consider at the outset the relative values of the three methods of treatment in blood poisoning.

1. The ordinary, by the mouth.—Dose after dose of ammonia is given, and is probably at once converted in the stomach into hydrochlorate of ammonia. If it passes the stomach it meets with the alkaline secretions of the intestines or mixes with the fatty matters of the bile. In either case it has to be absorbed by the stomach or intestinal veins, pass through the liver, then to the right side of the heart, then through the lungs back to the left side of the heart, and thence all over the body.

The objections to this treatment are, first, that in cases of snake poisoning the stomach rejects rather than retains; second, that ordinarily the circulation is so slow that absorption does not take place; third, that long before the remedy enters the general circulation it ceases to be that which it was when administered by the mouth; and, lastly, experience shows that it cannot be relied on.

2. The hypodermic (under the skin) treatment is inadmissible, for the caustic alkali destroys the tissues, producing sores and sloughs, and does not become absorbed.

3. The direct injection of caustic or liquid ammonia, mixed with two parts of water, avoiding the internal laboratory of stomach, spleen, liver, and intestines, at once mixes with the blood, which sufficiently dilutes its caustic powers. Within twenty or thirty seconds of its introduction into a vein it passes to every unit of structure of the body. Wherever the serpent's poison lurks, there the ammonia is, and by the end of one minute has twice made the circulation of the body. It has passed in as a caustic alkali, free to exert its marvellous influence upon the inspired oxygen, or even possibly, upon the poison itself, but certainly upon its products. It can also be used without the least fear of introducing air, and should any air enter by so minute a puncture as is made, no harm will follow.

With such physiological truths as guides, let us see the result of practice; and here I may state that all practice not based on physiology is old woman's avocation, and is fast passing out of date, at least in the old country. Far from the centre of knowledge it may still flourish, but *delenda est Carthago*.

Experiment 1.—Oct. 23, 1868.—A small dog was bitten by a tiger snake (*Hoplocephalus curtus*) at two p.m. By 4 o'clock it was incessantly purging and vomiting, and by the next morning was nearly dead, the breathing being slow and the heart's action scarcely to be felt; in fact, it was questionable to some whether life had not passed away. I now slowly injected 10 minims of the strongest liquid ammonia, mixed with 25 minims of water, into a vein of the neck—the external jugular. Immediately the dog improved; the heart beats were more evident, and the breathing fuller and more natural. The next day he was still better, but paralysed. On the following morning, Oct. 26, I repeated the injection, but this time into the vein on the opposite side of the neck; from this he at once improved, and by the 31st could run about and eat well.

Experiment 2.—Oct. 28, at 10.40 a.m., I pressed the whole contents of one poison gland beneath the skin of a small dog. At 11.5 a.m., vomiting, purging, and staggering came on. I at once injected into one external jugular vein the same quantity of diluted ammonia as in the first case; but the vomiting continued. At 12.15 p.m., I injected half the former quantity into another vein. Immediately the dog became quite easy; the vomiting, purging, and staggering ceased, and by 4 p.m., was quite well, eating and drinking.

Experiment 3.—Nov. 2, at 10.30 a.m., I inoculated in five or six separate places a middling-sized dog with the contents of two poison glands of a large tiger snake. Vomiting, purging, and staggering were very severe and constant by 11.30 a.m. The same quantity of ammonia was injected, but into separate veins, owing to spilling some when operating on the first vein. Immediately all symptoms of snake poisoning ceased, although, from the severity of the inoculation, large sores prevented the dog running about for days.

Experiment 4.—Nov. 2, at 10.45 a.m., I inoculated a middling-sized dog with the contents of one poison gland. Vomiting, purging, and staggering commenced at 11.30 a.m. At 11.45 a.m., I injected 20 minims of the solution. The dog at once recovered.

Experiment 5.—Nov. 4, at 9 a.m., I placed a small dog in my box, in which were two large vicious tiger snakes. After he had remained in the box one hour and a half, during which time the snakes seemed afraid of biting, although occasionally, when irritated, they attacked him, but I could not be certain, though I fancied one had pricked him in the ear, I removed him, and to make certain, inoculated him with the contents of one poison gland. From what followed I believe he had been bitten. At 10.50 a.m., excessive vomiting, bloody purging, and staggering came on. I then injected 20 minims of the solution, which caused a strong spasm all over the body, and in one minute every bad symptom had ceased, and after waiting nearly an hour with two friends I left, satisfied of the dog's recovery, but in my absence, which lasted one hour, the dog became worse. My duties did not permit me to stay and repeat the injection, as I should otherwise have done, and in a few hours the dog died.

But now commences a new chapter in the history of snake-poisoning.

Five days after the publication in *The Argus* of the experiments on dogs—that is, on the 11th of November 1868—Dr Dempster, of Beechworth, first used the new method upon a human being. He thus wrote me: “An adult male came under my care for treatment for the bite of a black snake. He was bitten about 8 a.m., and after several minutes had elapsed he pricked and incised the wound. Prior to this however, he had felt very giddy. I did not see him for more than an hour afterwards, and treated him in the usual way, with brandy and ammonia, and scarifying the wound and applying ammonia. The man, however, fell into a state of stupor, and when I was called to him at mid-day we could not rouse him. I therefore injected liquor ammoniæ fortior B. P. into the saphena vein, and also hypodermically. This affected him at once, and after the second injection he woke up, and became sensible; his pupils, which had before been very sluggish, acted well; and his pulse rose from fifty-six to

seventy. After this he progressed well, with the exception of violent vomiting for twelve hours. He is now (November 15) convalescent but very weak. I of course continued the stimulant treatment, but I certainly attribute the man's recovery to the injection of ammonia, of which I altogether used about twelve minims." "The effect of the injection," says the *Ovens Advertiser*, "was wonderful;" and the *Spectator* says "the effect was immediately perceptible."

It will be well to consider somewhat attentively this the first recorded case. It occurred in the practice of a gentleman well qualified, I am assured, to judge of the meaning of symptoms. Everything had been tried—cutting out the part, suction, brandy and ammonia internally, and ammonia externally, and yet the stupor became so profound that "they could not rouse him." Immediately after the injection of ammonia into the vein he woke up, and the pupils of the eyes, instead of being motionless, as in coma, contracted and expanded with the approach and recession of light.

Quite sufficient was it for me, when reading the doctor's letter, to know that the ammonia had been actually injected into the veins of a human being, and that the nerve cells, instead of, as under the influence of snake-poison, being dead to those vibrations whose reception constitute light and sound, now responded, and the man was once more, ammonia being added to his blood, in harmony with the forces which surrounded him. Animal life in abeyance, or passing away, was re-manifested, or brought back.

Let it not be imagined that the physician has not this power; he has, and hence the God-like nature of his avocation: far more will he have the power to save than he yet knows or dreams of. But in making this assertion, let me not be charged with impiety, for life I hold as distinct from soul or spirit; and is the proper study of the physician, the form and functions of the body should be the study of his life, as they were that of Harvey, Hunter, Bell, and others famous in the healing art. Hence, therefore, it will be seen that the ultimate recovery of this first case had not for me the importance that might have been imagined, for recovery sometimes takes place under any form of treatment, or, indeed, in spite of it, but what was of importance was the almost instantaneous awakening to external impressions, the *post hoc* and the *propter hoc* of the ammonia.

The second case is detailed in the *Newcastle Chronicle*, N.S.W., in which, on the 28th November, 1868, Dr. Irwin, of Lake Macquarie road, injected a quantity of ammonia into a vein above the wrist, and the woman recovered. I have been unable to get further particulars, and merely mention it for what it is worth.

The third case is thus recorded by Mr. Arnold, M.R.C.S., &c., of St. Kilda:—"On Nov. 30, 1868, Mr. Brown, station-master, Elsternwick, was, between the hours of 11 and 12 a.m., bitten severely on the third finger of the right hand by a brown snake (*Hoplocephalus superbus*) about 2ft. 10in. in length. He felt great pain in the wound at the time, sucked it, and applied a ligature of string. Nearly two hours elapsed before he was brought to my residence for treatment, as he did not feel the least alarmed at the consequences. On arrival, he had lost all power over the lower extremities, and had passed into a state of perfect insensibility, vomiting, feeble pulse, pupils sluggish, &c. Having adopted the usual plan of applying a ligature, I excised the flesh in the vicinity of the wound, and applied strong ammonia, giving brandy and ammonia. I sent for my neighbour, Mr. A'Beckett, to consult with me in the case. We then brought to our aid galvanism, which removed for the time, whilst the patient was under its influence, the insensibility. This with the occasional administration of stimulants, was kept up for about two hours. Having in the interim sent for Professor Halford, he now, with Dr. Wooldridge, of South Yarra, came to our assistance. We then calmly and seriously reviewed the alarming aspect of the case, and came to the conclusion that if further means were not adopted our patient must sink. Messrs. Wooldridge and A'Beckett, and myself, therefore, strongly urged Professor Halford to inject ammonia.

into the system. Dr. Halford, therefore, cut through the skin, exposing the superficial radial vein, and the point of the syringe being introduced into the vein, the injection was completed. At the time of the operation the patient was comatose. The effect of the injection of ammonia into the system was marvellous. In a very short time the patient became sensible, and in answer to a question, 'How he felt,' replied 'Fine'—a very appropriate and significant word. From that time he improved, and all symptoms of coma disappeared.'

Some remarks upon this case may not be without interest to the general reader:—

In the first place, the accident occurring so near Melbourne, rendered its publicity very general; and the opportunity of gaining all particulars was very good. It may be taken then, for certain, that before reaching Mr. Arnold's, Brown had only taken six-penny-worth of brandy, and part of that he had rejected. By this time, also, his legs refused to carry him, and he has now no recollection of entering Mr. Arnold's house; in fact, he had then become insensible. It will be seen that galvanism had the power of temporarily restoring him, but that this power was surely failing; the coma was becoming too deep, and the pulse more feeble and irregular. Of this most important point I made the closest inquiries, and Messrs. Arnold and a'Beckett, who had watched and helped the patient with the greatest anxiety and assiduity since his arrival, felt their resources failing.

In consultation with these gentlemen and Mr. Wooldridge, I stated that, having originally suggested the ammoniacal injection, I would at once operate if they wished; but that, lest it might be supposed I could not refrain from mounting my hobby-horse, and cutting capers in the face of a dying man, we would, if they thought fit, still continue the old-fashioned remedies. At once they took the responsibility of the new method, and within a few minutes the patient was out of danger.

Dr. Wooldridge, who was sitting, watch in hand, directly in front of the patient, said the pupils began to contract, dilate, and contract again, within a minute after the injection of the ammonia.

Let the reader not forget what I have before stated, viz., that in this time the ammonia, although injected at the wrist, had probably visited those eyes, and the nerve-cells with which they were *en rapport*, and every other part of the body twice, and that as long as it remained in the blood with the increased frequency of the pulse, the visits would be repeated every twenty seconds. The change would otherwise appear marvellous; but, in verity, truth is stranger than fiction.

The fourth case is that of Philip Edmonds, who, on the 9th of December, 1868, was bitten in the leg. Dr. O'Grady, fearing the case was a hopeless one, the patient being quite comatose and sinking fast, injected sixty drops of diluted ammonia into the median-basilic vein of the right arm. Besides this, a tablespoonful of brandy and water was given every half-hour, and the galvanic battery used, and on the following morning the man resumed his ordinary work at Mr. W. Nicholl's station, Camperdown. In answer to my question as to what share the new treatment had in the recovery, Dr. O'Grady thus writes:—"I am decidedly of opinion that the patient would have died but for the injected ammonia."

The fifth and sixth case is that of Dr. Barnett, of Smythesdale, who wrote to me as follows:—

"Thursday, Dec. 24, 1868.

"Between ten and eleven a.m. a messenger arrived requiring my immediate attendance on a girl named Isabella Mellross, aged fourteen years, who had, when drawing water from a hole, been bitten on the extremity of the last phalanx of the little finger of the right hand by a tiger snake, which had coiled itself round the cord of the ascending bucket.

"It being some two miles distant, I furnished myself with my pocket

case of instruments, hypodermic syringe, a bottle of sp. ammon. co., and another of solution of ammonia (liq. ammon. fort. 1drm., aq. 2drm.). On arriving there I found that the mother had excised the bitten part, and put a ligature round the finger immediately, and given about two ounces of gin. The girl was being walked about between two others; countenance swollen and dusky, conjunctiva much injected, cornea glassy, pulse small and slow, breathing also slow—a complete state of stupor—from which, with difficulty, I could only partially rouse her, and obtaining an incoherent muttering reply to a question. If the support was withdrawn she sank on to the floor.

“11.10.—Had her placed on a bed, and injected fifteen drops of the solut. ammon. into the median vein of injured arm; also gave 1 drm. of sp. ammon. co., and washed the wound with solut. ammon. In a few minutes she became violently excited, laughing, crying, singing, biting, and throwing herself about so much as to require two persons to restrain her.

“2.—Intervals of tranquillity, in which she lies with her eyes open and fixed, noticing nothing, nor replying if spoken to; pulse normal.

“5.30.—Restored to perfect consciousness; pulse and countenance natural.

“7.—Continues all right, so I leave her.

“Friday, December 25.

“About four p.m. I receive a message to go to Black-hill, as the same girl had been again bitten by a black snake.

“4.20 p.m. I arrived at the house, and the mother tells me that the girl and a younger brother, when in or near the garden, saw a snake basking; the younger one ran back to the house and informed the mother, who immediately went to the spot. Having on the way seized a clothes-prop, she called to her daughter to get out of the way, upon which the girl took a few steps on one side to where a green bush grew, took hold of a branch, and when bending it down to break it, the mother saw two snakes rise from under the bush, one of which seized her hand. The mother immediately acted as before, by excising the part, putting on a ligature, giving about two ounces of spirits, and also about 2 drm. sp. ammon. co. I had left on the previous day.

“I found no symptoms of poison present. There was a wound on the last phalanx of the right finger of the left hand, which I washed with the solut. ammon., and, as a matter of precaution, injected fifteen drops into a vein at the elbow; but wishing to test the efficacy of the injection, I administered nothing whatever internally.

“In five minutes I asked her if she felt anything unusual. She said ‘No,’ excepting a burning pain on the inside of the arm, in the course of the basilic vein. In another five minutes the same train of nervous symptoms set in as occurred yesterday, but not so violently.

“5.—Retching a little, but ejecting nothing.

“8.30.—Still in the same state; no toxic symptoms have shown themselves, and considering that the others will subside as before, I leave her, and send a nervine sedative mixture, with orders to be informed in the morning if she is not all right.

“Saturday, December 26.

“7.30 a.m.—Messenger arrived to say she continues in the same state as when I left her last evening. Send her a mixture of hyoseyamus, valerian, castor, and spirits of ammonia compound.

“11.—Visit her and find a change in the type of symptoms; they are those I have seen in cases of shock from fright, paroxysms of shrieking and trembling when any unusual noise is made, or person goes into the room; a wild, terror stricken expression of countenance; sensible, and held out her arm for me to examine when ordered, but would not reply to a question.

“7 p.m.—Much the same, but has dozed a little at times, and speaks when addressed. Ordered beef tea.

“10.—Add chlorodyne to mixture, and to let me know in the morning if she is no better.

“Sunday, December 27.

“5 p.m.—No message having arrived, I call in on going near the place on my round. Found her quite convalescent, but nervous.”

I have had much correspondence with Dr. Barnett about this case. The mother of the girl is a most intelligent woman, and saw as did her brother the second bite inflicted. The locality is infested with snakes, the father having killed no less than twenty-seven in an old shaft last year at one time, the bottom of the shaft being, as he said “alive with them.” There is also a little eminence near the house which years ago was named “Snake-hill.”

This case is valuable in showing that from a complete state of stupor the ammonia roused the girl into a condition of violent excitement, the time required being only a few minutes. After the second bite, also, although no symptoms of poisoning had shown themselves, the system bore the injection of fifteen minims of diluted ammonia with no other evil resulting than great mental excitement as on the previous day, and fright consequent on two such terrible accidents. As I have said before, her recovery is at present a secondary consideration, that will be primary only as the remedial powers of ammonia become established, and I have other cases yet to refer to as aids to a decision on this matter. However, on the 2nd January Dr. Barnett expressed himself in the most hopeful, and to me flattering terms, of the value of the treatment in all such cases, and as, in his opinion, opening up a wide field for physiological investigation. My object is to put before the reader the first impressions of the first witnesses to a new mode of treatment, ere, in fact, it becomes reputable; while yet, indeed, it is assailed openly, or despised and sneered at secretly, as witness an announcement that was at this time sent all over the colony:—“Injecting ammonia into a vein will cause phlebitis and death.” Such a warning did Dr. Barnett receive from Melbourne a few days after the recovery of his patient. In spite, however, of warning, people began getting syringes of some sort. Amongst others, my friend and colleague, Professor Wilson, had a syringe constructed and sent down to him at his villa at Mornington. It was not long idle. Here is a copy of a letter I received from him:—

“Mornington, Saturday, Jan. 9, 1869.

“About ten a.m. this morning, a young man of eighteen or nineteen, was bitten by a (tiger?) snake on the outside of the calf of the left leg. Incision was made by a razor through the bite and above and below it; ammonia was procured, and rubbed in, and a ligature placed round the leg just below the knee. About three-fourths of a bottle of brandy, mixed with ammonia was administered internally. He was then driven into the township, great exertions being requisite to keep him awake. Mr. Lane, surgeon, was sent for, and while waiting for him I gave him fifteen or twenty drops of liq. am. fort., in a wineglassful of water, about every five minutes. He was kept walking backwards and forwards. His whole weight was supported by two men between whom he walked, and his head drooped on their shoulders. He was able to swallow. He vomited copiously once. On Mr. Lane's arrival he made an incision in the skin of the right arm above the elbow, and injected ten drops of liq. amm. fort. and twenty drops water, into a large vein. This was at half-past eleven. The pupils, which previously were nearly insensible to light, instantly contracted and expanded on opening and closing the eyelids. The pulse remained tolerably steady at from eighty-four to ninety. The injection of the ammonia was followed by a motion of the eyelids, an opening and shutting of the eyes, a wild rolling of the eyeballs, and afterwards by a spasmodic action of the left arm and right leg, which increased so that the arm required all a man's strength to hold it. The hand clutched at the hair and at the leg. There was also an appearance of choking, and an attempt to vomit. There was also difficulty in swallowing, and the attempt was followed by a foaming at the mouth. He understood what was said, so as to put out his tongue when told to do so. The expression of his face was

more intelligent than previously. At four p.m. he was sensible, spoke a word or two, but could not swallow. He was quite quiet. The spasmodic action almost quite gone. He did not seem inclined to sleep, and, in answer to questions, said his chest and throat were very sore.

“Sunday Evening.

“This morning the young man was much better, but very weak, his arm and leg very painful. He dozed a little. His throat was very sore, and he could not swallow. In the evening he was still getting quietly better. Quite sensible, cannot swallow, but is not inclined to take anything.”

In this, the seventh case, I have since been assured by Professor Wilson and Dr. Lane, that before the syringe was put down the pupils began to be contracted and otherwise show the recognition of impressions of light, and that, humanly speaking, the injection of ammonia saved the boy. There is no doubt the case was greatly complicated, and made worse by the large quantity of brandy and strong ammonia given internally. This the good professor himself suspected after the excitement of battling for the boy's life was over.

The eighth case is one of great value, as showing the restorative power of ammonia in snake poisoning when injected into the veins, and the facility with which the operation may be performed in the absence of a medical practitioner :—

“On the 28th of January, 1869, at two p.m., Stephen Maher, aged nine years, was bitten in the left foot, immediately below the ankle, by a tiger snake. He at once ran home to his mother, who rubbed some salt into the bitten part. Noticing the place turning black and the boy getting giddy, she carried him to a neighbour named Rogers, who scarified the place, and burnt some gunpowder on it. He then carried him on horseback to Mr. Henshall, chemist, of Seymour, who immediately sent for a medical man, and in the meantime treated the boy with Underwood's antidote and brandy and ammonia. The medical man refusing to come, the boy was taken to him, and remained under his treatment till 7 p.m., when, as he seemed to be getting worse, he was taken to Mr. A. Stillman, another chemist, who immediately applied a pledget of lint saturated with strong liquid ammonia to the wound, and administered brandy, ammonia, and hot coffee internally. At 9 p.m., the boy was in a complete state of stupor, and evidently sinking, the body and the extremities being icy cold. Mr. Stillman being now joined by Mr. Henshall they decided upon using the injection, as recommended by Professor Halford. A half-ounce glass syringe having been carefully charged with diluted ammonia, in the proportion of two parts of ammonia to ten of water, Mr. Stillman made a lateral incision with a lancet in a vein of the right arm at the bend of the elbow. Mr. Henshall immediately inserted the nozzle of the syringe and slowly injected upwards towards the shoulder, about half the contents of the syringe. The effect was instantaneous; the boy rallied at once from the state of stupor, and the wound in the foot bled afresh. Afterwards friction was applied to his icy cold body and limbs, and hot coffee given *ad libitum*. By two a.m. he sat up in front of a fire, playing with a kitten, and he is now (February 1, 1869) quite recovered.”

Such was the account received by me from Mr. Brock, of the flour mills at Seymour. Besides the testimony of the operators themselves, I have been assured of the accuracy of the details by Mr. Sturt, police magistrate of Melbourne, who was in the township on the night of the accident. Wishing to get every information, I wrote to Messrs. Henshall and Stillman, and on the 17th of February, they thus replied :—

“The nozzle of the syringe was unquestionably inserted into the vein without any chance of error. There can be no doubt in our minds of the perfect efficiency of your discovery, and also that this was a real case of snake-bite pushed to the last extremity. The boy is now perfectly recovered, and does not suffer the least inconvenience.”

Here was a little fellow sinking, sinking, sinking, and suddenly rallying from the stupor ; the wound in his foot bleeding afresh. There is a mediæval touch about this description—something that smacks of the saints, especially as it finishes with the child, after a few hours, playing with a kitten before the fire. It is scarcely possible to imagine a clearer case of failure of ordinary remedies, and of sudden restoration and recovery after the injection of ammonia.

The ninth I have now to record, through the kindness of Dr. Langford, resident-surgeon at Kyneton Hospital, is the following obscure and unfortunate case—obscure, because, apart from knowing little of the accident, the punctures found on the thumbs were only one-eighth of an inch apart, which do not correspond with those inflicted by snakes, except they are extremely minute—unfortunate, from the lapse of time allowed to occur before medical aid was sought. It will doubtless be remembered that long ere twenty-seven hours had passed the serpent's poison had done its worst on Mr. Drummond, and here was a child of nine far upon the road we all shall travel, before any could recall him. This is Dr. Langford's letter :—

“Kyneton Hospital, March 25, 1869.

“Dear Sir,—In reply to yours of the 24th instant, I send you a short report of the case of a boy named Piggins, who died in the hospital, we believe, from snake bite.

“The boy, nine years of age, put his hand into a hole in a log about four p.m. on Saturday, when he was bitten by what he said was an opossum. He very soon felt ill, and coeyed, and his friends found him unable to walk many steps without falling ; they described his manner as that of one who was struck silly.

“Vomiting then came on, and they gave him a nobbler of brandy but no further treatment. At 7 p.m. on Sunday evening, twenty-seven hours after he was bitten, he was brought into the hospital. His pulse was 120, intermitting frequently, the extremities cold, the pupils dilated and insensible to light. He lay quiet, but answered reasonably when spoken to, complained of pain in the throat, had some difficulty in swallowing a dose of brandy and water, which I gave him immediately on his admission. There was trismus. He stated that he had seen the opossum bite him on the right thumb. On examination of the palmar aspect of the first phalanx of the thumb found four punctures like the pricks of a needle ; there was no sign of inflammation.

“A consultation of the honorary medical officers, Dr. Geary and myself, was held, and we came to the conclusion that the boy had been bitten by a snake, which, in the confusion and alarm of the moment, he had mistaken for an opossum. (He was looking for an opossum.) At 7.30 p.m. we injected five minims of the liq. ammon. fortior., diluted with twenty-five minims of lukewarm water, by means of a hypodermic injection syringe, into the basilic vein, of the right arm. Cutting on and exposing the vein, we thrust the sharp point of the syringe into the vein in the direction of the heart, and injected.

“We perceived very little effect ; the pulse and pupils remained as before, the skin became a little warmer, but as he was warmly covered and by this time had had two doses of brandy, we did not know whether we should attribute the increased warmth to the injection. A tablespoonful of brandy with the same quantity of water was now administered every twenty minutes. At 11.30 p.m. the same quantity of liq. ammon. was injected in the same manner into the cephalic vein of the left arm, without any apparent effect.

“The patient was kept plied with questions by the wardsman in attendance, to prevent his sleeping ; the brandy and water was given every quarter of an hour.

“At 9 a.m. on Monday the pulse was 130, very irregular, and intermitting frequently ; the skin was warm, and the pupils less dilated and somewhat

sensible to light. The trismus had increased, and made it difficult to administer the brandy and water.

“From 1 to 2 p.m. five minim doses of the liq. ammon. fortior in two tablespoonfuls of milk, were given every quarter of an hour, instead of the brandy and water. Then we again gave the brandy with calves’ foot jelly in place of the water.

“At 7 p.m. he was worse in every way; the pulse was 136, so irregular as to be difficult to count, with frequent intermissions. The right pupil was dilated and fixed, the left contracted a little to light.

“We again injected the same quantity of liq. ammon. into the basilic vein of right arm. No apparent effects. He remained perfectly sensible when spoken to, but gradually sank, and died about 9 a.m. on Tuesday. A *post-mortem* was made.

“On examining the injured thumb, I could only find two punctures; they looked such as would be inflicted by a pin and were about an eighth of an inch apart.—I remain, yours truly,

“W. LANGFORD, Resident Surgeon.”

I think there can be very little doubt that this was a case of snake-bite, and I conceive the boy was past human aid before admission to the hospital. Possibly, larger doses of ammonia by the syringe might have restored him; at least, knowing what I do now, nothing would prevent me from injecting a sufficient quantity to produce effects, perhaps the small quantity did prolong his life. Still, it must not be expected of any remedy to have power illimitable—that would be absurd; and, as I said before, in this case it was applied too late.

On considering all that has gone before, it seems that ammonia roused and saved whenever it had been used within seven hours of the infliction of the bite. Instead of improving, all the cases had been getting worse under the old treatment, and the injection of ammonia was used as a *dernier ressort*, and not with much faith in its efficacy. A case was wanting, uncomplicated with other forms of treatment; such a case (the tenth, and last) has lately occurred in the practice of Dr. Rae, of Bacchus Marsh, who has furnished me with the following important particulars:—

“About noon on the 17th July, 1869, a robust man, twenty-three years of age, while stooping on his hands and knees to drink from a water-hole, felt a sharp stinging pain on the inside of the palm of the right hand, which he at the time supposed was caused by a thistle. On getting up, however, he saw a snake about eighteen inches long getting into the water directly under him. The man immediately ran to an adjoining hut, where the bitten portion of the hand was freely excised with a razor. The wound bled profusely. He then rode to my residence, a distance of six miles, when I saw him. Suction was employed, and the wound was cauterised. As there was no appearance of general disturbance, he was sent home, with instructions to send to me at once should drowsiness or any other untoward symptom appear. About three o’clock he became drowsy, and complained of numbness of the right arm, intolerance of light, oppression about the chest, and slight sickness. At this time he took one glass of brandy, but refused to take more, although urged to do so by his friends. No vehicle being at hand, he set out on horseback to see me again, accompanied by two friends. On the way, the disposition to sleep became so great that one of his friends had to support him on the horse, while the other kept up a pretty severe flagellation with a stick. When I saw him he could scarcely be roused. Shouting and shaking elicited only an occasional monosyllable. The face was puffed and congested, the surface of the body cold and covered with a clammy perspiration; breathing quiet and slow; pulse feeble and intermittent. The pupils were widely dilated, and scarcely responded to the stimulus of light. It was quite evident that unless very decided measures were at once adopted death was inevitable, and that in a very short time. My first impulse was to administer

a powerful stimulant by the mouth; but the idea was abandoned, as it seemed unsafe to trust to the power of swallowing. The injection of ammonia into the circulation was therefore determined on. The median cephalic vein of the right arm was exposed, and twelve minims of strong solution of ammonia in a drachm of warm water were carefully injected into the blood current by means of a hypodermic syringe. Within a minute the man moved himself in the chair, and the pulse became steadier and of better volume. Shortly afterwards he opened his eyes, became conscious of what was going on around him, and in about ten minutes had so far recovered as to be able to walk out into the open air unassisted. I did not allow him to go home for a few hours afterwards, but his recovery was complete. He called on me on the following day, when he expressed himself as feeling quite well, and he has since returned to his work. The case speaks for itself. The promptitude of the action of the ammonia, and the permanence of its effect, appear to me to indicate a specificness which gives promise of most important results."

In another communication to me, Dr. Rae says :—" My own experience of the method of treatment by injection of ammonia into the circulation leads me to believe that we now possess the means of treating all ordinary cases of snake-bite with the certainty, or at least with a reasonable prospect of success."

Dr. Rae has since informed me personally that he was not induced to inject the ammonia from any faith in it as a remedy, but that the man seemed about to die, that he was surrounded by an agitated crowd, and the thing was done because nothing else could be; and, lo! in ten minutes, the astonished doctor and excited crowd see the man smoke his pipe and walk away—for this thing was not done in a corner. Dr. Rae assured me he could scarcely believe his eyes, and could hardly venture to write on the subject, as the facts were past belief, and yet nevertheless true.

Such, then, being the results obtained by many totally independent and differently localised observers, in what estimation should we hold this new method of treating snake-bite? That it is not mere empiricism, as the word is commonly understood, is evident from the physiological bases on which it rests. That it will take its place in the annals of experimental medicine I now firmly believe.

It is not within the scope of this paper to enter into a consideration of the allied conditions of the body to which the injection of ammonia may be applicable. I have elsewhere shown the remarkable power it exerts in restoring from full doses of chloroform. In opium poisoning and cholera it is particularly indicated.

It is said that more people have been bitten by snakes lately than in former years, and the fact is explained by the more general occupation of the land. We may probably, therefore, expect that in a few weeks, and during the coming summer, other cases will occur; and they will doubtless be amongst the poor or hard-labouring classes. How are these people to be aided? I would propose that one, or two, or more persons from every remote district be instructed in the use of the syringe. Any one might be taught its use in one hour. There is no danger about injuring veins; if you fail in one, what matters? A little bit of rag will stop the bleeding. Cut down upon another and inject ten minims of the strongest liquor of ammonia, mixed with twenty of water, the point of the syringe entering the vein *directed towards the heart*, and repeat the operation if necessary. Perhaps people in the townships, or the squatters, could take the matter up, the nearest doctor giving gladly his advice.

It may be as well for me to make one or two concluding observations on a notice that appeared in the *Lancet* of some experiments performed by Dr. Fayrer, of Calcutta. It is said—for the details of the experiments have never appeared—that he caused a full grown cobra to bite a dog and several pigeons,

and that although the ammoniacal injection delayed, it did not prevent the death of the animals. The reader will probably at once understand that any treatment applied to a man has far greater chance of success than when the subject of experiment is a dog; and any one possessing the least physiological knowledge would hardly expect a pigeon to recover either from the bite of a cobra or after the injection of the ammonia—by such delicate apparatus is the life of birds sustained. Nor if in future all the lower animals, although injected, died from cobra or even tiger-snake poisoning, would it affect the evidence that has now been obtained as to the influence of the injection of ammonia into the veins of men. But, indeed, we know nothing of the manner in which the said injection was performed, and I am hopeful that the inhabitants of both India and America and the adjoining colonies may yet benefit by this new method of treating snake-bite, for, thanks to the courage of Drs. Dempster, Irwin, Arnold, A Beckett, Wooldridge, Lane, Barnett, Messrs. Henshall and Stillman, and of Dr. Rae, and to the encouragement of many of the inhabitants of Melbourne, amongst whom the chiefest were of my own profession, the practice has been lifted from the region of dogs and pigeons into that of man himself.

APPENDIX.



Experiments performed with the assistance of Drs. NEILD and WOOLDRIDGE, to show that Ammonia may not only be injected into the veins but into the heart itself without injurious effects, and that it counteracts in a most powerful manner the lethal influence of chloroform.

EXPERIMENT I.

A large young dog was got under the influence of chloroform, the front of the chest was removed and artificial respiration maintained; chloroform being occasionally dropped into the bellows.

11.27 a.m.—Half a drachm of Liq. Ammonia B.P. sp. gr. 0.959 was injected into the left external jugular vein. The heart's action was at once accelerated, but soon settled down into steady pulsations.

11.35 a.m.—Half a drachm more was injected into the right ventricle. Immediate increase of the heart's action ensued. Consciousness returning as evidenced by the reflex movements of the eye-lids, and by a withdrawing of the leg on pricking the foot. Pulsation powerful and steady.

11.45. a.m.—Completely conscious, struggling to get up. More chloroform was poured into the bellows. Soon became insensible again.

11.50 a.m.—Half a drachm was injected into the left ventricle. This was almost immediately followed by a contraction of all the muscles of the body, which soon subsided. Heart's pulsation very vigorous.

11.53 a.m.—Dog returning to consciousness; more chloroform poured into the bellows. Soon again insensible.

12 noon.—Half a drachm more injected into the left ventricle. The same increased pulsation, followed by slight universal spasm as before.

12.2 p.m.—Dog quite conscious and struggling; more chloroform poured into the bellows.

12.11 p.m.—Dog again conscious and struggling; more chloroform poured into the bellows.

12.13 p.m.—Again quite insensible, pupils dilated, &c.

12.17 p.m.—Half a drachm more Ammonia was injected into the right ventricle. Heart pulsated forcibly, the same general spasm following.

12.22 p.m.—Dog again conscious ; more chloroform by the bellows.

12.26 p.m.—The dog being again quite insensible, I injected half a drachm more into the right jugular vein. In ten seconds the heart's action was increased, the same general muscular spasm following. Sensibility returning as shown by the reflex acts of the eyelids, &c.

12.33 p.m.—Quite conscious and struggling to get up ; more chloroform in the bellows ; soon again insensible.

12.36 p.m.—Half a drachm more injected into the left ventricle. Pulsations immediately increased, followed by the same general spasm, but in a milder degree.

12.40 p.m.—Heart's action powerful and steady ; pulsations good all over the body.

12.43 p.m.—Dog again quite conscious ; more chloroform given ; soon insensible.

12.48 p.m.—One whole drachm was injected into the left ventricle. Heart's action immediately quickened, followed by the general spasm. Reflex action of eyelids returning.

12.57 p.m.—Dog quite conscious, and struggling hard to get up. He seeming to have as much vitality as ever, and a sufficient trial having been made the heart was cut out and an end put to the experiment.

On examining the cavities of the heart, there was not the least trace of irritation or inflammation, and the punctures through the muscular substance were scarcely visible. The vigour and persistence of the heart's contractions after removal from the body were greater than I had ever before witnessed.

EXPERIMENT II.

Another large dog was chloroformed, the front of the chest removed, and artificial respiration maintained for one hour and twenty minutes, during which time the heart's movements were carefully observed. As in the former case the injection of the Ammonia had the effect of continually rousing the dog from the full influence of the chloroform, necessitating always a further supply of the anæsthetic before another quantity of Ammonia was used. In this dog both jugular veins once, the right ventricle once, and the left ventricle three times, were injected with half drachm doses of Liq. Ammoniæ B.P. sp. gr. 0.959. The results were precisely similar to those noticed in the other dog, viz., immediate increase of the heart's pulsations settling down into steady beats. The same muscular spasms followed by returning consciousness, and lastly the same absence of any visible injury to the heart's cavities or walls.

I N S T R U C T I O N S .



Immediately upon being bitten, cut out the part, the first cut to be on the side of the wound nearest to the heart, so as to at once stop the poison travelling towards the chest.

Let nothing prevent this proceeding. However valuable any after treatment may be, this must not be neglected. On the same principle in poisoning by the stomach, the first remedy is the emetic.

When symptoms of drowsiness or sickness come on, let the patient's arm hang down, by which the veins will become distended and visible. Raise up the skin over any one of the large veins with the forefinger and thumb of the left hand, and pass the blade of a pen-knife having its back to the vein, between the latter and the finger and thumb, and then cut upwards through the skin. The opening made will show the vein lying in the loose tissue. The point of the syringe should pierce the vein so as to enter its cavity, but not pass through it, and it should be directed towards the heart.

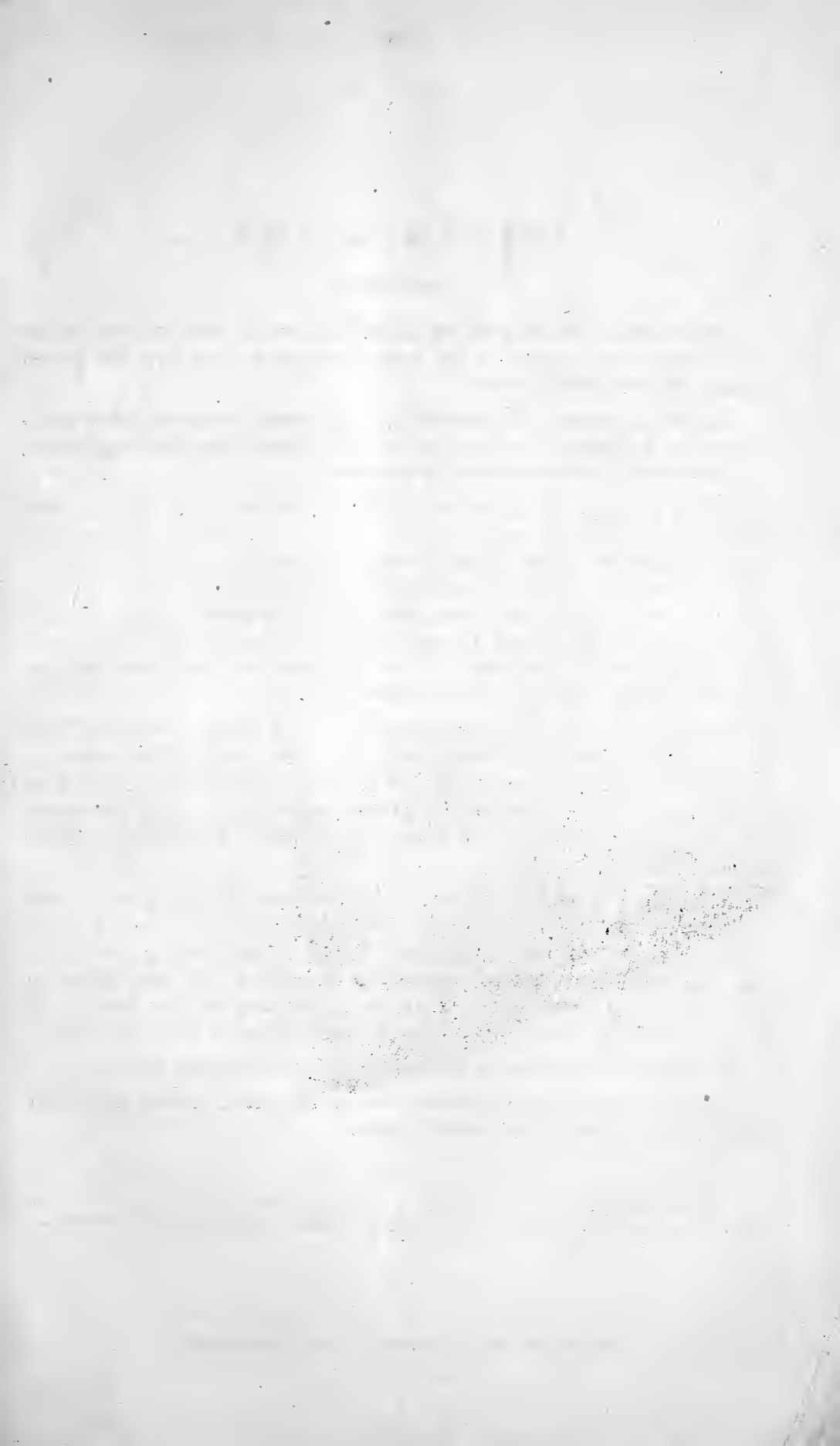
Before cutting, have the syringe ready full of the diluted Ammonia,* and don't spill any about the wound; don't touch the piston till the canula is clearly in the vein, and then press it down firmly. Repeat the operation as often as necessary. After injecting, put the finger lightly on the opening in the vein, so as not to impede the current of the blood; which in all veins is towards the heart.

If far away from any surgeon, practice in anticipation the operation on a dead dog. A large vein will be found lying beneath the skin of the side of the neck, running from the lower jaw to the top of the chest. After this, try it upon a living one; two friends holding the animal quiet. Exercise a little stern authority over the dog; and he will probably let you inject him without moving. If you succeed, there will be no difficulty in operating upon a fellow creature.

In these trial operations let the syringe be filled with water simply.

I believe it takes a week to learn to use a bicycle. I assure the reader one afternoon will suffice to use the syringe.

* 10 drops of the strongest Liquid Ammonia to 20 of water. This is the dose for an adult; a child requiring less, according to age. It may be purchased ready mixed and kept for emergencies.



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